Processing Derived Word Orders in Basque

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Abstract

In the present research we compared the processing of two derived (non-canonical) syntactic structures from a relatively free word order, Basque. A self-paced reading experiment was used in order to measure the processing time of each word/constituent of the sentences and to analyze the processing of verb-medial SVO and OVS sentences. When we compared the mentioned word orders we did not observe any significant reading time difference. This result suggests that SVO and OVS orders are derived from the canonical SOV word order by means of syntactic displacements.

1. Introduction

In the history of Linguistics, one of the most important questions has revolved around whether there are universal languages of language, or whether variation across languages has no limits (Robins 1967). In the XXth century, Joseph Greenberg's *Universals of Language* (1963) was very influential. Since then, it is established that variation across languages is limited, and that all human languages, even if in the face of the surface variability they look different, they are organized by the same patterns. Greenberg was the founder of modern linguistic Typology; the results of his surveys showed that many language features are related, and that they can be derived from the same source. Thus, languages can be classified by these structural features into a few language types.

Greenberg realized that some language features are related each other, that is languages with feature 'x' have also feature 'y'. Greenberg's universals are related to phonology, morphology, and syntax. Here, we are interested in language types which come from syntactic dimension; specially, we are interested in the implications that come from the relative basic order of S(ubject), O(bject), and V(erb). What Greenberg found in his survey is that syntactic features are correlated: if one language has SOV as canonical constituent order in declarative sentences, then this language has postpositions, noun modifiers appear before nouns, adverbs before verbs or adjectives, and auxiliary verbs after main verbs. Precisely, Greenberg's implicational universals classified Basque language as SOV type language (de Rijk, 1969). In Basque, declarative sentences with neuter informational structure organize the constituents of a sentence in SOV order. Following the greenbergian correlations, Basque has postpositions (example 1), in declarative sentences adverbs appear to the left of verbs and adjectives (examples 2 and 3), and auxiliary verbs appear following the participle (example 4).

(1) gizonA-RE-KIN *'WITH THE man'*
(2) Mikel BERANDU etorri da *'Mikel arrives LATE'*
(3) Zure autoa OSO polita da *'Your car is VERY beautiful'*
(4) Mikelek Ana ikusi DU *'Mikel HAS seen Ana'*

Word Order

Basque is a free word order language. Constituents can appear in almost any order. In example 5 which is adapted from Ortiz de Urbina (2003: 448), all sentences generated combining the constituents in all orders (in square brackets) are grammatical:

(5) a. PP-S-IO-O-V

[Afaldu ondoren] [Mikelek] [Anari] [gerriko berria] [oparitu dio]

[After dinner-PP] [Mikel-S] [to Ana-IO] [the new belt-O] [given has-V]

'*After dinner, Mikel has given the new belt to Ana*'

b. O-PP-IO-S-V

[Gerriko berria] [afaldu ondoren] [Anari] [Mikelek] [oparitu dio]

c. S-O-PP-V-IO

[Mikelek] [gerriko berria] [afaldu ondoren] [oparitu dio] [Anari]

d. IO-V-O-PP-S

[Anari] [oparitu dio] [gerriko berria] [afaldu ondoren] [Mikelek]

e. ...

Based on this freedom of the elements in the sentence, some linguists (Rebuschi 1987) have argued that sentence structure in Basque is flat and has no hierarchical arrangement (that is, it is non-configurational). However, nowadays most authors agree that sentence structure is hierarchical in this language (De Rijk 1969, 2007; Salaburu 1985; Eguzkitza, 1986; Ortiz de Urbina, 1989; Laka, 1990; Artiagoitia, 1995; Fernandez, 1998; A. Elordieta 2001, Arregi 2001, among others)[1]. In particular, linguistic evidence shows that Subject is higher than Object. There is widespread agreement among linguists that (5a) is the canonical, underived word order of a sentence, and all other word-orders are derived from this one via movement/displacement.

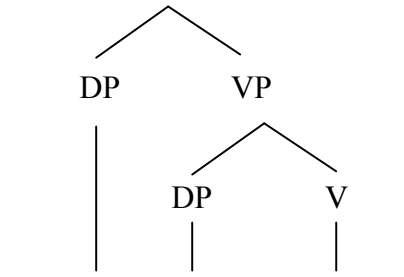
Syntactic complexity

Following linguistic researches of Basque (De Rijk 1969, Eguzkitza 1986, Ortiz de Urbina 1989, Laka 1990, Artiagoitia 1995, Fernandez 1998, A. Elordieta 2001, Arregi 2001 among others), SOV sentences behave like canonical word order, and the other word orders (OSV, SVO and OVS) are derived and harder to process. We follow syntacticians, and assume that SOV is the canonical word order provided by sentence structure in Basque, and therefore we hypothesized that all other word orders (OSV, SVO and OVS) will have a processing cost because they are syntactically derived.

[1] Following Kayne's (1994) *antisymmetry*, some researchers have argued that in Basque the underlying word order is SVO (Ormazabal et al. 1994, G. Elordieta 1997, Haddican 2004, Vicente 2004). Nevertheless, for our purpose of measure syntactic complexity in Basque, antisymmetric approach take SVO as derived when it is generated by focus.

As shown in the (somewhat simplified) syntactic representation in Figure 1, the syntactic structure of the OSV word order is derived from the canonical SOV by means of displacing the object over the subject.

(6) A.



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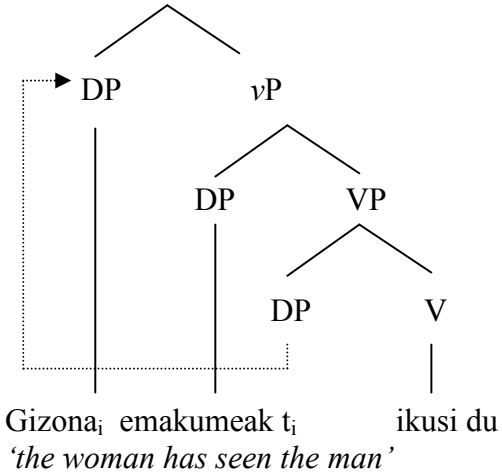

Figure 1: *In these syntactic representations the* v*P represents the transitive sentence where the Determiner Phrases (DP) are the subject and the object of the verb (V). A: Syntactic structure of the canonical SOV word order in Basque. The object (gizona 'man') is generated in the Verb Phrase (VP), preceding the verb (V). B: Starting from the basic SOV order, OSV is generated displacing the object above the subject to the specifier position of a higher projection (XP).*

Recently, psycholinguistic and neurolinguistic evidences have supported the conception that Basque language's SOV word order is syntactically simpler than the derived OSV word order (Erdocia et al., submitted). In that work reaction times showed that canonical SOV is processed faster than OSV word order. Furthermore, reaction times showed that derived word order required a syntactic reanalysis in second DP position probably due to the fact that participants process the first DP as the subject of a simpler intransitive sentence (see Figure 2).

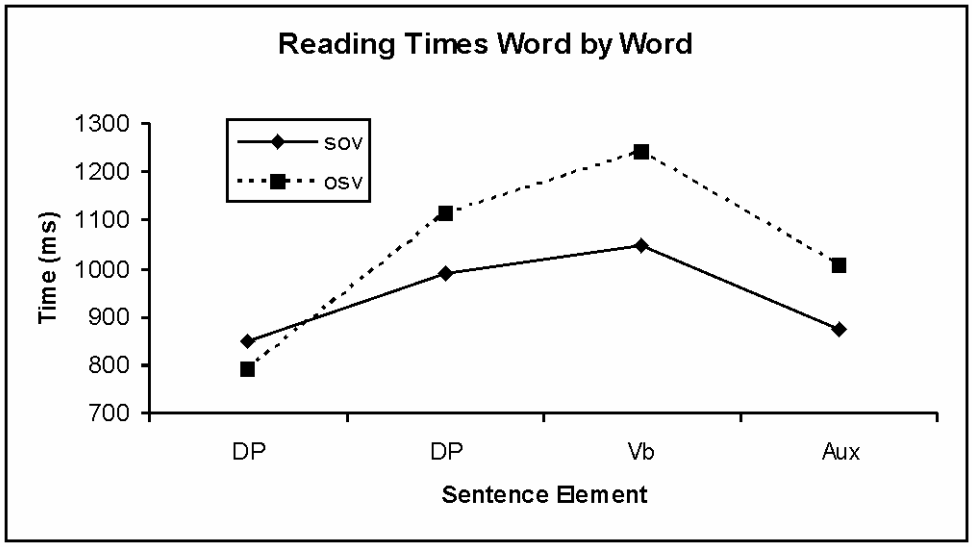

Figure 2: *Word-by-word mean reading times of canonical SOV and derived OSV word orders. The y-axis features reaction times in milliseconds; in x-axis the different constituents of each sentence are depicted (DP = Determiner Phrase; Vb = Verb; Aux = Auxiliary verb). The DPs are the subjects and the objects of the transitive verbs. In the SOV condition the first DP corresponds to the subject of the sentence and the second one to the object, and vice versa in the OSV condition. Reading the subject (first DP of the SOV) after the object required extra processing effort comparing with reading subject before object (OSV) (adapted from Erdocia et al., submitted).*

In addition to reaction times, we provided ERP evidences that non-canonical OSV word orders showed increasing negativities in both DP positions and a P600 effect in the verb position when compared to the canonical SOV word order (Figure 3).

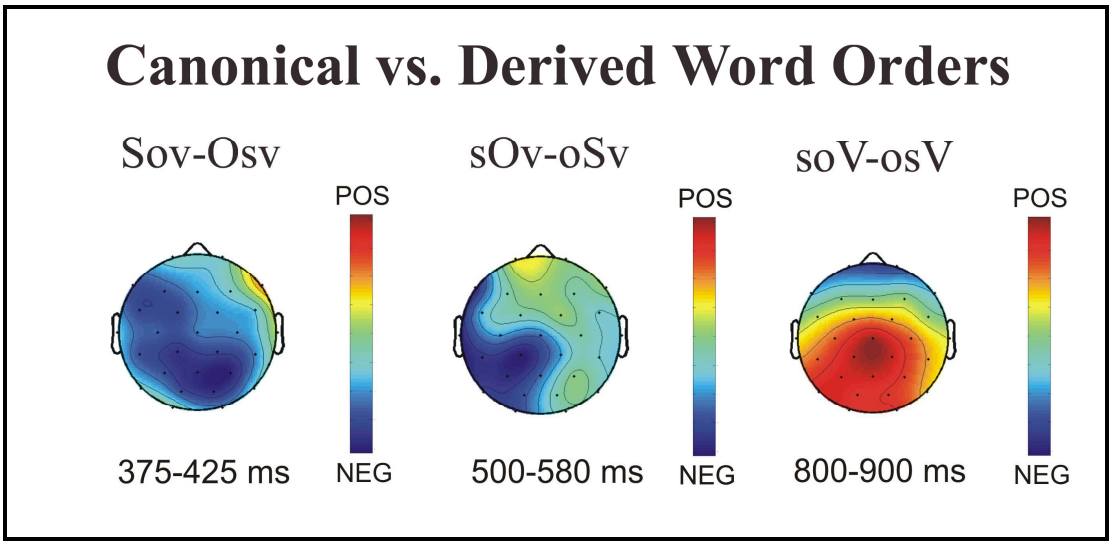

Figure 3: *ERP topographical maps of the comparison between SOV and OSV word orders in Basque. The negativities at DP positions showed that Subjects and Objects were differently processes. The late P600 effect at verb position represents the higher processing cost of derived words orders. Capital letter indicates that the ERP comparison is triggered in that particular position of the sentence. For example,* sOv – oSv *shows the comparison between the object in a canonical sentence and the Subject of the non-canonical one (adapted from Erdocia et al., submitted).*

In the present study we analyzed derived SVO and the OVS verb-medial structures in Basque. Verb-medial word orders are also derived from canonical SOV structures according to linguistic analysis. The simplified syntactic representations below (Figure 4) show how the verb-medial structures could be derived from canonical SOV structure (see Ortiz de Urbina, 1989).

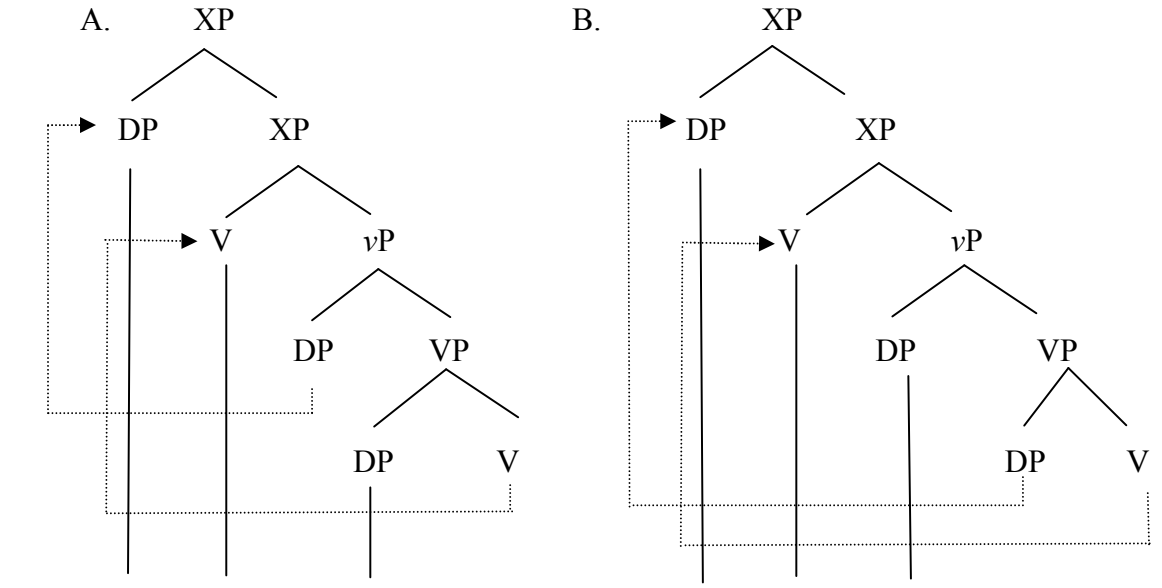

Figure 4: *Starting from the basic SOV order, both derived verb-medial structures are generated by means of displacing elements to higher positions. A: Syntactic representation of the derived SVO word order in Basque. The subject (emakumeak 'woman') and the verb (ikusi du 'has seen') are displaced above the object. B: The OVS is derived displacing the object and verb above the subject.*

According to current generative theory, displacement of an element is motivated only in the case of feature checking (Chomsky 1995). Linguistic researchers have usually motivated the displacement that changes the word order in Basque as movement to check features like Focus and/or Topic (for a review, see Etxepare and Ortiz de Urbina 2003).

Pro-Drop and Ergativity in Basque

Basque is three-way pro-drop language (Ortiz de Urbina 1989, Laka 1996), which means that subjects, objects and datives can be phonologically unrealized:

(6) a. Eman d-i-zu-t
Given it-root-you-me
'*I have given it to you*'
b. Ikusi na-u-zu
seen me-root-you
'*you have seen me*'

Basque is also an ergative language (Dixon, 1994; Levin, 1983; Ortiz de Urbina, 1989), which means that subjects of intransitive clauses and objects of transitive clauses are morphologically identical, and bear no overt case ending, while agentive subjects of transitive clauses are morphologically distinct, and carry and ergative case marker (7):

(7) a. **Gizon-a** etorri da
Man-the arrived is
'*The man arrived*'
b. Emakume-a-k **gizon-a** ikusi du
Woman-the-erg man-the seen has
'*The woman has seen the man*'

Given this combination of grammatical features, if the constituent *gizona* "the man" is encountered at the beginning of an utterance, the following possibilities arise: (i) it is the S(ubject) of an SV intransitive sentence like (7a); (ii) it is the O(bject) of an OSV sentence like; (iii) it is the O of a OV transitive sentence where S has been pro-dropped as in (6).

Ambiguities

We also analyzed the processing of syntactically ambiguous chains. Besides the ambiguity coming from the ergative and the pro-drop features, Basque language has a morphologically ambiguous marker. In the case of (8), both constituents end with the ambiguous *–ak* form.

(8) Emakume**ak** gizon**ak** ikusi ditu
Woman-the S_{sg}/O_{pl} man S_{sg}/O_{pl} seen has
'*The woman has seen the men*' or '*The man has seen the women*'

In (8), one of these constituents is the singular subject of the sentence, and the other is the plural object of the sentence. In Basque objects can appear at the beginning of the sentence, so without the help of any acoustic or prosodic information, in visually presented sentences it is impossible to know whether the first constituent is a singular transitive subject, a plural intransitive subject, or a plural object.

By measuring the reading times of fully ambiguous verb final declarative sentences (e.g., sentence 8) we have shown in the previous study (Erdocia et al., submitted) that these

ambiguous sequences are processed as SOV canonical sentences. We interpreted these results considering that the ambiguous first constituent is processed as a singular transitive subject, and hence the second ambiguous constituent is processed as plural object, thus displaying a strong *subject first* processing strategy (Bates et al., 1988).

Furthermore, as shown in (9), a sentence can be ambiguous with respect to its initial constituent, and it can be morphosyntactically disambiguated. That is, we can start the sentence marking the first constituent with the ambiguous *–ak* ending, but if we mark the second constituent unambiguously, then the sentence ends up not being ambiguous.

(9)	Emakume**ak**	gizon**ek**	ikusi	dituzte
	Woman-the S_{sg}/O_{pl}	man S_{sg}	seen	have
	'*The men have seen the women*'			

Example (9) starts ambiguously (the first constituent could be the subject or the object of the sentence) but it is disambiguated at the second constituent position by means of the unambiguous *–ek* plural transitive subject marker. Thus, once the second constituent is processed, the first constituent should be interpreted necessarily as the object of the sentence. In our previous study, we showed that that these temporally ambiguous chains (e.g., sentence type 9) are disambiguated syntactically at the second constituent position (Erdocia et al., submitted). Comparing the canonical SOV sentences and these temporarily ambiguous OSV sentences, the reading times increased significantly at sentence second position of temporally ambiguous sentences (Figure 5).

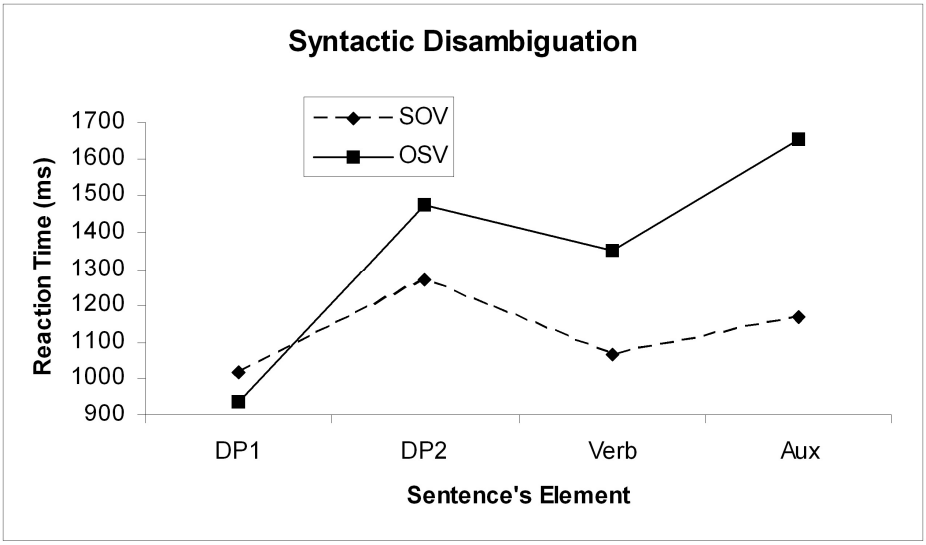

Figure 5: *Syntactic Disambiguation effect at second DP position of OSV derived sentences (adapted from Erdocia et al., submitted).*

Thus, the results suggest that participants initially processed the first ambiguous constituent as the subject of the sentence, but upon finding the unambiguous plural subject at sentence second position, participants were forced to reanalyze their initial processing hypothesis, changing the *subject-before-object* interpretation to the derived *object-before-subject* interpretation. Finally, in the corresponding ERP experiment, (Erdocia et al., submitted, exp. 3) we also observed a specific modulation of a negative frontal-posterior component in ambiguous SOV sentences which were semantically disambiguated at the verb constituent. We interpreted this modulation as an index related to working memory costs induced by syntactic reinterpretation analysis (changing the default SOV interpretation to OSV in ambiguous sentences).

In the present study we took advantage of these morphologically ambiguous *–ak* markers to explore the syntactic disambiguation effect in two derived structures, verb-medial SVO and OVS. Furthermore, we explored whether these syntactically derived (non-canonical) structures are equally or differently processed in terms of reaction times.

2. Comparing derived SVO and OVS words orders.

The aim of the present study was to measure the syntactic complexity and the ambiguity resolution that word order variation generates. By using *self-paced reading* (Just et al. 1982) and a *comprehension task*, we studied the processing of sentences with SVO and OVS word

orders in Basque, in order to measure differences between the *subject-before-object* and *object-before-subject* effects.

Material

The experimental material consisted of 100 sentences like (10a). Starting from this type of sentence, we generated the rest of conditions by means of changing the order and the number of constituents. Thus we have 100 of singular SOV sentences like (10a), 100 of singular OSV sentences like (10b), 100 of ambiguous sentences like in (10c), 100 of plural SOV like (10d), and finally 100 of plural OSV like sentences (10e). Altogether there were 500 stimuli.

(10) a. Gizonak ikusi du emakumea [Sak-V-Oa]
Man-S see has woman-O
'The man has seen the woman'

b. Emakumea ikusi du gizonak [Oa-V-Sak]
Woman-O see has man-S
'The man has seen the woman'

c. Gizonak ikusi ditu emakumeak [Amb-V-Amb]
man-? see has woman-?
'The man has seen the women' or 'The woman has seen the men'

d. Gizonek ikusi dituzte emakumeak [Sek-V-Oak]
men-S see have women-O
'The men have seen the women'

e. Emakumeak ikusi dituzte gizonek [Oak-V-Sek]
women-O see have men-S
'The men have seen the women'

Recall that the constituents carrying the morpheme *-ak* are ambiguous. Therefore, sentences like (10a), (10c) and (10e) are ambiguous at first constituent position. Sentences (10a) and (10e) are disambiguated at auxiliary position. In the case of (10a) the resulting structure is SVO and in the case of (10e) the resulting structure is OVS. Only the sentences

like (10c) are fully ambiguous sentences because both constituents carry the ambiguous -ak ending. Although conditions (10a), (10c) and (10e) start ambiguously we decided to label only the constituents of the fully ambiguous condition (10c) with the *Amb* mark.

Stimuli were divided in five lists. Sentences were randomized (Latin-square), and one version of each item was assigned to one of the five lists. This method allowed every participant to read only once each version of a sentence. The five list were balanced across participants ensuring that the material was correctly rotated across conditions and participants. This ensured that each version of each sentence was read equally number of times across participants. The experimental items were presented along with 16 practice trials (2 sentences of each condition and 6 fillers) to verify that participants understood the instructions of the experiment.

We created 100 filler sentences which were also presented in the experiment. The same fillers were used in the five lists. Like in the experimental conditions, fillers were four words long and with different syntactic structures from the experimental stimuli.

Method

The experimental data were obtained by presenting the materials to the participants using Self Paced Reading Moving Window (Just et al. 1982) and performing the Comprehension Task. We measured the reading times of the participants, which is the time required for reading each word in every sentence. Then we added the reading time of each word, in order to obtain the reading time of the whole sentence. We could determine whether the participants understood the sentences correctly through the comprehension task, and we also measured the reaction time of the comprehension task itself.

Using the self-paced reading technique participants performed the experiment at their own pace; they decided the speed of the task. To move from one element to the next element, participants had to press the space bar of the computer keyboard, one for each element. Thus, each participant decided the time they needed in order to process each element of the sentence, and therefore they decided the time they needed to comprehend the whole sentence.

Different methods could be chosen for stimuli presentation using the self-paced reading technique (Just et al. 1982; Kennedy and Murray 1984). Due to the agglutinative morphology of Basque language we decided to present the sentences word by word. In this manner participants read the words as they would normally read them in a written text. The moving window technique used here (Just et al. 1982) requires that sentences are presented word by word, and once a word has been read it turned into a string of asterisks.

Each trial began with a series of yellow dashes marking the length and position of the constituents in the sentences (*one dash for each letter*). Sentences were presented on the computer screen in blue. No punctuation marks were presented throughout the trial. The first press of the space bar replaced the first dashes with the first word of the sentence. As the participants pressed the space bar, the next dashes were replaced by the next word, and the preceding word was again replaced by dashes. When participants finished reading the sentence this way, a comprehension question appeared on the screen. In order to answer the question of the comprehension task, participants had to press the button corresponding to 1 and 2 in the keyboard. Participants did not receive feedback about their answers. The amount of time the participant spent reading each word was recorded as the time between key-presses.

The comprehension task allowed us to be sure that the participants had understood the sentences they read. The task consisted in a yes-or-no question after each sentence. The answer to half of the questions of each word order was "yes" and the other half was "no". Example (11) would be the question corresponding to the test item of (10a); in this case the answer would be positive:

(11) egia al da emakume batek ikusi duela gizon bat?
true-S Q[2] is woman one-S seen has man one-O
'is it true that one woman has seen a man?'

Note that due to the types of the questions we made in the comprehension task corresponding to the ambiguous chains, both answers (yes and no) could be correct. We predicted that if participants didn't realize that the sentences were ambiguous they would process the sequence as a SVO sentence; but if they realized they were ambiguous, then we would expect the participants' self-confidence in the comprehension of ambiguous chains to decrease.

Participants

Twenty nine native speakers of Basque participated in the experiment as volunteers. All participants who made more than 7 mistakes out of 20 sentences of each condition were rejected from statistical analysis. However, in the case of ambiguous sentences we included the participants who made more than 7 mistakes for statistical analysis since in any case their

[2] The interrogative particle *al* is used in yes-no questions.

answers could not be taken as incorrect. Had we not included these participants, then we would not have had any participants to analyze. All in all, we analyzed data from 24 subjects (2 men and 22 women; mean age 20, SD ± 3.21).

The participants filled a Basque-Spanish bilingualism questionnaire (adapted from Weber-Fox and Neville 1996). The results of the questionnaire showed that participants use the Basque language more often than Spanish[3]. More specifically the results for Basque obtained 1.9 ± 0.3 (SD) points in a 1 to 7 point scale where 1 corresponded only to Basque use and 7 only Spanish). Subjects had to rate themselves in comprehension, in reading, in speaking and in writing. In a 4-point scale where 4 was 'very good' and 1 was 'bad', the mean values for the present sample were 3.94 ± 0.2 for Basque and 3.5 ± 0.6 for Spanish. They were also asked in which language they felt more comfortable or preferred (in general); six participants answered they felt equally comfortable in both languages, one preferred Spanish, and the rest of the participants felt more comfortable in Basque. In sum, the present sample is very fluent in Basque and is the language which is usually used in their environment.

Recording

Participants were instructed to read at a normal, comfortable pace and in a way that would enable them to understand the sentences. Sentences were presented using a standard Personal Computer and running the EXPE6 (Pallier et al. 1997) program. The computer recorded the time interval since a word was first displayed until the next press of the space bar. The choice program recorded the reaction times and the answers of the participants. More specifically the program recorded: (i) the required time to read each word of the sentence, (ii) the required time to read and answer the question of the comprehension task, and (iii) whether the answer to the question was correct or not.

Results

The reading times of the experimental conditions revealed two groups of conditions (Figure 6). The sentence types whose constituents were in the singular behaved in one way (Sak-V-Oa = 3210ms; Oa-V-Sak = 3163ms) and the sentence types whose constituents were in plural showed larger reading times (Sek-V-Oak = 3643ms; Oak-V-Sek = 3669ms). Ambiguous chains patterned with the plural group (3661ms). The difference between the sentence types of each group was not significant (Sek-V-Oak vs. Oak-V-Sek T(23) = -0.330 *P*

[3] One of the participants, who was from Hendaye (French-speaking area of the Basque Country), filled the bilingualism questionaire for French-Basque.

= 0.744; Sek-V-Oak vs. AMB-V-AMB T(23) = 0.191 $P = 0.850$). But the difference between the two groups of sentence types was very significant (Sak-V-Oa vs. Sek-V-Oak T(23) = -5.949 $P < 0.001$; Oa-V-Sak vs. Oak-V-Sek T(23) = 5.071 $P < 0.001$).

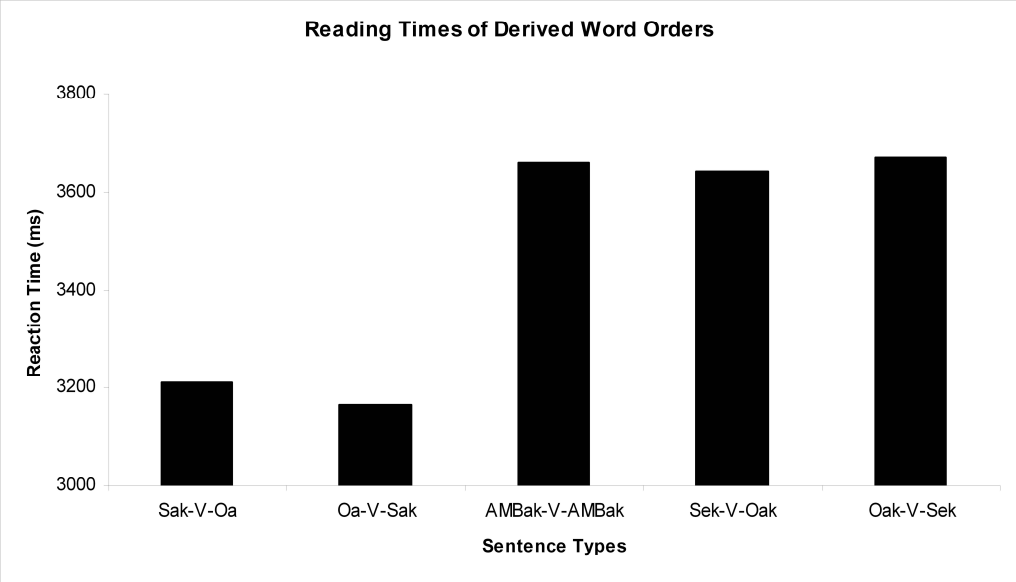

Figure 6*: Mean reading times of the five verb-medial derived conditions.*

The time required in the performance of the comprehension task showed that questions about Sak-V-Oa condition were faster than any other experimental condition (Sak-V-Oa vs. Oa-V-Sak T(23) = -4.051 $P < 0.001$; Sak-V-Oa vs. Sek-V-Oak T(23) = -6.304 $P < 0.001$; Sak-V-Oa vs. Oak-V-Sek T(23) = -6.736 $P < 0.001$; Sak-V-Oa vs. AMB-V-AMB T(23) = -6.685 $P < 0.001$). Comparing singular Oa-V-Sak to plural counterpart Oak-V-Sek the difference was significant (T(23) = -3.048 $P < 0.007$). The difference between Oa-V-Sak and Sek-V-Oak it was not (T(23) = -1.871 $P = 0.074$). Finally, comparing singular Oa-V-Sak to ambiguous chain (AMB-V-AMB) the difference in reading and answering of the comprehension task was significant (T(23) = -2.835 $P < 0.01$).

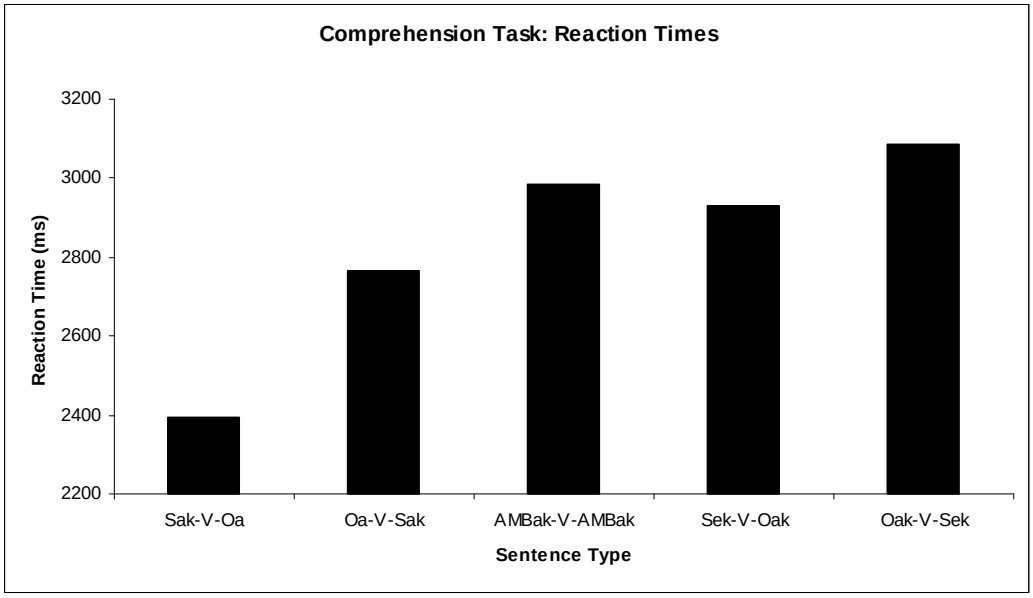

Figure 7*: Means of the performance of the Comprehension task.*

Turning to the errors in the comprehension task, it has to be said that all errors in the ambiguous chains were included in the analysis, so the results were conditioned by this issue. As it can be seen in Figure 8 the condition that elicited more errors was the ambiguous condition. Comparing the ambiguous chain with any other condition the difference was significant (AMB-V-AMB vs. Sak-V-Oa T (23) = -9.684 $P < 0.001$; AMB-V-AMB vs. Oa-V-Sak T(23) = -6.232 $P < 0.001$; AMB-V-AMB vs. Sek-V-Oak T (23) = 8.126 $P < 0.001$; AMB-V-AMB vs. Oak-V-Sek T(23) = 7.055 $P < 0.001$ value, $P < 0.001$). On the other hand Sak-V-Oa sentences generated fewer errors than any other condition (Sak-V-Oa vs. Oa-V-Sak T (23) = -3.093 $P < 0.006$; Sak-V-Oa vs. Sek-V-Oak T (23) = -2.547 $P < 0.02$; Sak-V-Oa vs. Oak-V-Sek T (23) = -2.145 $P < 0.05$). Finally there were not differences between Oa-V-Sak, Sek-V-Oak, and Oak-V-Sek conditions.

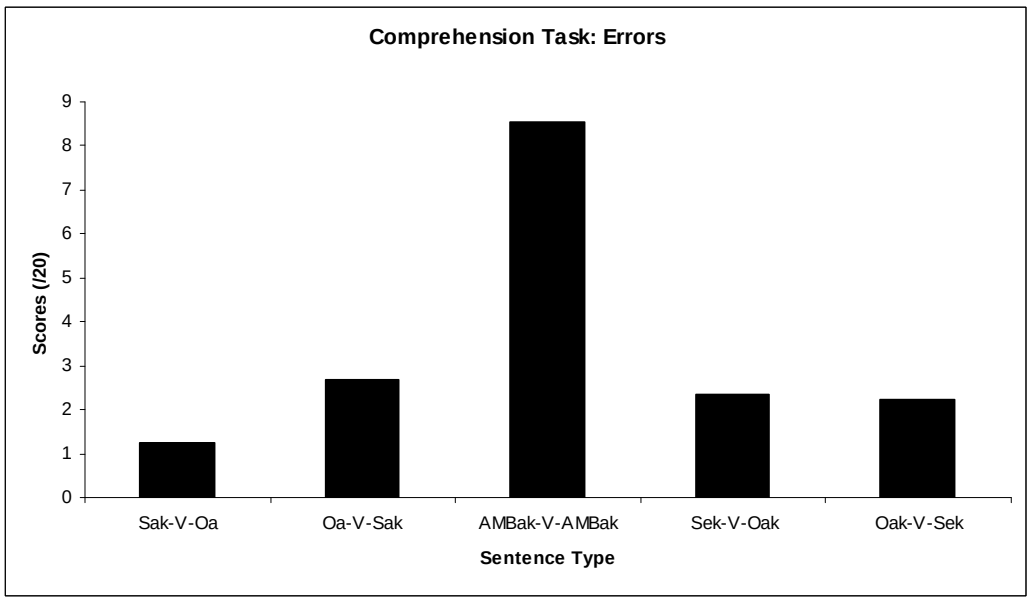

Figure 8: *Error rates (out of 20) of the Comprehension task of the five experimental conditions*

Summarizing, we have seen that Basque speakers processed sentences containing singular constituents faster, but no difference was found between the SVO and OVS word orders. On the other hand, the comprehension task showed that ambiguous chains generated many errors. In order to shed further light on the differences we observed across these conditions, we carried out the word by word comparisons.

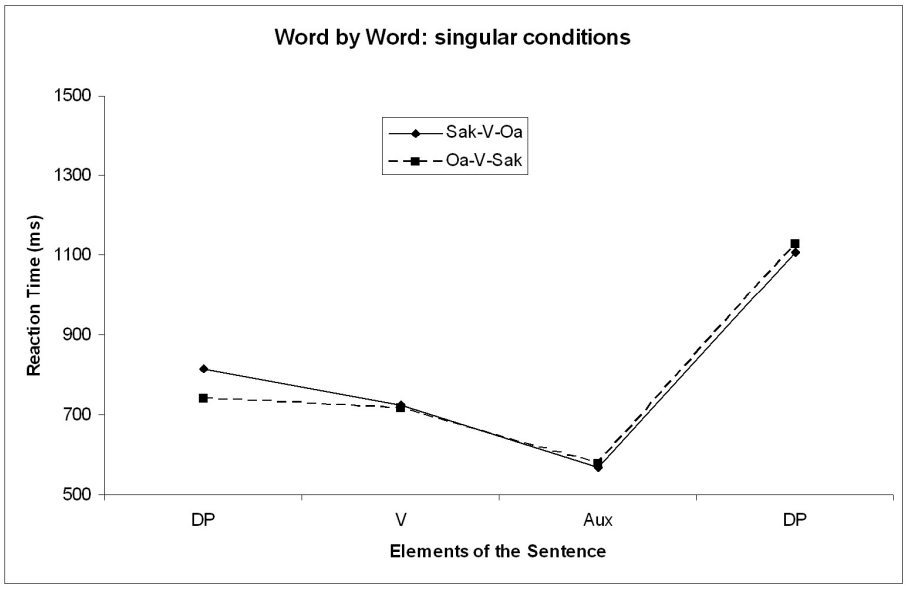

Figure 9: *Word by word comparison of SVO and OVS word orders with singular constituents in S and O position.*

First of all, we compared the conditions which contained singular constituents (Sak-V-Oa and Oa-V-Sak). Comparing them word by word the only significant difference appeared at first word position ($T(23) = 2.401$ $P < 0.026$) (Figure 9). This difference was the same difference we obtained in previous studies comparing canonical SOV and derived OSV verb final structures (Erdocia et al., submitted; see also Figure 3 of this chapter): at sentence initial position unmarked (absolutive) constituents were processed faster than marked (ergative) constituents. At sentence initial position the processing of object (738 ms) was faster than the processing of the subject (812 ms). There was not any other significant result.

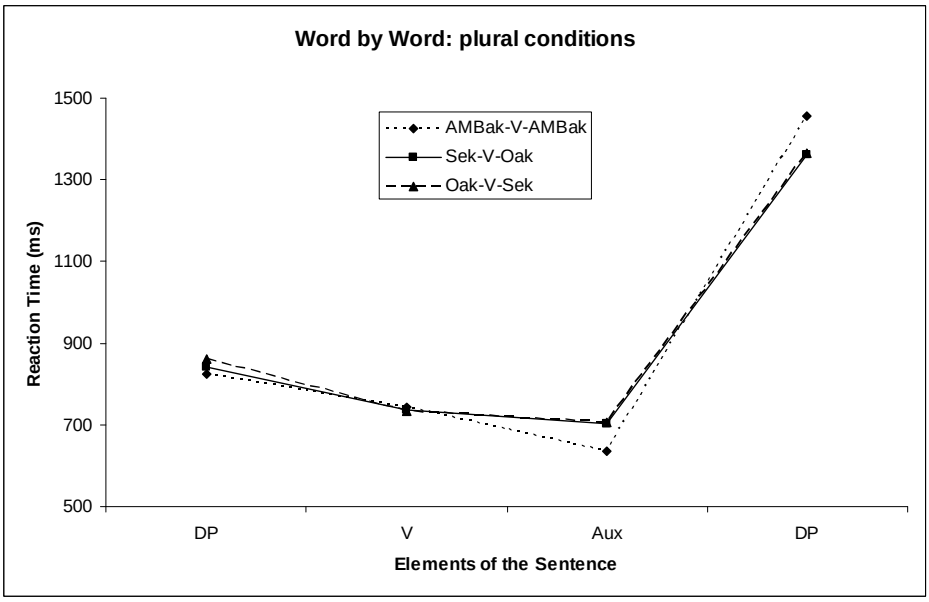

Figure 10: *Word by word comparison of plural and fully ambiguous conditions. The plural SVO and OVS conditions were equally read. The ambiguous condition was faster at auxiliary position.*

When comparing the plural subjects with the plural objects significant differences were found at sentences initial position as well as at sentences final position (Figure 10). However, comparing the verb and the auxiliary positions of the five conditions, the results revealed that at verb position there were not differences. But, when the auxiliary was processed the results showed three different patterns when comparing between them (a) the auxiliary (*du*) in singular sentences was processed fastest, (b) followed by the auxiliary (*ditu*) in ambiguous chains and (3) finally the auxiliary (*dituzte*) in plural sentences. The difference between these auxiliaries was significant (*du* vs. *ditu* $T(23) = -2.721$ $P < 0.02$; *du* vs. *dituzte* $T(23) = -5.475$ $P < 0.001$; *ditu* vs. *dituzte* $T(23) = -2.952$ $P < 0.008$). There was not difference between conditions with the same auxiliary. It could be argued that the difference between auxiliaries was due to their length in letters or to their morphological complexity.

Finally, the only significant difference obtained in the comparison between plural Sek-V-Oak and ambiguous chains was found at auxiliary position ($T(23) = -2.952$ $P < 0.008$), and in the interaction ($F(23) = 4.586$, $P < 0.05$) between verb-auxiliary and sentence type (see Figure 10).

Discussion

The present study revealed that verb-medial non-canonical SVO and OVS structures are processed similarly. The reading times of the whole sentences showed a difference between the sentences with singular constituents and the sentences with plural constituents. However, the reading times did not show any difference between SVO and OVS structures. It does not mean that both word orders were processed in the same way. Some differences were found in certain words depending on to the condition, but these differences did not influence the processing time of whole sentences.

Secondly, the comprehension task revealed that singular subject-first condition (Sak-V-Oa) was easier to process. The task was performed faster and the accuracy was higher in singular subject-first condition. However, it could be biased by the SVO structure of the questions in the comprehension task. The fact that the questions of the comprehension task had the SVO structure could facilitate the task in sentences with SVO order. Nevertheless, we did not find any facilitation effect in the plural SVO conditions regarding the plural OVS counterpart. More interestingly, we found that fully ambiguous chains elicited more errors than the rest of conditions. Even if we named "errors", recall that in the comprehension task of fully ambiguous chains, the both responses were correct. The comprehension task showed the preference (SVO or OVS) of the participants comprehending of fully ambiguous sentences. This highest error rate in the comprehension task of fully ambiguous chains could represent that participants realized they confronted with ambiguous chains. In other words, although the native Basque speakers did not show any difference when reading the ambiguous chains, performing the comprehension task elicited more errors. It could be the case that reading ambiguous chains participants did not realize that they are ambiguous. After reading, when participants performed the comprehension they notice the ambiguous character of the sentences. A similar effect was described by Tamaoka et al. (2003) in Japanese. In that study participants did not show any difference reading canonical SOV and scrambled OSV structures in Japanese. However, the comprehension task revealed that the scrambled sentences were harder to judge as correct sentences than canonical sentences. The authors considered Japanese canonical and scrambled sentences based generated. Following Boskovic

and Takahashi (1998), Tamaoka et al. (2003) proposed a configurational structure without movement for Japanese. According to the authors, an intermediate step between reading the sentences and performing the comprehension task integrates and verifies the information of the sentences (Tamaoka et al. 2003). Turning to our Basque data, it could be possible to state that native Basque speakers realize that they confronted ambiguous chains while they performed the comprehension task.

The differences obtained in the word by word analysis were above all due to morphological differences rather than to syntactic difference. First, due to the lack of mark of the absolutive singular it was read faster than the marked forms. Similar results were obtained in verb final SOV and OSV structures in Basque (Erdocia et al., submitted). Secondly, regarding the differences obtained at auxiliary position, we have shown that there was an effect on reading time due to the amount of existing morphemes. However, the aim of the present behavioral experiment was not to measure the processing cost of the morphologically different auxiliaries. Contrarily to the comparison between canonical SOV and derived OSV (see Figure 3), in verb-medial sentences we didn't find any interaction between the sentence type and the word suggesting that there was not any syntactic reanalysis effect.

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