Subject preference and ergativity

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A R T I C L E   I N F O

A B S T R A C T

This paper presents the first-ever processing experiment on relativization in Avar, an ergative language with prenominal relatives. The results show no processing difference between the ergative subject gap and the absolutive object gap. The absolutive subject gap, however, is processed much faster. We propose a principled explanation for this result. On the one hand, Avar has a subject preference (cf. the Accessibility Hierarchy, Keenan and Comrie, 1977), which would make the processing of the ergative and the absolutive subject gap easier than the processing of the absolutive object gap. On the other hand, the ergative DP in a relative clause serves as a strong cue that allows the parser to project the remainder of the clause, including the absolutive object DP (cf. Marantz, 1991, 2000); such morphological cueing favors the absolutive object gap. Thus, two processing preferences, the one for subject relatives and the other for morphologically cued clauses, cancel each other out in terms of processing difficulty. As a result, reading time results for the ergative subject and absolutive object relative clauses are very similar. The overall processing results are significantly different from what is found in accusative languages, where subject preference and morphological cueing reinforce each other, leading to a strong transitive subject advantage.

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1. Introduction

Every natural language is capable of forming relative clauses, and their patterning across languages displays one of the most robust generalizations attested in cross-linguistic research. This generalization has been captured in the Accessibility Hierarchy (AH) of Keenan and Comrie (1977, 1979). According to the AH, there is an ordering of grammatical relations such that, within a given language, if one grammatical position can relativize with a gap, then all grammatical positions to the left of this position on the hierarchy must also be able to relativize with a gap:

(1)   subject > direct object > indirect object > oblique object > possessor > object of comparison

That is, if a language can relativize obliques, it can also relativize direct and indirect objects and subjects. If a language can relativize objects, it can also relativize subjects, but not necessarily obliques.

A critical claim behind the AH is that every language should be able to relativize its highest argument even if nothing else on the scale in (1) is accessible to relativization. The AH was intended as a cross-linguistic generalization on the distribution

of different types of relative clauses in various languages: from English, whose relativization is omnivorous, to many Austronesian languages, which only allow the relativization of subjects/external arguments (cf. Keenan, 1976; Gärtner et al., 2006; Chung and Polinsky, 2009).

More recently, the AH has also been evoked in the explanation of the subject preference in the processing of relative clauses in English. Subject preference has been noted in first and second language acquisition (see O'Grady, 2010 for an overview), and in other languages: German (Schwartz, 2007, a.o.), Dutch (Frazier, 1987), Russian (e.g., Polinsky, 2011), Hebrew (e.g., Friedmann and Novogrodsky, 2004), Japanese (Miyamoto and Nakamura, 2003; Ueno and Garnsey, 2008), and Korean (Kwon et al., 2010), to name just a few.[1] All these languages, however, mark their subjects invariably with the nominative case.

Ergative languages have posed challenges to the AH in that many of them exhibit syntactic ergativity, a feature in which the absolutive arguments (intransitive subject and transitive object) relativize with a gap, but the ergative subject DP does not (Keenan and Comrie, 1977, 1979; Dixon, 1994; Aldridge, 2008). With the advent of processing studies, ergativity, with its dissociation between morphological case marking and grammatical function, offers a particularly promising area for the study of relativization, as it opens up a special dimension for a study of the interaction between syntax, morphology, and processing. In addition to conceptual considerations, it is worth noting that the processing of ergative languages has yet to be explored by the linguistic community, and the current study is an initial step in that direction.

We present and analyze the results of an experiment that tests the processing of relative clauses in a head-final ergative language, Avar. The paper is organized as follows: Section 2 explains the logic of the study presented here. Section 3 is a brief overview of Avar, and Section 4 presents the results of a behavioral experiment on Avar relativization. Section 5 provides a discussion of these results. Section 6 addresses broader implications of this study and Section 7 presents our conclusions.

2. Why ergativity: the relevance of ergative languages for the general understanding of processing

In an ergative language, case marking and/or agreement align the single intransitive argument with the object of a transitive: both appear in the absolutive case and/or are indexed by the same agreement exponent, while the transitive subject appears in the ergative or has a special agreement exponent. However, in the majority of morphologically ergative languages, the ergative DP has all the criterial properties of a subject: it is the addressee of an imperative, it binds the absolutive but cannot be bound by it, it participates in control and raising, and often it has preferential properties in the control of cross-clausal anaphora (cf. Anderson, 1976, 1977, 1984; Bobaljik, 1993a,b; Manning, 1996; Legate, 2001, 2008a; Aldridge, 2008; McGregor, 2009).

This constellation of properties points to the accusative alignment in syntax, grouping intransitive and transitive subjects together, despite the occurrence of the surface ergative case marking. That is, these properties suggest that the ergative is a syntactic subject in a transitive clause, just like its nominative counterpart in accusative languages. Two manifestations of syntactic ergativity are well known: ergativity in Dyirbal (Dixon, 1972, 1994) and a very common restriction on A-bar movement (relativization) of the ergative subject. The former is a data point open to interpretation (cf. Heath, 1979, 1980; Jake, 1978; Polinskaja, 1989; Legate, 2008b), and we will not be concerned with it here. The latter is central to our investigation, but we will postpone the relevant discussion until Section 6.1.

An investigation into the processing of ergative languages therefore offers us a special opportunity to explore the respective roles of grammatical functions and of case forms in the parsing of relative clauses, which are indistinguishable in accusative languages. If subject relatives are universally easier to process, then relative clauses with an ergative gap should be easier to process than those with an object absolutive gap. If, however, relativization is sensitive to case marking, relative clauses with an object absolutive gap should be processed differently from relative clauses with an ergative gap.

Based on the latter scenario, which configuration should this difference favor in processing? Here the logic is as follows: certain morphological cases cannot appear on their own and only show up if another distinct case is present. The two best-known cases that depend on the presence of another DP (bearing a different case) are the accusative and the ergative (Marantz, 1991, 2000). They are therefore "dependent" cases,[2] while the cases they have to co-occur with are "independent". The appearance of a dependent case form serves as a signal to the parser that the case it depends on is also present and that the relevant XP needs to be projected (cf. Bornkessel and Schlesewsky, 2006, a.o.). Thus the presence of a dependent case form allows the parser to make a stronger prediction about the argument structure of the predicate and project the syntactic structure of the clause or a portion of the clause well in advance – at least much earlier than in an encounter with an independent case form. For an ergative language, this entails that processing of relative clauses should be facilitated by the presence of the ergative: such a DP signals that the absolutive has to be there, it is therefore expected, and the gap in the absolutive position should be easier to project. This in turn should make the processing of object relatives easier.

In sum, if processing is sensitive to case form, relative clauses with an object absolutive gap should show a processing advantage. Such an advantage would be particularly tangible in a head-final language with prenominal relative clauses, because one of the earliest constituents the parser encounters is an ergative DP informing the parser that there is an absolutive somewhere down the line, either coming up or gapped.

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[1] Mandarin and Cantonese have been more problematic in that regard, with different studies showing different results. The discussion of those languages' relative clauses is beyond the goals of this paper.

[2] We follow Marantz's terminology but nothing hinges on the actual syntactic account of dependent case for our purposes.

Our predictions are summarized in the table in (2), where '>' stands for 'easier to process', and 'SR' and 'OR' stand for 'subject relative' and 'object relative', respectively.

(2)   Predictions concerning the processing of relative clauses in accusative and ergative languages: grammatical function vs. morphological case.

	Processing of the relative clause with a gap is sensitive to:	
	Grammatical function	Morphological case
Accusative alignment	SR > OR	SR > OR
Ergative alignment	SR > OR	OR > SR

Whether grammatical functions and surface forms work in tandem or not cannot be established without a comparison between the extraction of the ergative and absolutive DPs out of a transitive clause and the extraction of the subject/absolutive DP out of an intransitive clause (and, for completeness, the extraction of the nominative from intransitive clauses in nominative–accusative languages).[3] It is necessary to include the intransitive subject because it shares with the transitive subject the same high structural position, and, for ergative languages, it shares absolutive case marking with the object.[4]

In an accusative language, again, predictions regarding grammatical function and morphological case are indistinguishable, but in an ergative language, these two factors pull in different directions. Thus, if grammatical function wins, the intransitive subject gap would pattern with the subject, regardless of the differences in case marking. If the case-marking factor wins, the intransitive subject gap would pattern with the absolutive object gap.

Of course, the predictions for the intransitive subject also have to include another possibility, namely, that it would be different from both core arguments of a transitive clause – such a difference could be due to lower argument complexity of an intransitive (or alternatively, to the distinction between unergative and unaccusative subjects, which is not always clear, especially in lesser studied languages).

3. Avar

3.1. Basic structural facts

Our study was based on the standard (literary) dialect of Avar (ava), one of the largest language of the Northeast Caucasian (Nakh-Dagestanian) language family. Avar is spoken in the northwest and central parts of the Republic of Dagestan, as well as in Azerbaijan, Kazakhstan, and Turkey. There are about 700,000 Avar speakers, and informal estimates of the Avar population in the Russian capital Moscow stand at about 30,000. Traditionally, Avar has been used as the trade language and one of the main languages of communication in Dagestan, and is still used by speakers of less-spoken Avar-Andic and Tsezic languages (Alekseev, 1988). The language has existed in written form (Arabic-based script) since the seventeenth century. In the Soviet period, the script was changed to Cyrillic, and Avar was one of several major languages in Dagestan that had a special status: it was a language of instruction and learning in elementary and secondary schools, and a language of media and emerging literature (Madieva, 1965, 1967; Alekseev and Ataev, 1997 and references therein). Despite its substantial population size and special status as the lingua franca of a significant part of Dagestan, Avar has been gradually giving way to Russian – most of the young people who do not live in the rural areas of Dagestan are Russian-dominant. Russian is taking over both among the Avars who live in Russian cities (Moscow, St. Petersburg) and in the lowlands of Dagestan (Maxachkala, Buynaksk, Shamxal). The modest written language tradition and a relatively large number of speakers make Avar a reasonably good candidate for behavioral testing. On the structural side, an important characteristic of Avar is that it allows the relativization of both absolutive and ergative DPs; thus it has no syntactic ergativity and allows us to compare all the relevant relative clauses.

Avar is morphologically ergative, with no evidence of splits (Alekseev, 1988; Klimov and Alekseev, 1980; Tchekhoff, 1970). Its morphological ergativity is so consistent and robust that it is found even with pronominals, which overtly distinguish between absolutive and ergative, for example, in the first person singular forms *dun* (abs.) and *dica* (erg.). The absolutive-ergative case contrast is illustrated in (3)[5]:

(3)   a.   was:-as: šiša   b-ek-ana
              boy-ERG   bottle.ABS   III-break-PAST
              'The boy broke a/the bottle.'

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[3] However, see Fox (1987) and Gordon and Hendrick (2005) for some psycholinguistic considerations and generalizations based on the distribution of relative clauses in corpora.

[4] Some ergative languages, for instance Basque, have unergatives that license the ergative case. Setting aside the issue of whether such verbs are true intransitives, the division of intransitives into the ones that take the subject in the absolutive and the ones that take ergative subjects is not universal to ergative languages; in our discussion, we specifically focus on intransitive subjects in the absolutive.

[5] Here and below we are following the Leipzig glossing rules. Roman numerals indicate noun class.

    b.   was   ruq':o-w-e   '-an-ila
          boy.ABS   home-I-LAT   go-PAST
          'The boy went home.'

The verb agrees with the absolutive DP in noun class (Avar has three noun classes in the singular), cf. the prefix *b* in (3a), which indexes the DP 'bottle'.

In addition to the ergative and absolutive cases, Avar has genitive, dative, and a number of locative cases; the dative case as well as the locative form *–da* can be used in argument position, for example, as experiencers (Bokarev, 1949:34–38), cf.:

(4) a.   qaħa-l   kʷer-az-e   ħalt'i   b-oλ':-ula-ro
           white-PL   hand-PL-DAT   work.ABS   III-like-PRES-NEG
           'White hands don't like work.' (Alekseev and Ataev, 1997:45)
     b.   di-da   he-b   pyesa   b-ix:a-na
           1SG-LOC   this-III   play.ABS   III-see-PAST
           'I saw this play.' (Alekseev and Ataev, 1997:48)

Avar word order in the root clause is relatively free, with SOV appearing most commonly (see also Bokarev, 1949; Testelec, 1998; Magomedova, 2006). In terms of head-dependent arrangement, the language is robustly head-final, with postpositions and prenominal relative clauses.

Avar is a *pro*-drop language. There are no corpora of Avar but we conducted text counts based on folklore texts and more recent narrative texts available at http://saidov-ak.ucoz.ru/publ/2-1-0-89. These text counts show the following distribution of *pro*-drop: the transitive subject is dropped about 70% of the time, the intransitive subject is dropped 47%, and the absolutive object is dropped just 5% of the time. Thus, Avar *pro*-drop is subject-oriented and its distribution is similar to the pattern observed in Japanese (cf. Ueno and Polinsky, 2009).

Relative clauses do not have a relative pronoun, and their predicate appears in a special participial form (Bokarev, 1949; Madieva, 1967; Alekseev and Ataev, 1997). All argument positions are accessible to relativization; for our purposes, it is important that the absolutive arguments, both subject and object, and the ergative subject can relativize with a gap. All the arguments expressed in the relative clause appear in the same case that they have in the corresponding root clause.

Based on folklore texts (three fairy tales), vernacular stories at the website mentioned above, and the Avar translation of Luke's Gospel (Lukaca, 2000), we identified 158 relative clauses; of those, 84 had a gap corresponding either to the absolutive or to the ergative, with the following distribution: 68 cases of absolutive subject gap (43%), 41 cases of ergative subject gap (26%), and 49 cases of the absolutive object gap (31%). The numbers are too small for statistical analysis, but at a glance, this distribution is not very different from what has been reported for more familiar languages with available corpora (cf. Fox, 1987 for English; Carreiras et al., 2010 for Basque).

3.2. Grammatical functions of core arguments

The category 'subject' in Nakh-Dagestanian languages has often been deemed controversial because of agreement facts and the behavior of coreference across clauses (Klimov and Alekseev, 1980; Kibrik, 2003). For example, in Avar, verb agreement is determined by the absolutive DP, i.e., the subject of an intransitive and object of a transitive verb. An additional complication is that Avar has gerunds and converbs which can have a null pronominal subject; that subject can be co-indexed either with the ergative or with the absolutive DP (Samedov, 2003):

(5) a.   *pro*ᵢ   mašina-gi   b-iču-n   muradᵢ-c:a   mina   b-a-na
                     car.ABS-EMPH   III-sell-GER   M-ERG   house.ABS   III-build-PAST
           'Having sold his car, Murad built a house.'
     b.   was-asᵢ   mašina   b-i ču-n   insu-c:a   *pro*ᵢ   w-ux:a-na
           son-ERG   car.abs   III-sell-GER   father-ERG   I-beat-PAST
           'The son sold his car, and the father beat him up.' (lit.: theson having sold the car, the father beat up)
     c.   ustar-as: s:aʕatᵢ   q':ač'a-n   *pro*ᵢ   ħalt'i-ze   ł:uʕa-na
           craftsman-ERG   clock.ABS   repair-GER   work-INF   begin-PAST
           'The watchmaker repaired the clock and it started working.' (lit.: the watchmaker having repaired the clock, it started working)

However, beyond these two phenomena, all other standard tests indicate that the ergative DP asymmetrically c-commands the absolutive. The ergative can bind the absolutive but not vice versa. The ergative, and not the absolutive, participates in control structures and undergoes raising (the raising subject always appears in the absolutive). Finally, the ergative is the

addressee of an imperative, as any nominative subject could be. All these properties are standard characteristics of syntactic subjects, which indicates that the ergative DP is the subject of a transitive clause.

If Avar shows a preference for relative clauses with ergative gaps (and intransitive relative clauses), it would argue for subject preference in the processing of relativization. If, however, Avar shows a preference for transitive relative clauses with absolutive object gaps, that would be consistent with the morphological case account of parsing in the processing of relative clauses. (Although this would not exclude the possibility that grammatical function still has an effect, it would suggest that the effect of case outweighs the effect of grammatical function.)

4. The experiment

4.1. Goals and predictions

The experiment presented here compared the processing of three gap types in Avar: ergative subject (in a transitive RC), absolutive object, and absolutive subject (in an intransitive RC). The main question addressed by the experiment was whether or not ergative gaps are easier to process than absolutive gaps. If accounts of filler-gap dependencies based on phrase-structural considerations are correct, subject gaps, regardless of the case form of the corresponding DP, should be easier to process. Thus, (6a) should be easier than (6b).

(6) a.   [SUBJECT.GAP$_i$ Object/PP   Verb$_{trans}$/Verb$_{intrans}$]   HEAD   NOUN$_i$
     b.   [Subject   OBJECT.GAP$_i$ Verb$_{trans}$]   HEAD NOUN$_i$

If, however, the processing preference is driven by surface case considerations, then we should expect a difference between the ergative gap on the one hand and the absolutive gap on the other, thus (6b) should be easier to process than (6a).

4.2. Materials, participants, and methods

The materials for the experiment included 18 sentence triplets with ergative, absolutive object, and absolutive subject gaps. The nouns were matched for animacy and all the clauses denoted reversible actions.[6] The head noun in our stimuli was in the subject position, appearing either in the absolutive or ergative case (in equal proportion). There were 110 filler sentences. All the materials were normed for conformity with the standard language by three native speaker linguists. Each subject saw all the stimuli sentences; the materials were randomized, and comprehension questions followed roughly every 4 sentences.

The target structures are shown in (7) through (9) (word numbering is shown for example (7) only; all the examples were of equal length in words). Word 2 is the right edge boundary of the first DP or PP in the sentence (all these expressions included a prenominal adjective or genitive); word 5 is the right boundary of the relative clause, and word 6, the head noun.

(7) *Ergative subject gap (transitive subject RC)*

[___$_i$ ʕoloqana-y   yas   repetici-yal-de   y-ač:-un   y-ač'-ara-y]
         unmarried-II   girl.ABS   rehearsal-OBL-LOC   II-bring-GER   II-come-PRTCP-II
W1   **W2**   **W3**   **W4**   **W5 [RC PREDICATE]**

artistka$_i$ bercina-y   y-igo
actress.ABS   beautiful-II   II-AUX
W6 [HEAD NOUN]   **W7 [SPILL OVER]**   **W8**

'The actress that brought the young girl to the rehearsal is pretty.'

(8) *Absolutive object gap (object RC)*

[xalq'iya-y   artistka-yał   ___$_i$ repetici-yal-de   y-ač:-un   y-ač'-ara-y]
people's-II   actress-ERG   rehearsal-OBL-LOC   II-bring-GER   II-come-PRTCP-II

yas$_i$ bercina-y   y-igo
girl.ABS   beautiful-II   II-AUX

'The girl that the distinguished actress brought to the rehearsal is pretty.'

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[6] We are aware of the research showing that the processing difficulty of object relatives may be affected by semantic or pragmatic factors such as animacy (Goodluck and Tavakolian, 1982; Mak et al., 2006; Gennari and McDonald, 2009, a.o.), but all the existing comparisons of SR and OR are based on stimuli where the subject and object are of equal animacy. Even if the processing difficulty of object relatives is limited to a particular subset of nouns, it still needs to be examined and analyzed.

(9) *Absolutive subject gap (intransitive subject RC)*

[___i xalq'iya-y artistka-yal-da-ask'o-y repetici-yal-de č':u-n
      people's-II actress-OBL-LOC-near-II rehearsal-OBL-LOC standing-GER

y-ik'-ara-y] yasi best'ala-y y-igo
PRTCP-II girl.ABS orphaned-II II-AUX

'The girl that stood next to the distinguished actress at the rehearsal is an orphan.'

Avar does not seem to have structural diagnostics of unaccusativity and all its intransitive verbs invariably assign the absolutive to their subject, so in selecting the verbs for the intransitive condition we tried to at least rely on semantics to include both the type that is usually associated with unaccusativity (verbs of position, verbs of directed motion) and the agentive verb types that are usually associated with unergativity.

46 native Avar speakers (21 females) with an average age of 31 participated in this experiment. These speakers included eight college students and seven homemakers; the rest were blue-collar workers or professionals. All the subjects had a high school education. All had normal or corrected-to-normal vision. The subjects were reimbursed for their participation. The experiment was conducted in Moscow; of the 46 subjects, seventeen were visiting Moscow from Dagestan. One subject did not finish the experiment; this subject's results were not included in the analysis. Two other subjects had a low accuracy of comprehension question responses, and were subsequently excluded from the analysis as well.

The experiment consisted of self-paced reading with word-by-word presentation appearing in a running window on a computer screen. Sentences were presented using the Linger Software package (Rohde, 2007) on a PC and a Mac. Participants pressed the space bar in order to continue reading each sentence, in a word-by-word fashion. Prior to the experimental portion of the task, subjects were given a series of practice sentences and practice comprehension questions. The first four subjects were asked to read the instructions in Avar on the screen, prior to the practice test; the rest of the subjects read the instructions and received additional spoken instructions, also in Avar. There was no significant difference in the data between the first four subjects and the rest of the pool.

The average accuracy of responses to comprehension questions was 78%. These accuracy rates are lower than what is traditionally allowed for self-paced reading studies, but are to be expected given that we are dealing with a population different from the traditional undergraduate subject pool used for more established languages.

4.3. Results

Self-paced reading times were analyzed using linear mixed models with random intercepts for subjects and items and log(raw reading time) as the dependent variable. Tokens more then two standard deviations away from the mean raw reading time of all subjects were excluded from the analysis (204 tokens; 4.7%). Reading time was predicted using two centered orthogonal contrasts (colinearity controlled; all partial correlations < .005): CASE (Absolutive *vs.* Ergative) and GRAMMATICAL FUNCTION (Absolutive Subject *vs.* Absolutive Object). Individual models were fitted for log(raw reading time) of the right edge of the first DP or PP inside the relative clause (word 2), the predicate of the relative clause (word 4), the last word of the predicate in the relative clause (word 5), the head noun (word 6), and the spill-over region (word 7).

Average word-by-word reading times are shown in Fig. 1.

At W2, there was a significant effect of CASE ($\beta = 0.16$, $t = 3.57$, $p_{MCMC} < 0.001$) and no effect of GRAMMATICAL FUNCTION ($\beta = -0.05$, $t = -1.02$, $p_{MCMC} = 0.31$). Clauses with the ergative gap are read much faster at this point than the other two clause types.
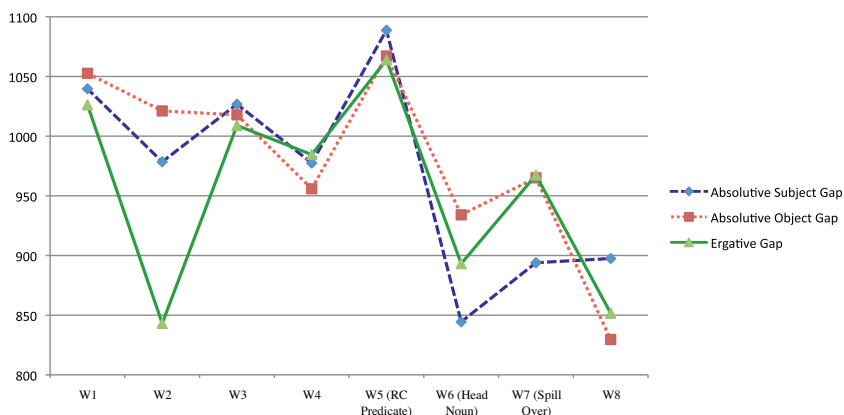
Fig. 1. Reading times (in ms) for relative clauses with absolutive subject gap (intransitive RCs), absolutive object gap (transitive RCs), and ergative gaps (transitive RCs).

At W4 and W5, there was no effect of either CASE or GRAMMATICAL FUNCTION (W4, CASE: $\beta = -0.03$, $t = -0.72$, $p_{MCMC} = 0.51$; W4, GRAMMATICAL FUNCTION: $\beta = 0.02$, $t = 0.42$, $p_{MCMC} = 0.66$; W5, CASE: $\beta = -0.02$, $t = 0.42$, $p_{MCMC} = 0.68$; W5, GRAMMATICAL FUNCTION $\beta = 0.02$, $t = 0.47$, $p_{MCMC} = 0.63$). This lack of effect suggests that argument structure did not affect the results within the relative clause. W4 is the last word before the predicate of the relative clause and the one that completes the argument/adjunct structure for that clause (in the case of the absolutive subject extraction, it is the end of the adjunct phrase); the evenly distributed results in this region indicate that there were no argument structure confounds or other possible confounds at the end of the relative clause.

Outside the relative clause, at the head noun (W6) there was no significant effect of CASE ($\beta = -0.02$, $t = -0.34$, $p_{MCMC} = 0.73$) and only a marginally significant effect of GRAMMATICAL FUNCTION ($\beta = -0.1$, $t = -1.91$, $p_{MCMC} < 0.066$). The intransitive subject was read the fastest, and the ergative subject and the absolutive object were not different.

At the spill-over region (W7), again there was no effect of CASE ($\beta = -0.07$, $t = -1.83$, $p_{MCMC} = 0.076$), but there was a significant effect of GRAMMATICAL FUNCTION ($\beta = -0.1$, $t = -2.3$, $p_{MCMC} < 0.05$); again, the intransitive subject was read the fastest. In self-paced reading, it is common for effects – especially stronger ones – to be delayed by a word or to spread over onto later regions (cf. Ueno and Garnsey, 2008:665), so here we are seeing a large cumulative effect of GRAMMATICAL FUNCTION.

5. Discussion of results

5.1. Case effect at the sentence-initial position

At the right edge of the sentence-initial XP (W2), there was a strong effect of case marking but no effect of grammatical function: the absolutive DP (the first DP in the relative clause which contains the ergative gap) was read faster than the ergative DP (in the ABS-obj gap condition) or the PP (in the ABS-subj gap condition). We can account for this by appealing to the notion of case dependence introduced earlier. As we have suggested, the appearance of a dependent case form allows the parser to make predictions about the argument structure of the predicate and project the structure of the clause in advance; the appearance of an independent case does not lead to such predictions. In terms of processing, this means that the dependent case form signals that other forms are either missing or coming up, whereas the independent case form does not indicate any future commitments.

In Avar, the absolutive is the independent case form, and its appearance does not allow the parser to make any predictions; this absolutive can be associated with an intransitive or transitive verb, so one needs to read on to project the structure. On the other hand, the dependent ergative signals that the absolutive has to be projected, and this leads to a slowdown when the ergative is first encountered. Likewise, a postpositional phrase also needs to be held in the working memory to attach to a predicate or another projection. This explains the slowdown at postpositional phrases/adverbial expressions in the intransitive condition. In sum, the local slowdown in the beginning of the clause is associated with the extra processing load that has to do with the anticipation of upcoming arguments.

Independent support for this analysis comes from Japanese and Korean, where the accusative in the sentence-initial position (at the beginning of a relative clause in particular) is processed slower than the nominative (Miyamoto and Nakamura, 2003; Ueno and Garnsey, 2008:665; Kwon et al., 2006). Just like the ergative, the accusative is a dependent case whose appearance means that the nominative has to be projected. The need to assume that another case, the one that the dependent case is contingent on, is present leads to a local processing cost.[7] In our study, the slowdown occurs at the relevant case form; in Japanese and Korean it is at the next word (Ueno and Garnsey, 2008; Kwon et al., 2006). Again, this slowdown follows from the extra processing work needed to project the argument cued for by the dependent case form.

5.2. Subject preference or absolutive preference?

In this section, we will concentrate on transitive relative clauses. We started out with two possible scenarios: either transitive relative clauses in ergative languages are processed based on the structural position of the gap, which would predict that the results should look the same as in an accusative language (10a), or the processing of such relative clauses cares about the case of the gap, not its grammatical function, and the ergative gap should therefore be more difficult to process (10b).

(10) a. effect of grammatical function: SR > OR;
       b. effect of case marking: OR > SR

The results do not confirm either of these predictions. Instead, the two types of relative clauses, SR and OR, have a very similar processing profile beyond W2, thus SR ~ OR. Does this mean that we simply have a null result? We would like to argue otherwise. Instead, we would like to propose a model that takes both CASE and GRAMMATICAL FUNCTION into account.

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[7] Avar does not have ergatives that occur without an overt absolutive, so the ergative is a clear sign that an absolutive has to be projected. In languages that have ergatives or accusatives occurring with surface intransitives (e.g., Basque for ergatives; Russian for accusatives with the impersonal null subject), one could expect a more complex picture, but even in such languages, the predominant number of ergatives/accusatives occur only in the presence of the corresponding absolutive/nominative.

According to the subject preference, which is encoded in the Accessibility Hierarchy, the extraction of any subject, regardless of its surface case form, should be easier. In the meantime, we just saw some independent evidence, observed locally at W2, that surface case also matters. The case preference has to do with the (in)ability of a particular case form to be a cue that a DP in a different case form has to be present, or, in other words, with the property of (in)dependent case. According to the case preference, the absolutive, which is an independent case, should be easier to process because it is cued for by the dependent case – the ergative. Note that the cue-based explanation is particularly valid for languages like Avar, which are head-final and have prenominal relative clauses – the parser sees the relevant case forms before the verb is encountered, and the presence of the ergative helps the parser to project the absolutive.

Assuming, by hypothesis, that the two factors are of equal weight, they will pull the parser in opposite directions and as a result cancel each other out, thus: [8]

(11)   a.   ERG is subject to two conflicting pressures: it should be easier to process as subject and more difficult to process as dependent case
        b.   ABS-obj is subject to two conflicting pressures: it should be more difficult to process as object and easier to process as independent case

If we now add the intransitive subject to the mix, we can explain why it gets the boost we observe at W6 and W7. For the intransitive subject, the independent case factor and the subjecthood factor work together: the intransitive subject appears in the absolutive, which gives it an immediate boost, and it is also a subject, which again gives it more preference. The overall result is the strong extraction advantage we observe for the absolutive intransitive subject.[9]

In a nominative–accusative language the two factors are always in harmony: subjects, at least the ones examined in the processing literature, are in the independent case, and objects are in the dependent case. We will return to this confluence of factors in Section 6.2.

6. Broader implications

6.1. Syntactic ergativity

Our results have a potential bearing on the understanding of a particular recurrent feature in the syntax of morphologically ergative languages.

As we have already mentioned, most ergative languages treat the ergative DP as a syntactic subject, which shows in its binding, control, or coreference properties. However, there is a systematic exception: the majority of morphologically ergative languages do not allow A-bar movement of the ergative (Dixon, 1994; Aldridge, 2008). Such a restriction against the extraction of the ergative is known as *syntactic ergativity*. For instance, out of the 32 morphologically ergative languages listed in WALS (Comrie, 2008) only five allow the relativization of the ergative DP. These five belong to two language families: Nakh-Dagestanian (Hunzib, Ingush, Lezgian; all genetic relatives of Avar) and Pama-Nyungan (Ngiyambaa, Pitjantjatjara). If we add Basque to the list we end up with six out of 33 ergative languages that allow the extraction of the ergative DP. So on the one hand, syntactic ergativity is cross-linguistically pervasive, and on the other it is not categorical.

Of late, linguists have tried to explain many restrictions in grammar by appealing to processing (cf. Hawkins, 2004, a.o.), and such explanations are particularly seductive when a pattern is not categorical. If we view syntactic ergativity from a cross-linguistic perspective, it is indeed non-categorical. The processing explanation for syntactic ergativity would be as follows: if languages without syntactic ergativity, such as Avar, showed a processing disadvantage for the ergative (and a processing advantage for the absolutive) then one could treat syntactic ergativity as grammaticalization of the gradient processing constraint. The processing disadvantage of the ergative would presumably follow from its status as a dependent and/or marked case. The results we have obtained do not show that ergative subjects pattern differently from absolutive objects, however.

Arguably, the processing account could still be maintained if the two factors, case and grammatical function, had different weights. For instance, if case advantage were stronger than subject advantage then ergative subjects would be more difficult to process; this may be the case in Basque (Carreiras et al., 2010; Junkal Gutierrez, 2011). In theory, such a difficulty could be grammaticized and turn into an absolute constraint leading to syntactic ergativity. But a comparison with accusative languages makes such a processing explanation of syntactic ergativity less likely. If we take a random sample of 30+ nominative–accusative languages, there will be few if any languages that do not allow A-bar movement of the accusative. But the accusative is the dependent (or marked) case in those languages. Furthermore, experimental work on the

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[8] The notion of multiple pressures is of course not new. Our proposal is conceptually close to the one advanced in Bornkessel and Schlesewsky (2006), Bornkessel-Schlesewsky and Schlesewsky (2009), and O'Grady (2010), according to which processing is shaped by several principles that can work at cross-purposes. The overall conclusion is that processing is subject to a number of competing constraints and is streamlined when the relevant factors all line up in harmony, but becomes more difficult when the competing factors are at odds with each other.

[9] There is another possible explanation for the absolutive subject advantage, namely, the difference in valency. Arguably, intransitive clauses may be easier to process, even if they contain a balancing PP, as in our stimuli (intransitive bias, cf. Ueno and Polinsky, 2009). To distinguish between such an intransitive bias and the cumulative effect of case and grammatical function, one would need to compare the processing of intransitive and transitive subject gaps in nominative-accusative languages, something that has not yet been done.

processing of relative clauses has consistently shown that the processing of accusative gaps is more difficult than the processing of nominative gaps. Still, most nominative–accusative languages allow A-bar movement of the accusative object. In those nominative–accusative languages where only subjects extract (e.g., many Austronesian languages), the restriction against all other arguments can be derived from their structural design, and not from processing. Different researchers have approached this restriction from different perspectives. In some Austronesian languages, for instance, the idea is that a vP forms a phase (Rackowski and Richards, 2005),[10] which means that all constituents are "locked up" in it. For other nominative–accusative languages, the proposal is that A-bar movement targets all DP arguments and is signaled morphologically on the verb, presumably by *wh*-agreement (Pearson, 2005), which means that it has nothing to do with a particular case position.

6.2. Subject preference

If the processing of relative clauses is subject to two *separate* pressures, one from the grammatical function (roughly captured by the Accessibility Hierarchy) and one from the presence of a dependent case (which serves as a cue for projecting the rest of the clause), that would call for a reconsideration of the apparent subject preference noted for already studied languages. As we have mentioned, all these languages are nominative–accusative, and the subject preference may be confounded by the special status of the accusative as a dependent case. Such a special status can be inferred from morphological case marking (as in Japanese, Korean, Russian), from linear position (as in English), or from agreement (as in Spanish or Russian).

The bottom line is that in English, just as in Avar and Korean or Japanese, the subject preference may still be present, but it is obscured by other factors that follow from language-specific properties.

So where can we see the unconfounded subject preference in the processing of relative clauses? It can be expected to manifest itself when morphological cues are absent. For instance, in German, nominative and accusative forms of the feminine and neuter are ambiguous, hence the ambiguity of relative clauses such as the following:

(12) das Mädchen,   [das   die Frau   attackierte]
     [DET girl]. NOM/ACC   that.NOM/ACC   [DET woman].NOM/ACC   attacked
        (i)   'the girl who attacked the woman'
        (ii)   'the girl whom the woman attacked'

If tested experimentally, these clauses show a strong preference for the subject interpretation (12-i) (cf. Schwartz, 2007 and references therein). Next, early bilinguals who grow up with just a passive knowledge of their home language (heritage speakers), known largely to ignore morphological cues, also show a strong subject preference in the interpretation of relative clauses (Polinsky, 2011): in a comprehension study where heritage speakers had to choose between an object and a subject relative they performed at chance on object relatives and consistently showed a preference for the subject relative interpretation.

At first blush, these results, taken together with the Avar results reported here, may come across as negative: subject preference is a kind of last resort that speakers use only if everything else fails. However, the take home message is that the subject preference still exists, but we should all be careful in not claiming its existence where it may be confounded by morphological cues. The end result would then be that the subject preference has to be examined more carefully, in the absence of such cues, and also in the cases where it may be overridden by some other cues (as may be the case in Chinese relative clauses, which we have been avoiding in this discussion). If the preference is alive and well, albeit in a smaller number of instances than has been originally assumed, it still behooves us to explain why such a preference would exist in natural language. We are thus back to the explanation for the Accessibility Hierarchy, which has so far been elusive.

7. Conclusions

In this paper, we tested processing preferences in relativization in an ergative language with prenominal relatives, Avar. Avar's structural properties (head-final structure, prenominal RCs, relativization with a gap) make it comparable to Korean, Japanese, and Chinese, which have been the three staple languages in studies of the processing of backward (gap-before-filler) long-distance dependencies. Of these three languages, Korean and Japanese have shown clear evidence in favor of a universal subject preference in the processing of relative clauses. Unlike Japanese and Korean, Avar is morphologically ergative, which adds an intriguing morphological dimension to the mix.

In theory, the processing of relative clauses in an ergative language could be sensitive to case marking or could rely purely on subject preference, following the Accessibility Hierarchy. If case marking were a critical factor, one could expect the absolutive case in transitive clauses to have a processing advantage. This advantage is motivated by the observation that the mere presence of the ergative, as a "dependent" case, serves as a cue that the absolutive is present. (Similarly, the presence of

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[10] See Coon and Preminger (in press) for the same approach in Mayan languages, which are ergative. The phase approach is orthogonal to the alignment type.

the accusative case serves as a sign that the nominative needs to be projected.) In Avar, where the nominal arguments precede the verb, this cuing should be quite straightforward: as soon as the parser encounters the ergative DP it knows that the absolutive is either coming up or missing. Meanwhile, the appearance of an absolutive DP does not serve as a cue for other constituents because the absolutive can appear on its own (e.g., in intransitive clauses). If, however, the processing of relative clauses in Avar is determined by the subject/object asymmetry, one would expect a processing advantage for the ergative, which, as we have shown, has all the structural properties of a subject.

The results may initially take one by surprise: Avar does not show a processing difference between ergative gaps and the absolutive object. We propose a principled explanation for this result. On the one hand, Avar has a subject preference, which would make the processing of the ergative and the absolutive subject gap easier than the processing of the absolutive object gap. Indeed, absolutive subject relatives show a strong processing advantage. On the other hand, the ergative DP in a relative clause serves as a strong cue that allows the parser to project the remainder of the clause, including the (missing) absolutive object DP; such morphological cueing favors the absolutive object gap. But by the time the parser reaches the head noun, the preference for the absolutive gap is canceled out by the dispreference for object relativization.

We propose that the two processing preferences, the one for subject relatives and the other for morphologically cued gaps, cancel each other out in terms of processing difficulty, which is why the reading time results for the ergative subject and absolutive object relative clauses are very similar.

Given this result, the explanation for syntactic ergativity is unlikely to come from processing. The big question as to why ergative DPs in so many ergative languages are never accessible to relativization and, oftentimes, to other types of A-bar movement is therefore a question for syntacticians, not for the sentence-processing community.

We have seen that both case marking and grammatical function contribute to processing (dis)preferences. This result has implications beyond ergative languages. It suggests that some of the existing research on subject preference in relativization may have looked at "easy" cases where the presence of the accusative enhanced the preference for the nominative subject. The real subject preference, then, needs to be examined in those cases which are ambiguous and do not include any additional cues in terms of case forms or surface order, for example in German relative clauses with feminine or neuter DPs (e.g., Schwartz, 2007). The German data at least have been examined extensively and suggest that the subject preference is alive and well. If so, this preference may still exist, but it is not as easy to see as we had originally assumed: it is often obscured by other cues available in processing, for example case marking or word order. This in turn means that real instances of subject preference in relative clause processing are less common than typically presupposed. Nevertheless, if subject preference can be observed in the absence of surface cues such as case marking, this would give further validity to the psychological reality of the category 'subject'.

Acknowledgments

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