Relative Clauses in Heritage Russian: Fossilization or Divergent Grammar?

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1. Introduction*

This paper has two related goals. First, it explores the knowledge of relative clauses in several groups of Russian speakers, children and adults, thus adding new results to the growing body of literature on the processing of relative clauses across languages and populations of speakers. Second, it uses the results from a relative clause study to address the issue of linguistic knowledge in the poorly understood population known as heritage speakers.

Heritage speakers are early sequential bilinguals whose first language is a minority language of the society in which they grow up; they learn this language before they acquire the majority language, but the latter then becomes their dominant language. According to a widely accepted definition proposed by Guadelupe Valdés, a heritage speaker of language L is someone who grew up hearing and possibly speaking L in

* This study grew out of the intersection of two separate projects, an ongoing study of the grammatical structure of incompletely acquired Russian, and the study of relative clause processing across several languages. The work reported here would not have been possible without the generous support from the Center for Research in Language at UCSD, where the experimental stimuli were designed and some of the experiments were run. I would like to thank the following people whose comments and recommendations have helped me in this work: John Bailyn, Christina Bethin, Maria Carreiras, Ivano Caponigro, Kathleen Dillon, Boris Harizanov, Dustin Heestand, Gaby Hermon, Chris Hirsch, Olga Kagan, Rebecca Karpay, Robert Kluender, Nayoung Kwon, Rachel Mayberry, Silvina Montrul, Cathy O'Connor, David Perlmutter, David Pesetsky, Colin Phillips, Irina Sekerina, Yakov Testelets, Yanny Siu, and Ming Xiang. I am also grateful to the audiences at FASL-16 in Stony Brook, at Brandeis University, and at the 2007 Heritage Language Institute at UC Davis. I wish I could have taken into account all the excellent recommendations that I received from my colleagues.

the home but who as an adult is more comfortable in the dominant language of the society in which they grew up (Valdés 2000: 5). This definition is rather broad and it encompasses both children of immigrants (second-generation immigrants who learn the heritage language from their parents) and immigrant children (1.5 generation immigrants, who arrive in the dominant language's society as young children). Whether or not the two populations show differences in the knowledge of the heritage language as adults remains an open question, but the two groups clearly share a number of properties: sequential rather than simultaneous bilingualism, dominance of the language learned later, and insufficient or restricted input in their L1.

In general, heritage languages are an uncharted territory for formal work on language, but they have much to offer to linguists and cognitive scientists. Linguistically, heritage languages add yet another piece to the puzzle of how a grammar can be acquired under minimal or impoverished input. A linguistic investigation of heritage languages is focused on two big questions, which very informally look like this: what do adult heritage speakers actually know? Is this knowledge a result of fossilization of child language, attrition over time, or failure to learn certain structures? Another important question that arises as we consider heritage languages has to do with the influence from the dominant language—to what extent is the structure of a heritage language due to transfer? While answers to these questions are far from obvious, answering them would help us better understand what exactly it means to be a native speaker of a given language and what happens to linguistic competence over a lifespan.

This paper seeks to address these general questions on a small scale, by analyzing the grammatical knowledge of relativization in heritage speakers of Russian living in the USA (so called American Russians, see Polinsky 2006). The choice of relative clauses is not accidental—they have long played a major role in acquisition and processing research, and their investigation in a heritage population can both build upon and add to the existing body of knowledge of syntactic phenomena.

The reason relative clauses have long enjoyed a particularly prominent role in theoretical and experimental syntax is that they are a robust example of a long-distance dependency. Such dependencies have two crucial characteristics: first, the expressions filling the head and tail points of the dependency differ in their articulation; second, the positions

are separated by a number of unrelated segments. Consider the examples in (1).

(1) a. A reporter asked the senator$_i$ what he$_i$ was trying to accomplish in the new bill.
b. A reporter asked the senator$_i$ about the new bill but ever the diplomat$_i$ avoided the answer.
c. A reporter asked the senator$_i$ at the press conference ___$_i$ to elaborate on the new bill.

The identity of a more articulated expression occupying one of the positions (*the senator*) determines the referential identity of the linguistic expression in the other position—this latter expression may have less descriptive content and can be silent (null). For instance, a lexically specified noun phrase can serve as the antecedent of a pronoun (including a null pronoun) (1a), an epithet (1b), or a hypothetical null element (1c). The relationship between the lexically specified antecedent (filler) and the less elaborated expression or gap is established at a distance, across other linguistic expressions separating them. This distance imposes a memory task: the two linguistic positions have to be held in working memory until they are associated with the same referent.

Numerous experimental studies show that in English, subject relative (SR) clauses (2a) are easier to process than object relative (OR) clauses (2b), and this result has been replicated across various methodologies (reading time: King and Just 1991; ERP: King and Kutas 1995; fMRI: Just el al 1996, Caplan et al 1999, 2000, 2001, Cooke et al 2001; PET: Stromswold et al 1996, Caplan et al 1998, 1999, 2000; eye-tracking: Traxler et al 2002). Furthermore, that subject relative clauses are easier to process has been confirmed for other languages (Dutch: Frazier 1987; German: Mecklinger et al. 1995; Schriefers et al. 1995; Hungarian: McWhinney and Pleh 1988; Hebrew: Arnon 2005; Chinese: Lin 2006, Kuo and Vasishth 2006; Japanese: Miyamoto and Nakamura 2002; Korean: Kwon et al. 2006, to name just a few).

(2) a. The reporter$_i$ who$_i$ ___$_i$ harshly attacked the senator admitted the error.
b. The reporter$_i$ who$_i$ the senator harshly attacked ___$_i$ admitted the error (King and Just 1991: 581)

The acquisition of relative clauses occurs fairly early, typically in the beginning of the third year of life (see Hamburger and Crain 1982, Flynn and Lust 1980, Diessel and Tomasello 2000, a.o. for English, Tjung 2006 for Indonesian, Hsu et al. 2006 for Chinese, Goodluck and Stojanovič 1996 for Serbo-Croatian, Gvozdev 1961 for Russian, Friedmann and Novgorodsky 2004, Arnon 2005 for Hebrew; Guasti and Cardinaletti 2003 for Romance, Goodluck et al. 2006 for Irish). Experimental data on early acquisition show that subject relative clauses appear earlier, are produced more frequently, and cause fewer comprehension errors; however, by age 4;0, errors in the choice of the head of a relative clause seem to become negligible (under 8% in English, under 3% in Chinese, cf. Hsu et al. 2006). The exact developmental trajectory for relative clauses in Russian is not clear, so in order to understand the status of relative clauses in the language of adult heritage speakers one also needs to have baseline data on child controls.

The logic is as follows: if adult heritage speakers show some deficit in their control of relative clauses, this may be due to the fossilization of their childhood language. In order to determine this, we need to examine four populations: heritage speakers (adults and children) and adult and child controls. We can entertain several predictions.

First, if heritage speaker children (children of immigrants) differ from their monolingual peers in the knowledge of relative clauses, that would suggest that they had never fully learned them; this lack of acquisition would project into the adult control of language. The concomitant prediction is that the adult heritage speakers would match the knowledge of relative clauses demonstrated by the heritage speaker children.

If heritage speaker children and heritage speaker adults show similar competence in relative clauses to their monolingual peers, that would indicate that relative clauses are not affected by whatever processes take place in heritage language acquisition, and might provide further support for the idea that relativization has a basis in universal grammar and is reasonably independent of input.

Finally, if child heritage speakers do not show deficits in relative clauses but the adult speakers do, that should be an indication of true loss (attrition) of the grammar learned in childhood. The summary of these

possible outcomes is in (3); of course, given all the groups there are more possibilities than listed here but these seem to be the most realistic ones.

(3) Control of relative clauses by heritage speakers, children and adults as compared to the baseline (monolingual) speakers
(= 'similar performance', X > Y 'X outperforms Y')

a. *no effect of incomplete acquisition*:
heritage children = monolingual children;
heritage adults = monolingual adults

b. *fossilization of inadequate acquisition of relative clauses:*
monolingual children/adults > heritage children/adults
heritage children = heritage adults

c. *attrition*:
heritage children = monolingual children;
heritage children > heritage adults

These predictions do not take into account the possibility of transfer from the dominant language, which will be discussed in section 3.

In addition to the salience of relative clauses in acquisition, there is another reason to investigate their knowledge by heritage speakers. A large body of experimental work on relative clauses is based on comprehension responses, and comprehension has proven to be the most effective means of studying heritage speakers.[1]

[1] When I first started working on heritage languages about ten years ago, I approached the work as a standard "fieldwork experience" and constantly tried to obtain production data from these speakers and to test their grammaticality judgments. It took many years and many frustrating efforts to understand that this was the wrong approach. In heritage speakers, especially low proficiency ones, we are dealing with an extremely reluctant population who are not willing to speak or expose their insecurities in a grammaticality judgment task (GJT). This reluctance is probably due to a number of factors, some of which are purely psychological (fear of being wrong, insecurity in one's judgments, greater confidence in the dominant language, difficulty with lexical access, association between the heritage language and "unsophisticated" childhood communication at home, etc.)—it would make for an interesting study to determine all the relevant factors and to rank them, but this is not a linguist's job. What became exceedingly clear though—after several frustrating years of observing chance

The remainder of the paper has the following structure. Section 2 presents a brief overview of Russian relative clauses. Section 3 presents the experiment that was conducted for this study. Section 4 shows the experimental results and section 5 is the general discussion.

2. Relative clause formation in Russian.

Russian allows relativization of any position on the Accessibility Hierarchy (Keenan and Comrie 1977) illustrated in (4):

(4) subject > direct object > indirect object > oblique object > possessor > standard of comparison

Relative clauses are formed using the gap strategy (the extracted constituent is replaced by silence) and involve a relative pronoun (*kotor-*) which agrees with the extracted constituent in gender and number and also shows case concord with the gap site.[2] Examples (6a-d) show the relativization of different constituents from the baseline sentence in (5).

(5)	deti	polučili	na	roždestvo	podarki
	children.NOM.PL	received	on	Christmas	gifts.ACC.PL

GJT on principle B or obligatory control--was that heritage speakers need to be studied using other tools, with the main emphasis on comprehension and away from GJT. In this study, as well as in a series of other work, I have tried to use the methodologies that have successfully been developed for working with other "reluctant" populations, such as young children or aphasics. Unlike these groups, adult heritage speakers do not have any cognitive deficits and become extremely engaged and cooperative as long as the task does not focus on sentence completion or decision between something like *Who hit Kermit* and *Who Kermit hit.*

I apologize to the reader who might find these remarks patently obvious and trivial, but if anyone finds these methodological notes useful and does not repeat the mistakes I made in my own work on heritage speakers, my mission will have been accomplished.

[2] Russian also has a non-agreeing relative complementizer *čto*, which will not be discussed here.

ot tjoti
from aunt.GEN
'Children received gifts from their aunt on Christmas.'

(6) a. deti$_i$ [kotor-ye ___$_i$ polučili na roždestvo
chidren REL-NOM.PL received on Christmas
podarki ot tjoti]
gifts from aunt
'the children that received gifts from their aunt on Christmas'

b. podarki$_i$ [kotorye deti polučili ___$_i$
gifts REL-ACC.PL chidren received
na roždestvo ot tjoti]
on Christmas from aunt
'the gifts that the children received from their aunt on Christmas'

c. prazdnik$_i$ [na kotoryj deti polučili podarki
holiday on REL.ACC.SG children received gifts
___$_i$ ot tjoti]
from aunt
'the holiday that the children received gifts from their aunt for'

d. tjotja$_i$ [ot kotor-oj deti polučili na
aunt from REL-GEN.SG children received on
roždestvo podarki ___$_i$]
Christmas gifts
'the aunt who the children received gifts for Christmas from'

In what follows, I will be comparing the processing of subject and object relative clauses in several groups of speakers, and the word order in these sentences will be important. In both subject and object relative clauses formed with transitive verbs, the order of constituents in the relative clause can vary: the non-extracted DP can either precede or follow the verb, thus:

(7) Subject relative
a. deti [kotor-ye ___ polučili podarki] *VO*
chidren REL-NOM.PL received gifts
b. deti [kotor-ye ___ podarki polučili] *OV*
chidren REL-NOM.PL gifts received
'the children that received gifts'

(8) Object relative

a. podarki [kotorye deti polučili ___] *SV*
gifts REL-ACC.PL chidren received
b. podarki [kotorye polučili ___ deti] *VS*
gifts REL-ACC.PL received chidren
'the gifts that the children received'

The following discussion of the different word orders in subject and object relative clauses is limited to relative clauses with nominal, not pronominal, constituents, such as those illustrated in (7) and (8). There are two reasons for excluding pronominal constituents. First, the surface order of nouns and pronouns in Russian is different, and one needs to formulate the generalizations on each subtype separately. Second, the experimental work on Russian relatives (and relative clauses in other languages as well) uses relative clauses with nominal constituents such as above, and it is the distribution of such relatives that is relevant here.

The right edge of the clause in Russian is strongly associated with focus (Adamec 1966; Kovtunova 1976; Padučeva 1985: ch. V), both at the root clause level and in the embedded clause. Therefore the OV and VO word orders are not equal. In subject relatives, VO is the communicatively neutral order (7a); in this order, the verb and the following object receive a wide focus reading, and the head of the relative clause receives the appropriate topic reading (see Kuno 1973 for the connection between topicalization and relativization). In the OV order (7b), the verb receives a contrastive reading, which limits the interpretation of the DP to something like 'the children that RECEIVED (rather than, e.g., gave) gifts'.

In the object relative, the choice of a communicatively neutral order is more difficult. In corpora, most object relatives actually have a pronominal subject, the type that is not considered here, for instance:

(9) podarki [kotor-ye oni polučili ___] *SV*
gifts REL-ACC.PL they received
'the gifts that they received'

In relative clauses with nominal constituents, the SV order (8a) entails a contrastive reading on the verb 'the gifts that the children RECEIVED (rather than, e.g., gave)', which can however be remedied if the preverbal subject is accented and the verb is de-accented. In (8b), where the subject

is inverted after the verb (VS) it is possible to have a contrastive reading on the subject ('the gifts that the CHILDREN (rather than, e.g., adults) received' or to interpret the entire verb-subject sequence as wide focus.

The information structural properties of these relative clauses find an interesting reflection in the frequencies of the relevant clauses. In the corpus count of 400 SRs and ORs done for this study (with both nominal and pronominal constituents), 228 relative clauses (57%) were subject relatives, and the remaining 43% were object relatives. However, once relative clauses with pronominal constituents were excluded, the distribution changed dramatically: out of the 252 relative clauses with nominal constituents (already a significantly reduced subset of the initial 400 tokens), 217 (86%) were subject relatives and only 35 (about 14%) were object relatives. Since the experimental stimuli discussed in section 4 below involve "out of the blue" isolated relative clauses without any pronominal constituents, it is this latter distribution (86% SR to 14% OR) that we are considering here.

Within this subset, subject relatives have the order VO (as in (7a)) much more frequently than the order OV (cf. Fig. 1 and see also Saj 2005; Levy et al. 2007). In object relatives with nominal constituents, the VS order is more frequent than SV, cf. Fig. 1.[3]

[3] A small corpus search done by Levy et al. 2007 showed the opposite pattern (SV more frequent than VS in object relatives), but they considered only 22 object relative clauses total (both nominal and pronominal constituents were in that sample). Our total for object relatives with nominal (non-pronominal) subjects is 33, which is not very high either but at least the sample is structurally homogeneous.

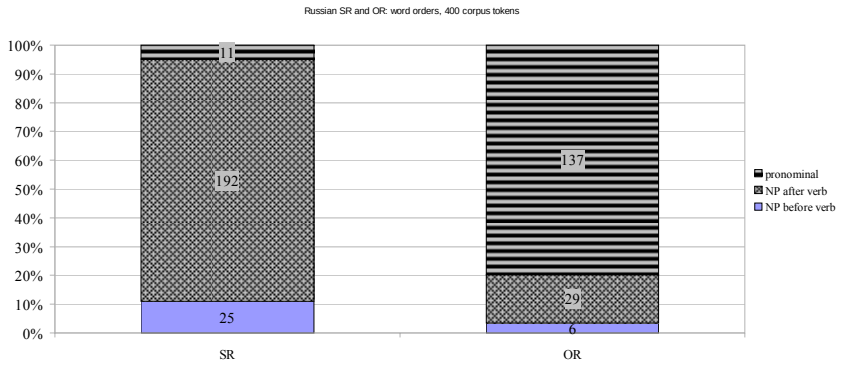

Figure 1. Distribution of pronominal, nominal postverbal, and nominal preverbal constituents in subject and object relatives (400 RCs, random selection from the Russian National Corpus, http://ruscorpora.ru/)

In the discussion of relative clauses presented here, I have tried to stay as theory-neutral as possible, and have avoided any discussion of the actual derivation of pre- and postverbal orders in the relevant relative clauses. For syntactic observations on the difference between pre- and postverbal subject orders, see Baylin 2004, 2007.[4]

The next section will formulate the predictions for sentence processing experiment of subject and object relative clauses in Russian.

3. Processing of Russian relative clauses

Several predictions can be formulated here. First of all, based on the consistent universal preference for subject relatives, we can predict that subject relative clauses should be easier than object relatives in Russian as well.[5] Next, one can expect that the more frequent and communicatively more neutral relative clauses should be easier than the ones that are less frequent and/or more restricted from the standpoint of information structure. In the case of SR and OR in Russian, frequency and communicative markedness are correlated, so it is hard to determine

[4] Baylin does not address relative clauses specifically but his analysis can be extended to incorporate them.

[5] I am not going to discuss possible explanations for this generalized subject bias, which goes beyond the scope of this paper.

what the deciding factor is. But the prediction is as follows (> means 'easier to process'):

(10) a. SR > OR
b. subject relatives: VO > OV
c. object relatives: VS > SV

These predictions are confirmed by the self-paced reading time experiment with forty monolingual Russian speakers conducted by Levy et al. (2007): Fig. 2 shows reading times for different orders of subject and object relatives obtained in their study:

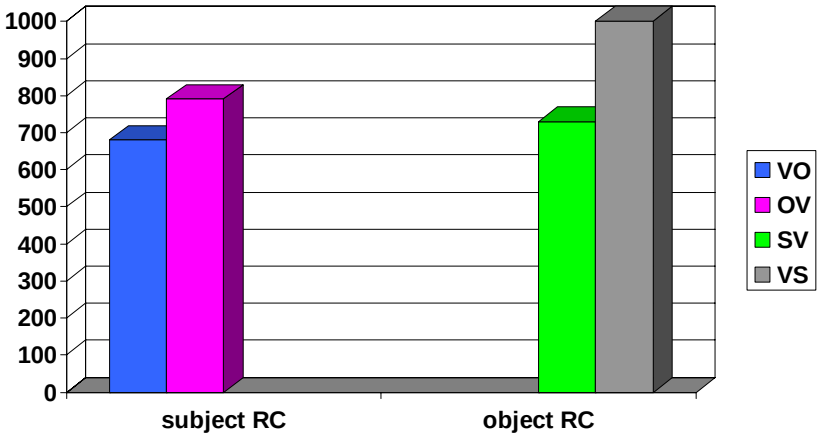

Figure 2. Reading time (msec) at the embedded verb in relative clauses (40 adult monolingual subjects), based on Levy et al. 2007

If we now turn to heritage speakers, several predictions can be made. First, the expectation that heritage speakers should find subject relatives easier to process still holds. In terms of the more fine-grained distinctions, three sets of factors could play a role: one might expect to see the influence of frequency, the preservation of the same patterns as found in the monolingual speakers, and the influence of English.

Frequency and the monolingual processing data are more or less consistent with each other, and predict that VO subject relatives should be easier than OV subject relatives, as well as that VS object relatives should be easier to process than SV object relatives. Assuming that heritage speakers may show the same patterns as monolingual speakers, one could also predict the following hierarchy of processingf ease (> 'easier to process'):

(11) SR, VO order > OR, VS order > SR, OV order > OR, SV order

Finally, if we match the surface order of Russian and English relative clauses, the following correspondences emerge. English and Russian SRs have the same word order when the Russian relative clause is VO. English and Russian ORs have the same word order when the Russian relative clause is SV. In the other two cases the relative clauses mismatch. A summary is given in Table 1:

	English SR the dog [that __ is chasing the cat]	English OR the cat [that the dog is chasing ___]
Russian SR	VO: sobaka [kotoraja __ dogonjaet košku]	OV: sobaka [kotoraja košku dogonjaet __]
Russian OR	VS: koška [kotoruju ___ dogonjaet sobaka]	SV: koška [kotoruju sobaka dogonjaet ___]

Table 1. Correspondences in surface order between Russian and English subject and object relatives (SR, OR)

For heritage speakers, who are dominant in English and who may ignore morphological cues based on case, one could predict that the congruent word orders in relative clauses would be facilitated, and that the "mismatched" (non-congruent) ones will undergo transfer and be

processed in the wrong way. These transfer predictions are summarized in Tables 2 and 3:

	English SR the dog [that __ is chasing the cat]	English OR the cat [that the dog is chasing ___]
Russian SR	VO: CONGRUENT, facilitation expected	OV: NON-CONGRUENT, should be interpreted as OR under English interference
Russian OR	VS: NON-CONGRUENT, should be interpreted as SR under English interference	SV: CONGRUENT, facilitation expected

Table 2. Possible transfer from English in the processing of Russian relative clauses

Table 2 presents a general summary of the expectations based on surface similarities between English and Russian relative clauses—the main factor that we expect to play a role in the transfer is the similarity in word order.

If the expectations presented in Table 2 are on the right track, transfer from English should result in the following processing strategies that heritage speakers may employ:

Facilitation/accurate interpretation	Misinterpreted as SR	Misinterpreted as OR
SR-*VO* OR-*SV*	OR-*VS*	SR-*OV*

Table 3. Russian relative clauses: Predictions based on transfer

Combining possible transfer effects and frequency effects, we can expect the interpretation of subject relatives with VO order to be the easiest and most accurate: they have a corresponding structure in English and they are very frequent. Subject relative clauses with OV order should be the likeliest to show transfer effects, also because they are infrequent.

For the object relative clauses, the possible effects of frequency and transfer may cancel each other out. There is not enough data to rank the two factors, so it is hard to make any predictions.

Next, recall that we also had a set of predictions spelling out possible differences between heritage child and adult speakers (see (3a-c) above). These predictions, together with the predictions based on transfer and frequency, formed the basis of the experiment described in the next section.

4. Experiment

The goal of this experiment was to determine possible differences in the comprehension of subject and object relative clauses in monolingual baseline speakers and heritage speakers. The experiment was also designed to test possible effects of frequency in all speakers and effects of transfer from English in heritage speakers.

Participants. Four groups of speakers took part in the experiment: monolingual speakers and heritage speakers, with children and adults in each subgroup. The breakdown of subjects is given in Table 4:

	Children	Adults
Monolingual controls	N=10, avg. age 6;6	N=7, avg. age 28;7
Heritage speakers	N=9, avg. age 7;5	N=12, avg. age 22; 8

Table 4. Participants in the picture-matching experiment

The monolingual controls were all tested in Moscow in September 2005; the children were tested in an after school computer program at a local school. The heritage group was tested in Los Angeles, Boston, and San Diego. Adult speakers were all undergraduates at American universities; the heritage child speakers were selected from kindergarten and first grade. All the heritage speakers, both children and adults, were children

of immigrants, so the group was homogenous in this regard. All subjects were prescreened. Heritage speakers, children and adults were given a pretest questionnaire and were asked to produce a story based on a set of pictures (frog story). Subjects were compensated for their participation in the study.

Materials and procedure. The materials included 36 pairs of pictures describing reversible actions (actions which could be performed by either of the two main participants). Both pictures within a pair were put on the desk/table in front of the subject (for example images, see Fig. 3 below). For each pair, the subject heard a relative clause within a question, and had to choose the picture matching the description. Consider subject relatives, with both orders:

(12) Gde koška [kotoraja sobaku dogonjaet]? ***SR-OV***
where cat REL-ACC dog.ACC is_catching up
'Where is the cat that is chasing the dog?'

(13) Gde koška [kotoraja dogonjaet sobaku]? ***SR-VO***
where cat REL-ACC is_catching up dog.ACC
'Where is the cat that is chasing the dog?'

Object relatives, with both orders are illustrated in (14) and (15):

(14) Gde sobaka [kotoruju dogonjaet koška]? ***OR-VS***
where dog REL-ACC is_catching up cat.NOM
'Where is the dog that the cat is chasing?'

(15) Gde sobaka [kotoruju koška dogonjaet]? ***OR-SV***
where dog REL-ACC cat.NOM is_catching up
'Where is the dog that the cat is chasing?'

The pairs were presented in random order, and each set of pictures appeared four times (twice for the SR condition and twice for the OR condition).

A pair of sample pictures corresponding to examples (12)-(15) is shown in Fig. 3 below:

The experimental sentences were presented auditorily. The auditory presentation was necessary given that some in the monolingual children group and most subjects in the heritage groups do not know how to read Cyrillic. The auditory presentation therefore allowed the most inclusive

coverage. The choice had to be done off-line, and the only measure was the accuracy of response. In some cases, particularly with both groups of children, subjects did not give any response and those instances were excluded from the results. In the monolingual child group, one of the children gave virtually no response, and was excluded from the statistics. Thus the two groups of children were at nine subjects each. The number of occasions where adults failed to respond was so small that it did not affect the results.

Figure 3. Reversible action pictures used in picture-matching experiment

5. Results

The accuracy of response by group is shown in Figures 4-7. As Figs 4 and 5 show, the choice of the correct picture was a very simple task for both monolingual adults and children—both groups gave highly accurate responses. In fact, several monolingual adults and one monolingual child

noted that the task they were given was extremely simple. The effect of the slight processing disadvantage associated with object relative clauses was not statistically significant, and the results do not show any difference between the two word orders in each of the relative clause types.

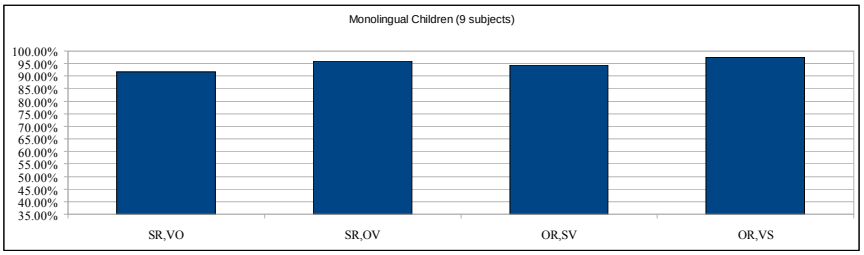

Figure 4. Accuracy of comprehension of subject and object relatives; monolingual child speakers, picture matching task

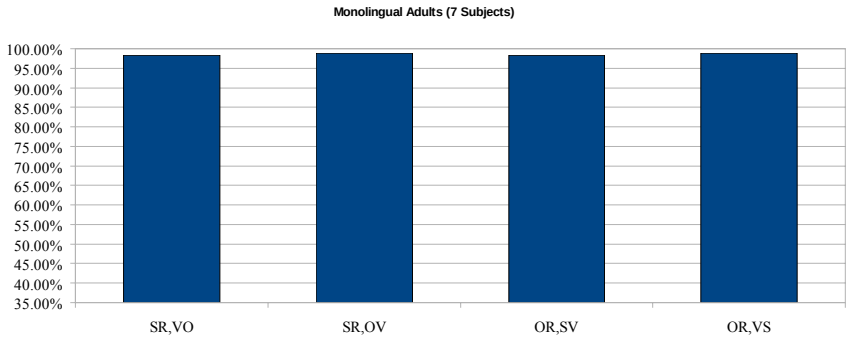

Figure 5. Accuracy of comprehension of subject and object relatives; monolingual adult speakers, picture matching task

Heritage child speakers were also quite accurate, and their responses did not differ much from the responses from the control child group (cf. Figures 4 and 6).

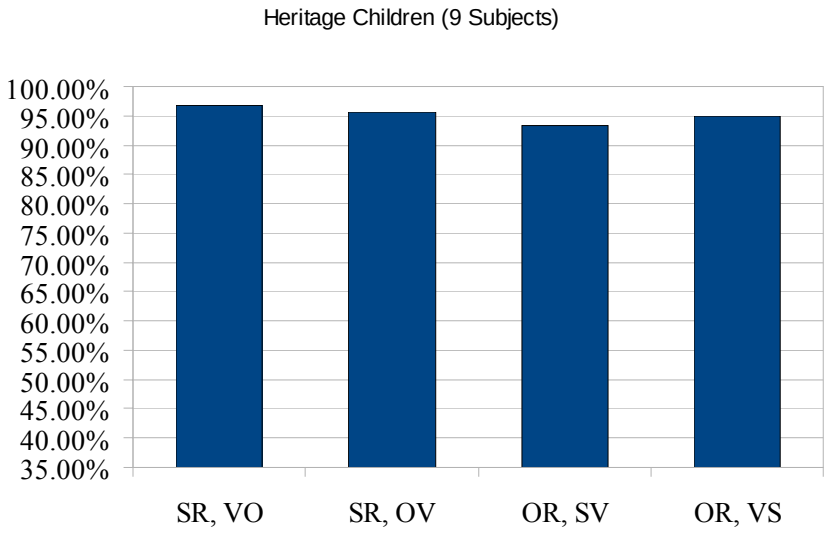

Figure 6. Accuracy of comprehension of subject and object relatives; heritage child speakers, picture matching task

The most surprising results are in the heritage adult group (Fig. 7), which differs from all the other groups in a significant way. Adult heritage speakers were still quite accurate with subject relative clauses but more or less at chance with object relative clauses. The asymmetry between subject and object relatives persisted regardless of the word order within the relative clauses.

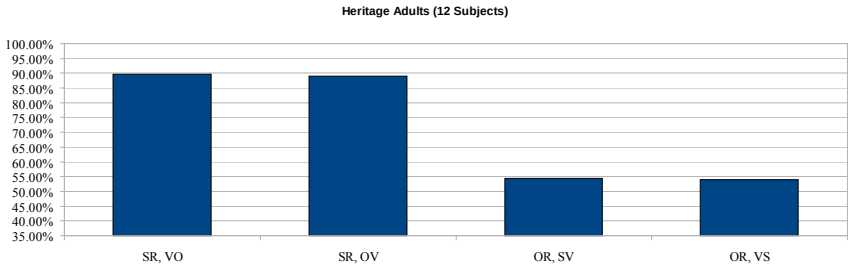

Figure 7. Accuracy of comprehension of subject and object relatives; heritage adult speakers, picture matching task

6. General discussion

In the sections above, I have outlined possible predictions concerning the status of heritage speakers in comparison to the monolingual baseline, with respect to transfer from English and fossilization. A summary of results across the four groups of subjects (children, adults; monolingual, heritage speakers) over the four conditions is given in Fig. 8.

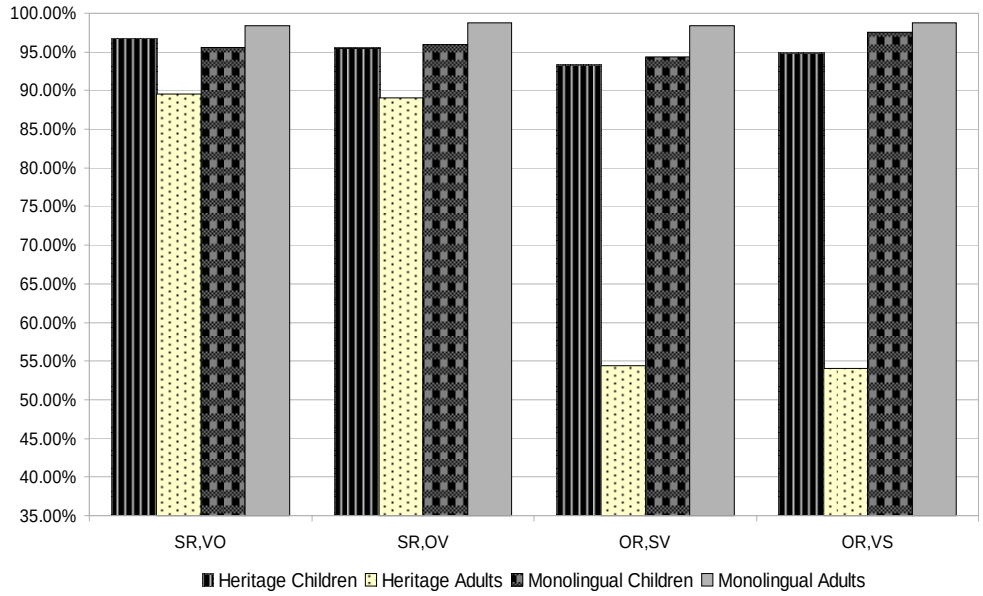

Figure 8. Accuracy of comprehension of subject and object relative clauses, monolingual control (adults and children) and heritage speakers (adults and children)

In comparing the monolingual and heritage speakers, we find that both monolingual groups and the heritage child group performed with comparable accuracy, essentially at ceiling. With respect to child speakers, this indicates that six and seven year olds have adult-like control of relative clauses, with equal mastery of subject and object relatives. This also indicates that heritage child speakers (whose input in Russian is more limited and who are ostensibly subject to interference from English) do not show any discernible effects of attrition or transfer. In fact, the stimuli that cause problems for both groups of child speakers are similar, with inanimate reversible states being particularly difficult ('the book that covers the newspaper', 'the kettle that the pot supports', 'the wagon that the car is pulling'). The discrimination of animate and inanimate actors is a well-established property of early child language (e.g., Bowerman 1973: 87, 88, 140-152), but it is intriguing that some effects of this discrimination persist even into later years.

The similar performance of monolingual and heritage children indicates that the mastery of relative clauses is achieved at comparable levels across the two groups. However, heritage adult speakers are qualitatively different from the three other groups in that they perform at chance in object relatives. They also differ slightly from the monolingual controls and heritage children in their comprehension of subject relatives (their average accuracy was at or below 90%, while the other groups were at about 95%). Thus, they stand out as a group different from the three others. This result indicates that, at least in this particular domain, the linguistic knowledge of adult heritage speakers is not due to the fossilization of incompletely acquired childhood grammar. Instead, it must be a true case of attrition over the lifespan.

If we now revisit the alternatives concerning the comprehension of relative clauses by heritage speakers, both children and adults, as compared to the baseline (monolingual) speakers, the results presented here do not support maintenance (3a) or fossilization (3b) but instead argue in favor of attrition: heritage children perform on a par with monolingual children and monolingual adults, but outperform heritage adults.

If the performance of heritage adult speakers is due to attrition, the next question that needs to be addressed has to do with the causes of that attrition. Specifically, is it caused by transfer from English? The predictions based on transfer from English were summarized in Table 3 above. If transfer is implicated, heritage adult speakers should **correctly interpret** subject relatives with the postverbal object (SR-*VO*) and object relatives with the preverbal subject (OR-*SV*). They should **misinterpret** subject relatives with the preverbal object (SR-*OV*) as object relative clauses, and they should treat object relatives with a postverbal subject (OR-*VS*) as subject relatives. In sum, they should show differential comprehension of different word orders regardless of the gap type. In other words, both a subset of subject relative clauses and in a subset of object relative clauses should cause problems for these speakers.

As Fig. 8 shows, these transfer-based predictions are not borne out. Heritage adults perform uniformly well on subject relatives, regardless of their word order. Turning to object relatives, adult heritage speakers perform at chance on those, also regardless of word order. This pattern points to a significant subject bias in relativization, and this subject bias is reminiscent of the subject advantage observed under Broca's aphasia

(Gadler 1995; Caplan 2000). In their interpretation of subject and object relative clauses with reversible actions, patients with Broca's aphasia showed a significant subject advantage.

However, unlike aphasics, adult heritage speakers clearly do not have any disturbance in their syntactic competence. They have no problem with cognitive tasks in English, and the change in the system is observed only when it comes to the heritage language. The metaphor that invites itself here is that the gate between the two languages, the dominant and the heritage language, has been locked, so no direct effect from the dominant language is observed. In the absence of sustained input and without the influence of the dominant language, the heritage language system undergoes restructuring. The resulting divergent grammar is such that only subject arguments seem to be accessible for relativization. Note that this grammar, while divergent from the grammar of the baseline language, is consistent with the universal constraint on relative clause formation noted by Keenan and Comrie (1977): if a language limits its relativization to a subset of argument positions, it has to relativize subjects. Heritage Russian ends up looking like Malagasy, where only external arguments can be relativized.

The experimental results presented here attest to the generalized subject advantage independently observed in environments beyond relative clauses (Keenan and Comrie 1977; Kwon et al. 2006). While this finding is empirically pleasing, it does not bring us any closer to explaining why the generalized subject advantage exists and recurs under different circumstances. What the divergent grammar of heritage language shows, however, is that the ubiquitous subject preference extends to yet another population of speakers, heretofore unnoticed by linguists.

7. Conclusions

This paper presented a behavioral experiment on the comprehension of subject and object relative clauses in child and adult speakers of Russian, comparing monolingual controls with heritage speakers, whose dominant language is English. The results show that child speakers at age 6;0 have full adult-like mastery of relative clauses. Heritage child speakers do not show interference from English in any types of relative clauses, and perform at the same level as their monolingual counterparts.

Adult heritage speakers, however, are significantly different from the monolingual adult controls and from the heritage child group. This divergent performance indicates that the adult heritage grammar is not a product of the fossilization of child language. Instead, it suggests the attrition, over the lifespan, of forms that exist in the baseline. This result is consistent with the observations on narrative structure in child and adult heritage speakers (Polinsky 2008); in the frog story narrative, children also performed very close to the monolingual baseline, while adults showed divergent patterns.

If this conception of restructured grammar in heritage speakers is on the right track, it indicates that several types of follow up studies of heritage language are needed: an investigation of the same phenomena in older heritage speakers (the adult subjects in this study were all in their twenties), an investigation of other grammatical phenomena that may be present in child language and undergo attrition later in life, and replication of such studies in heritage languages other than Russian. This future work will help us decide if there is more support for divergent grammar, with the evidence that phenomena that may be available and learned in childhood are actually subject to reanalysis later. The experiment presented here was quite simple, and it was designed primarily as proof of concept. Given its results, more sophisticated experimental work on child and adult heritage speakers is needed to understand the immense variance found among these speakers.

In addition to supporting the hypothesis of divergent grammar, the experimental results presented here also argue against direct transfer from English. The predictions concerning transfer rely on the crucial observation that the morphological component of heritage language is particularly vulnerable (cf. Choi 2003, Montrul 2004, 2006; Sorace 2004 for similar observations). In the absence of strong morphology, word order becomes the main disambiguating factor in the surface structure of heritage language. Under transfer from English, the word order in subject or object relative clauses in English is expected to encumber or facilitate the correct interpretation of the corresponding relative clauses in Russian. However, this prediction is not borne out by the experimental data, which suggests that direct transfer from the dominant to heritage language does not always occur or does not occur to any significant degree. Of course the absence of transfer in relative clauses does not

imply that transfer never occurs, but at least this case presents one of the clear indications against transfer.

The comprehension of relative clauses in adult heritage speakers follows the universal subject preference observed across a significant number of languages and populations, from young children to aphasics to L2 learners (O'Grady et al. 2003). The explanation for such a preference, which ranges from a strong tendency to an absolute preference, remains as an outstanding issue.

Although we are only beginning to understand how heritage languages are structured, the emerging patterns point to interesting differences between complete and incomplete first language acquisition, as well as second language acquisition by heritage speakers and foreign language learners (Montrul 2004, 2006). The emerging evidence shows that grown-up heritage speakers do not simply hold on to fossilized, frozen grammars from their childhood. Instead, the grammar undergoes a reanalysis, but what drives this reanalysis? Answering this question may help us come closer to solving the puzzle of language learning.

References

Adamec, Pavel. 1966. Porjadok slov v sovremennom russkom jazyke. Praha: Rozpravy Českosl. Akad. Ved.

Arnon 2005. Relative clause acquisition in Hebrew: Toward a processing-oriented account. In A. Brugos, M. R. Clark-Cotton & S. Ha (eds.), *Proceedings of the 29th Boston University Conference on Language Development*, 37-48. Somerville, MA: Cascadilla Press.

Bailyn, John F. 2004. Generalized inversion. *Natural Language and Linguistic Theory* 22: 1-49.

Bowerman, Melissa. 1973. Early syntactic development: A cross-linguistic study with special reference to Finnish. Cambridge: Cambridge University Press.

Caplan, David. 2000. Positron emission tomographic studies of syntactic processing. In Y. Grodzinsky, L. Shapiro, and D. Swinney (eds.). *Language and the brain: Representation and processing*, 315-325. San Diego: Academic Press.

Caplan, David, Nathaniel Alpert, and Gloria Waters. 1998. Effects of syntactic structure and prepositional number on patterns of regional blood flow. *Journal of Cognitive Neuroscience* 10: 541-552.

Caplan, David, Nathaniel Alpert, and Gloria Waters. 1999. PET studies of syntactic processing with auditory sentence presentation. *NeuroImage* 9: 343-351.

Caplan, David, Nathaniel Alpert, Gloria Waters, and Anthony Olivieri. 2000. Activation of Broca's area by syntactic processing under conditions of concurrent articulation. *Human Brain Mapping* 9: 65-71.

Caplan, David, Sujith Vijayan , Gina Kuperberg , Caroline West , Gloria Waters , Doug Greve, Anders M. Dale. 2001. Vascular response to syntactic processing: Event-related fMRI study of relative clauses. *Human Brain Mapping* 15: 26-38.

Choi, Hye-won. 2003. Paradigm leveling in American Korean. *Language Research* 39: 183-204.

Cooke, Ayanna, Edgar B. Zurif, Christian DeVita, David Alsop, Phyllis Koenig , John Detre, James Gee, Maria Pinãngo, Jennifer Balogh, and Murray Grossman. 2002. Neural basis for sentence comprehension: Grammatical and short-term memory components. *Human Brain Mapping* 15: 80-94.

Diessel, Holger, and Michael Tomasello. 2000. The development of relative clauses in spontaneous child speech. *Cognitive Linguistics* 11: 131-151.

Flynn, Suzanne, and Barbara Lust. 1980. Acquisition of relative clauses: Developmental changes in their heads. *Cornell Working Papers in Linguistics* 1, 33-45.

Frazier, Lyn. 1987. Syntactic processing: Evidence from Dutch. *Natural Language and Linguistic Theory* 5: 519-559.

Friedmann, Naama, and Rama Novgorodsky. 2004. The acquisition of relative clause comprehension in Hebrew: A study of SLI and normal development. *Journal of Child Language* 31: 661-681.

Gadler, Hanspeter. 1995. Broca-Aphatiker und das Verstehen von Relativsatzen. *Grazer Linguistische Monographien* 10: 81-89.

Goodluck, Helen, Eithne Guilfoyle, and Sile Harrington. 2006. Merge and binding in child relative clauses: The case of Irish. *Journal of Linguistics* 42: 629-661.

Goodluck, Helen, and Danijela Stojanovic . 1996. The Structure and Acquisition of Relative Clauses in Serbo-Croatian. *Language Acquisition: A Journal of Developmental Linguistics* 5: 285-315.

Guasti, Maria Teresa, and Anna Cardinaletti. 2003. Relative clause formation in Romance child's production. *Probus* 15: 47-89.

Gvozdev, Aleksandr N. 1961. *Voprosy izučenija detskoj reči.* Moscow: Izd. Akad. ped. nauk.

Hamburger, Henry, and Stephen Crain. 1982. Relative acquisition. In S. A. Kuczaj (ed.). *Language development: Syntax and semantics*, 245-274. Hillsdale, NJ: Lawrence Erlbaum.

Hsu, Natalie Chun-chieh, Gabriela Hermon, and Andrea Zukowski. 2006. Acquisition of head-final relative clauses: Elicited production data from Chinese children. Paper presented at GALANA-2, McGill University, Montreal, August 2006.

Just, Marcel, Patricia Carpenter, and Timothy Keller. 1996. Brain activation modulated by sentence comprehension. *Science* 274; 5284: 114-116.

Keenan, Edward L., and Bernard Comrie. 1977. Noun phrase accessibility and Universal Grammar. *Linguistic Inquiry* 8: 63-99.

King, Jonathan, and Marcel Just. 1991. Individual differences in syntactic processing—the role of working memory. *Journal of Memory and Language* 30: 580-602.

King, Jonathan, and Marta Kutas. 1995. Who did what and when? Using word- and cause-level ERPs to monitor working memory usage in reading. *Journal of Cognitive Neuroscience* 7: 376-395.

Kovtunova, Irina. 1976. *Porjadok slov i aktual´noe členenie predloženija*. Moscow: Prosveščemie.

Kuno, Susumu. 1973. *The structure of Japanese*. Cambridge: MIT Press.

Kuo, Kueilan, and Shravan Vasishth. 2006. Processing relative clauses: Evidence from Chinese. Ms., University of Potsdam.

Kwon, Na-Young, Maria Polinsky, and Robert Kluender. 2006. Subject preference in Korean. *Proceedings of the West Coast Conference on Formal Linguistics* 25: 1-14.

Levy, Roger, Evelina Fedorenko, and Edward Gibson. 2007. The syntactic complexity of Russian relative clauses. Paper presented at CUNY sentence processing conference, San Diego, March 2007.

Lin, Chien-Jer Charles. 2006. *Grammar and parsing: A typological investigation of relative-clause processing*. Ph. D. Dissertation, University of Arizona.

MacWhinney, Brian, and Csaba Pleh. 1988. The processing of restrictive relative clauses in Hungarian. Cognition 29: 95-141.

Mecklinger Axel, H. Schriefers, Karsten Steinhauer, and Angela Friederici. 1995. Processing relative clauses varying on syntactic and semantic dimensions: An analysis with event-related potentials. *Memory and Cognition* 23: 477-494.

Miyamoto, Edson, and Michiko Nakamura. 2003. Subject/object asymmetries in the processing of relative clauses in Japanese. *Proceedings of the West Coast Conference on Formal Linguistics* 22: 342-355.

Montrul, Silvina. 2004. Subject and object expression in Spanish heritage speakers: A case of morphosyntactic convergence. *Bilingualism: Language and Cognition* 7: 125-142.

Montrul, Silvina. 2006. On the bilingual competence of Spanish heritage speakers: Syntax, lexical semantics and processing. *International Journal of Bilingualism* 10: 37-69.

O'Grady, William, Miseon Lee, and Miho Choo. 2003. A subject-object asymmetry in the acquisition of relative clauses in Korean as a second language. *Studies in Second Language Acquisition* 25: 433-448.

Padučeva, Elena V. 1985. *Vyskazyvanie i ego sootnesennost´ s dejstvitel'nost´ju*. Moscow: Nauka.

Polinsky, Maria. 2006. Incomplete acquisition: American Russian. *Journal of Slavic Linguistics* 14: 191-262.

Polinsky, Maria. 2008. Heritage language narratives. In D. Brinton, O. Kagan, and S. Bauckus (eds.). *Heritage language education: A new field emerging*. Hillsdale, NJ: Lawrence Erlbaum.

Schriefers, Herbert, Angela Friederici, and Katja Kühn. 1995. The processing of locally ambiguous relative clauses in German. *Journal of Memory and Language* 34: 499-520.

Sorace, Antonella. 2004. Native language attrition and developmental instability at the syntax-discourse interface: Data, interpretations and methods. *Bilingualism: Language and Cognition* 7: 143-155.

Stromswold, Karin, David Caplan, Nathaniel Alpert, and Scott Rauch. 1996. Localization of syntactic comprehension by positron emission tomography. *Brain and Language* 52: 452-73.

Tjung, Yassir. 2006. The formation of relative clauses in Jakarta Indonesian: A subject-object asymmetry. Ph.D. Dissertation, University of Delaware.

Traxler, Matthew, Robin Morris, and Rachel Seely. 2002. Processing subject and object relative clauses: Evidence from eye novements. *Journal of Memory and Language* 47: 69-90.

Valdés, Guadalupe. 2000. *Spanish for Native Speakers.* Vol. 1. New York, NY: Harcourt College Publishers.

Appendix. Stimuli descriptions (in English)[6]

The cow is chasing the horse
The boy is scaring the girl
The woman arrested the man
The cat is attacking the dog
The man is kissing the woman
The girl punished the boy
The woman is serving the man (drink on a tray)
The child is pushing the monkey
The sailor drowned the pirate
The priest crossed the nun
The woman is tying up the girl
The girl is dressing the old woman
The robber has spotted (noticed) the policeman
The monkey is following the wolf
The motorcycle is passing the car
The wolf caught the bear
The giraffe defeated the elephant
The boy is summoning (beckoning) the girl
The girl photographed/drew the boy
Grandma is tickling grandpa
The elephant is pouring water on the whale
The skater is honoring (giving a prize to) the soccer player
The host is greeting the guest
The woman rescued the man (at sea)
The man is hugging the woman
The paraqueet freed the monkey from the cage
The witch is drawing the monster

[6] These are descriptions of pictures showing reversible actions, not the actual relative clauses that were used in questions.

The wagon (cart) is pulling the car
The kettle holds the pot
The book covers the newspaper
The dog is rocking the baby
The doctor is giving an injection to the nurse
The monkey lets the girl in (opening the door)
The granddaughter is combing the grandmother's hair
The dog is splashing the chicken
The bird is carrying the squirrel