

Quantifier Scope and Scrambling in the Second Language Acquisition of Russian

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1. Quantifier scope: Introduction

A question of interest both to generative linguistic theory and to generative approaches to second language acquisition is how speakers (native and non-native) map syntax to semantics: which sentence/meaning mappings are allowed by the grammar, which are disallowed, and why. Quantifier scope is one area where this issue has been investigated, in theoretical linguistics (May 1977, Aoun and Li 1993, Szabolcsi 1997, Heim & Kratzer 1998, among many others); in experimental research with adult native speakers (e.g., Ioup 1975, Kurtzman & MacDonald 1993, Tunstall 1998, Anderson 2004); and in research with adult L2-learners (e.g., Miyamoto & Takata 1998, Lee, Yip and Wang 1999, Marsden 2004, 2008, 2009, Li 2008, Chung 2013). Experimental studies of quantifier scope typically aim to determine which readings are allowed and/or preferred, and which are disallowed and/or dispreferred, and to account for the results in terms of grammar and/or processing. Studies with L2-learners furthermore seek to examine whether L2-learners have the same judgments and/or preferences as native speakers, and whether they are influenced by the behavior of quantifier scope in their L1.

This paper aims to add to the literature on quantifier scope by experimentally investigating scope in native and non-native Russian. Unlike quantifier scope in languages such as English, Hungarian, Japanese, and Chinese, quantifier scope in Russian has received relatively little attention in the theoretical literature. To the best of our knowledge, Russian quantifier scope has not previously been the subject of controlled experimental investigation, and has not previously been studied from the standpoint of L2-acquisition. The present work thus has two main objectives: (1) to experimentally examine quantifier scope with native Russian speakers, in order to test the predictions in the theoretical literature on Russian; and (2) to examine quantifier scope in L2-Russian, in order to examine whether learners' performance is consistent with transfer of grammatical and/or processing properties of scope from English, the learners' L1.

1.1. *Quantifier scope in English and Russian*

Double-quantifier English sentences such as (1) and (2) are well-known to be ambiguous between surface-scope and inverse-scope readings, spelled out below. In Montague-style semantics in generative grammar, the different scope readings are obtained through the operation of Quantifier Raising (QR) (May 1977, Heim & Kratzer 1998, Fox 2000). For the surface-scope reading, the object undergoes QR to [spec, VP] (or [spec, vP], depending on the theory), while the subject raises to the appropriate subject position (such as [spec, TP]); this is schematized in (3a). To derive the inverse-scope reading, the object has to undergo further QR to a TP-adjoined position higher than the subject, as schematized in (3b).

- (1) Every girl is stroking a/one kitten.
- a. surface-scope: (every>a/one) *Every girl is stroking a potentially different kitten.*
 - b. inverse-scope: (a/one>every) *For a specific kitten, every girl is stroking it.*

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- (2) A/one girl is stroking every kitten.
 a. surface-scope: (a/one>every) *A specific girl is stroking all the kittens.*
 b. inverse-scope: (every>a/one) *For every kitten, a potentially different girl is stroking it.*
- (3) a. LF for (1a): $[_{TP} [_{every\ girl}] \lambda 1 [_{VP} [a\ kitten] \lambda 2 [_{VP} t_1\ strokes\ t_2]]]$
 b. LF for (1b): $[_{TP} [a\ kitten] \lambda 2 [_{TP} [every\ girl] \lambda 1 [_{VP} t_2\ \lambda 2\ [_{VP} t_1\ strokes\ t_2]]]]]$

Psycholinguistic studies of English sentences such as (1) and (2) find that while both scope readings are available, the surface-scope reading is preferred, both offline (Ioup 1975, Kurtzman & MacDonald 1993, Anderson 2004) and online (Tunstall 1998, Anderson 2004). This led Anderson (2004) to formulate the ‘‘Processing Scope Economy’’ (PSE) principle, given in (4), according to which surface-scope readings are preferred because they are syntactically simpler and are therefore less costly to process. As schematized in (3) above, the derivation of the inverse-scope reading involves an extra step (QR of the object to a position higher than the subject), and is therefore taken to be more complex than the derivation for the surface-scope reading.

- (4) Processing Scope Economy: The human sentence processing mechanism prefers to compute a scope configuration with the simplest syntactic representation (or derivation). Computing a more complex configuration is possible but incurs a processing cost. (Anderson 2004 :31)

The Russian equivalents of (1) and (2) are given in (5a) and (6a). Russian has fairly free word order, and these sentences can also occur in OVS order, with the object scrambled leftward and the subject appearing postverbally (Bailyn 1995, King 1995), as shown in (5b) and (6b).

- | | | | | | | | |
|-----|----|----------------------|-----------------------|---------|----------------------|-----------------------|-----|
| (5) | a. | Každaja | devočka | gladit | odnogo | kotenka. | SVO |
| | | every _{NOM} | girl _{NOM} | strokes | one _{ACC} | kitten _{ACC} | |
| | b. | Odnogo | kotenka | gladit | každaja | devočka. | OVS |
| | | one _{ACC} | kitten _{ACC} | strokes | every _{NOM} | girl _{NOM} | |
| (6) | a. | Odna | devočka | gladit | každogo | kotenka. | SVO |
| | | one _{NOM} | girl _{NOM} | strokes | every _{ACC} | kitten _{ACC} | |
| | b. | Každogo | kotenka | gladit | odna | devočka. | OVS |
| | | every _{ACC} | kitten _{ACC} | strokes | one _{NOM} | girl _{NOM} | |

The availability of inverse-scope readings to sentences such as (5) and (6) is subject to debate. Ionin (2002) argues that all the sentences in (5) and (6) have frozen scope, with only the surface-scope reading available (i.e., the *one>every* reading in (5b) and (6a) and the *every>one* reading in (5a) and (6b)). Ionin explains this by appealing to information structure (cf. Junghanns and Zybatow 1997), arguing that in (emotively neutral) Russian sentences, the preverbal QP (whether the subject, or the scrambled object) is in Topic position, and the postverbal QP is in focus. According to Ionin’s proposal, covert QR above Topic position is impossible, as is reconstruction of the Topic to its base position. Antonyuk (2006) disagrees with the judgments in Ionin (2002) and argues that inverse scope of Russian sentences such as (5) and (6) *is* possible, and is derived by covert QR and reconstruction.

The disagreement about judgments is further complicated by the fact that surface-scope readings are preferred even in languages like English, which in principle allow inverse-scope readings. Assuming that the PSE in (4) applies cross-linguistically, it would also dictate a preference for surface-scope readings in Russian, at least for SVO sentences. It is not clear what the PSE would say about OVS sentences, on the assumption that the inverse-scope reading of OVS sentences can be derived by reconstructing the scrambled object to its base position. The PSE is concerned with the cost incurred by QR; it is not clear whether reconstruction of the scrambled object at LF should also be treated as adding a layer of processing complexity. If reconstruction at LF (like covert QR) incurs a processing cost, then the inverse-scope reading of OVS sentences (which involves reconstruction) should be more difficult to process than the surface-scope reading. On the other hand, if reconstruction is ‘free’ in terms of processing resources, then both surface-scope and inverse-scope readings of OVS sentences should be equally easy to process.

To sum up, it is not clear, at present, whether inverse-scope readings of sentences like (5) and (6) are completely disallowed, because of information-structure constraints (per Ionin 2002), or whether they are allowed but dispreferred (because of the PSE), and if so, whether SVO and OVS orders are equally affected by a preference for surface scope. The first objective of the present study is, therefore, to examine the availability of both surface-scope and inverse-scope readings for sentences such as those in (5) and (6).

1.2. *Quantifier scope in second language acquisition*

Prior L2-studies of quantifier scope have looked primarily at English vs. at languages such as Japanese and Chinese, which are argued to lack inverse-scope readings in configurations where English allows them. Lee et al. (1999) tested L1-Chinese L2-English learners' sensitivity to inverse scope readings in English; while Chinese disallows inverse scope, Lee et al. found that the learners had apparently overcome L1-transfer and were able to access inverse scope in English like native speakers. Marsden (2004) tested L1-English L2-learners of Japanese, which disallows inverse scope readings in double-quantifier sentences, and found that while intermediate learners were influenced by L1-transfer (mistakenly allowing inverse scope readings in Japanese), advanced learners had overcome L1-transfer (see also Marsden 2009). In contrast, L1-Korean and L1-Chinese L2-learners of Japanese in Marsden's (2004) study correctly rejected inverse-scope readings even at the intermediate levels – a finding expected under the influence of L1-transfer, since Korean and Chinese are like Japanese in terms of disallowing inverse scope. Li (2008) similarly found both effects of L1-transfer, and recovery from L1-transfer, with L1-English L2-Chinese learners on sentences with negation-numeral interactions (as in, *Rob didn't see two students*). Chung (2013) also found L1-transfer effects at lower proficiency levels with L1-Korean L2-English learners on sentences that involved negation and universal quantifiers (learners at higher proficiency levels were target-like). Effects of L1-transfer have also been found in the area of scope interactions between a *wh*-word and a universal quantifier (Miyamoto & Takata 1998, Marsden 2004).

The second objective of our study is to examine quantifier scope in the L2-acquisition of Russian by native English speakers. L1-transfer from English to Russian can potentially operate on two different levels: grammar and processing. On the level of grammar, English allows both surface-scope and inverse-scope readings, the latter derived by QR of the object QP to a position above the subject QP. If L1-English L2-Russian learners transfer the syntactic properties of their L1 to their L2, then they will similarly allow both surface-scope and inverse-scope readings in Russian, at least for SVO sentences. If, per Ionin (2002), Russian disallows inverse-scope readings (due to lack of covert QR), the learners (at least those at lower levels of proficiency) will be non-target-like, overaccepting inverse-scope readings due to the influence of English. On the other hand, if Antonyuk (2006) is right, and Russian is just like English in terms of allowing inverse-scope, then the learners – including those at the lowest proficiency levels – will be target-like in their scope interpretation. On the level of processing, L1-English L2-Russian learners are expected to exhibit a preference for the surface-scope reading in Russian even if they allow the inverse-scope reading.

2. Experimental study

As described in the previous section, our objectives are to investigate quantifier scope in native and non-native Russian. We therefore conducted an experimental study on Russian, testing quantifier scope with these two populations. In order to determine the extent to which L1-English L2-Russian learners are influenced by L1-transfer from English, we also used the same materials to study quantifier scope in native English. We describe the two studies in turn.

2.1. Russian study

2.1.1. Methodology

The study participants were 43 adult native Russian speakers and 18 adult L1-English L2-Russian learners.¹ Of the 43 native Russian speakers, seven were residing in Russia at the time of the study, and 36 were residing in the U.S.; all 36 had arrived in the U.S. as adults. The average age of the native Russian speakers was 35 (range 19 to 51). The L2-learners were all students at a U.S. university; their average age was 23 (range 19 to 30).

The participants completed a language background questionnaire and three tasks, in the following order: a screening task to determine basic familiarity with Russian case marking²; a Truth-Value Judgment Task (TVJT) testing quantifier scope, described in the next section; and a cloze test measuring L2-Russian proficiency. The language background questionnaire and all the tasks were administered via the web-based survey gizmo tool. The L2-learners and most of the native speakers were tested in a psycholinguistic lab, in the presence of one of the investigators; some of the native speakers (including all those tested in Russia) completed the study on their own computers, using the url provided by the investigators.

In the screening task, participants were presented with ten items, each of which consisted of a simple Russian sentence, with no quantifiers; five of the items had SVO order and five had OVS order. The participants were asked to read the sentence, and then respond to a question in English about who did the action (by using the same lexical items as the TVJT, the screening task also familiarized learners with the test vocabulary). For example, one item contained the sentence *Mal'čik obnimaet učitel'nicu* 'Boy-Nom hugs teacher-Acc', followed by the question "Who is doing the hugging?" Since half of the items had OVS order, learners needed to pay attention to the case marking, rather than the word order, in order to determine who was doing the action. If participants ignored the case-marking on the NPs, and assumed that the preverbal NP was always the subject, and the postverbal one the object (as in English), they would give correct responses to the SVO items and incorrect responses to the OVS items. In order to be included in the data analysis, participants had to respond correctly to at least seven of the ten items. The 18 learners included in the data analysis all passed the screening task.

The cloze test consisted of a passage of text with every seventh word replaced by a blank, for a total of 27 blanks. The passage was taken from Lev Tolstoy's story "The swan" (a version adapted for an elementary-school anthology) and was scored according to the appropriate-word criterion. All of the native speakers scored at ceiling on the test, making no more than one error on the 27 items.

The learners were divided into two proficiency groups based on their cloze test scores. The ten learners in the Low group had between zero and ten correct responses, while the eight learners in the High group had between 16 and 26 correct responses. Of the ten participants in the Low group, nine had started learning Russian during college; five were enrolled in second-year Russian during the study, two in third-year Russian, one in fourth-year Russian, and one in fifth-year Russian. The remaining participant in the Low group had been exposed to Russian during a five-year residence in Uzbekistan between the ages of 10 and 15, and was enrolled in first-year Russian during the study. Of the eight participants in the High group, all had started learning Russian during college; at the time of the study, two were enrolled in third-year Russian, one in fourth-year Russian and one in fifth-year Russian; the remaining three were no longer taking Russian courses. Six of the eight learners in the High group (including all three who were no longer taking Russian) reported spending between a few months and two years living in Russia or another Russian-speaking country.

2.1.2. Truth-Value Judgment Task: categories and predictions

In the TVJT, the participants were asked to judge the target sentences as true or false in the context of accompanying pictures. The sentences in (5) and (6), repeated below, were used. Two factors were varied in constructing the target sentences: quantifier configuration (universal subject & indefinite object, as in (5), vs. indefinite subject & universal object, as in (6)); and word order (SVO, as in (5a) and (6a)

¹ Twenty-five learners of Russian were tested for the study. Four were excluded because they did not pass the screening task, described below; and three more were excluded because English was not their native language.

² The screening task was not included in the version of the study administered to the native Russian speakers who were tested in Russia.

vs. OVS, as in (5b) and (6b)). Additionally, each test sentence was presented in the context of three different picture types, represented in Figures 1 through 3. The subject-oriented picture (Figure 1) makes the sentences in (5) unambiguously false, and those in (6) unambiguously true. The object-oriented picture (Figure 2) makes the sentences in (5) unambiguously true and those in (6) unambiguously false. Both of these picture types were controls, designed to ensure that the test format worked and participants were paying attention. The distributive picture (Figure 3) made the sentences in (5a) and (6b) true on the surface-scope reading and false on the inverse-scope reading, and made those in (5b) and (6a) false on the surface-scope reading and true on the inverse-scope reading. These truth-values are spelled out in Table 1. Two versions of the test were created, to avoid repetition; each version contained 4 tokens of each picture/sentence pairing (3 picture types x 4 sentence types x 4 tokens = 48 test items total), plus 24 fillers.

(5)	a.	Každaja	devočka	gladit	odnogo	kotenska.	SVO
		every _{NOM}	girl _{NOM}	strokes	one _{ACC}	kitten _{ACC}	
	b.	Odnogo	kotenska	gladit	každaja	devočka.	OVS
		one _{ACC}	kitten _{ACC}	strokes	every _{NOM}	girl _{NOM}	
(6)	a.	Odna	devočka	gladit	každogo	kotenska.	SVO
		one _{NOM}	girl _{NOM}	strokes	every _{ACC}	kitten _{ACC}	
	b.	Každogo	kotenska	gladit	odna	devočka.	OVS
		every _{ACC}	kitten _{ACC}	strokes	one _{NOM}	girl _{NOM}	

Figure 1. Subject-oriented picture

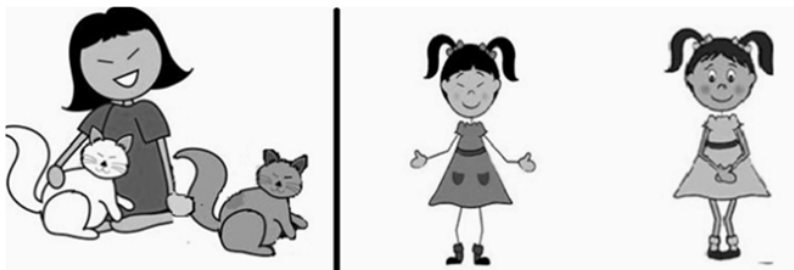


Figure 2. Object-oriented picture

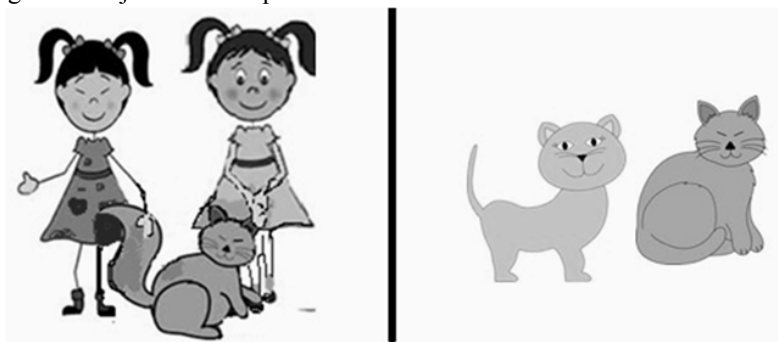
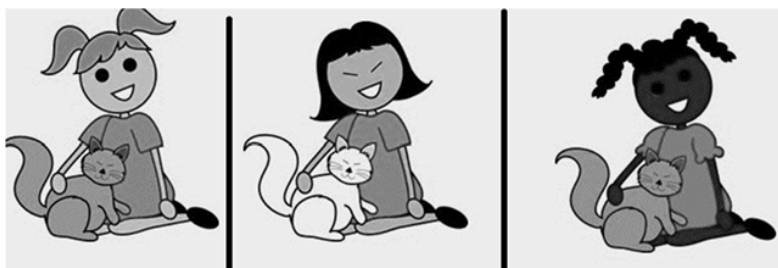


Figure 3. Distributive picture



Let us consider what can be expected for performance with the distributive picture. If scope in Russian is frozen for both SVO and OVS sentences, then native speakers are expected to give only ‘true’ responses to (5a) and (6b) and only ‘false’ responses to (5b) and (6a) in the context of the distributive picture. But what if inverse scope is possible, yet dispreferred for processing reasons? What pattern of results is expected in a TVJT when both readings (the true one and the false one) are grammatical, but one reading is more readily accessible for reasons of processing? To answer this question, we first need to consider the assumptions that underlie research with TVJTs.

A standard view in the literature on ambiguity is that adults, when faced with an ambiguous sentence that is true on one reading but false on another reading in a given context, will choose the interpretation that makes the sentence true in the context. This pragmatic preference has been termed the *Principle of Charity* by Gualmini, Hulsey, Hacquard and Fox (2008). On this view, if an adult participant provides a response of ‘false’ to (5b) or (6a) in the context of the distributive picture, this would indicate that the inverse-scope reading (which makes the sentences true) is completely unavailable, and only the surface-scope reading (which makes the sentence false) is allowed by the grammar. Conversely, as long as both surface-scope and inverse-scope readings are allowed by a participant’s grammar, then the sentences in (5b) or (6a) (as well as those in (5a) or (6b)) should be given ‘true’ responses 100% of the time. The *Principle of Charity* has nothing to say about one reading being more readily accessible than another: as long as the sentence has at least one true interpretation, participants will opt for that interpretation (no matter how difficult it may be to access) and give the response of ‘true’.

An alternative proposal for how adult speakers determine the truth-value of an ambiguous sentence is found in Meyer and Sauerland (2009). They propose the *Truth Dominance* constraint in (7) (p. 140); the difference between the *Principle of Charity* and the *Truth Dominance* constraint is that only the latter makes reference to the “most accessible” reading of a sentence. While the principle in (7) predicts that a sentence which is true on its most accessible reading will be judged as true, it makes no predictions as to how a sentence will be judged if it is false on its most accessible reading, but true on a less accessible reading. Meyer and Sauerland explicitly state that a sentence such as “One student is typing on every computer” might be judged false in a context where the surface scope is false but the inverse scope reading is true (e.g., when there are three computers, and three different students each type on a different computer). The reason for the ‘false’ answer would be that the surface-scope reading is more accessible than the inverse-scope reading, and the surface-scope reading is false. However, the prediction is weak: the sentence *might* be judged as false in this scenario, but it might also be judged as true.

- (7) *Truth Dominance*: Whenever an ambiguous sentence S is true in a situation on its most accessible reading, we must judge sentence S to be true in that situation.

Note that Meyer and Sauerland (2009) do not provide any criteria for what makes one reading of a sentence more accessible than another; they simply assume that the surface-scope reading should be more accessible than the inverse-scope reading. The PSE in (4) provides a processing-based explanation of this difference in accessibility: the surface-scope reading of a sentence with two QPs is easier to process than the inverse-scope reading because the latter has longer-distance QR.

Let us suppose that both surface-scope readings and inverse-scope readings are allowed in Russian, but the surface-scope reading is preferred. The *Truth Dominance* constraint in (7) predicts that for the distributive-picture context in our study, participants’ responses will differ depending on which reading makes the sentence true. When the surface-scope reading (the one that is more accessible) makes the sentence true (as in (5a) or (6b)), participants will give the ‘true’ responses close to 100% of the time. But when the inverse-scope reading makes the sentence true, while the surface-scope reading makes it false (as in (5b) or (6a)), participants may give the ‘false’ response – opting for the more accessible surface-scope reading. However, they will not necessarily give the ‘false’ response 100% of the time. A mixture of ‘true’ and ‘false’ responses to (5b) or (6a) in the context of the distributive picture will indicate that the inverse-scope reading is available but less accessible than the surface-scope reading.

The above predictions are spelled out in Table 1. These predictions in principle apply to both native speakers and L2-learners (however, in light of transfer from English, we do not expect to find frozen scope for L2-learners, even if it is present for native speakers).

Table 1. Predictions for the distributive picture (Figure 3)

quantifier configuration	word order	truth-value on:		predicted responses if...		
		surface scope	inverse scope	scope is frozen	scope is not frozen, and the <i>Principle of Charity</i> operates	scope is not frozen, and the <i>Truth Dominance</i> constraint + the PSE operate
universal subject, indefinite object	SVO (5a)	TRUE	FALSE	TRUE	TRUE	TRUE
	OVS (5b)	FALSE	TRUE	FALSE	TRUE	TRUE / FALSE
indefinite subject, universal object	SVO (6a)	FALSE	TRUE	FALSE	TRUE	TRUE / FALSE
	OVS (6b)	TRUE	FALSE	TRUE	TRUE	TRUE

2.1.3. Results for the control contexts

The results for the subject- and object-oriented contexts are given in Tables 2 and 3, respectively. They illustrate that the participants were paying attention. For the unambiguously false sentences, the rate of ‘false’ responses was near ceiling, for all groups. For the unambiguously true sentences, the rate of ‘true’ responses, while high overall, was unexpectedly low (77% to 85%) for the native speaker participants. Interestingly, the learners, even those at the lower proficiency level, were more accurate than the native speakers in giving ‘true’ responses to all unambiguously true sentence types.³ This issue aside, all groups made a strong distinction between unambiguously true and unambiguously false sentences in both control contexts.

Table 2. Results for the subject-oriented picture (Figure 1): truth-values and %true responses⁴

quantifier configuration	word order	truth-value	NS (N=43)	All L2 (N=18)	High L2 (N=8)	Low L2 (N=10)
universal subject, indefinite object	SVO (5a)	FALSE	6 (16)	4 (10)	0 (0)	8 (12)
	OVS (5b)	FALSE	3 (8)	0 (0)	0 (0)	0 (0)
indefinite subject, universal object	SVO (6a)	TRUE	85 (19)	94 (16)	100 (0)	90 (21)
	OVS (6b)	TRUE	77 (24)	90 (15)	88 (19)	93 (12)

³ A possible explanation is that the native speakers assigned a distributive interpretation to the sentences: that is, they interpreted (5a-b) as *Every girl is stroking a different kitten*, which would indeed make the sentences false in the context of the object-oriented picture; and similarly, they may have interpreted (6a-b) as *A different girl is stroking every kitten*, which would indeed make the sentences false in the context of the subject-oriented picture. The reason for assigning this distributive interpretation is that *každyi* ‘every’ is strongly distributive in Russian (perhaps behaving more like ‘each’ than like ‘every’ in English). A more felicitous way of describing the subject-oriented and object-oriented pictures would be with the quantifier *vse* ‘all’ in place of *každyi*. The infelicity of *každyi* used in a non-distributive context could have caused the elevated ‘false’ responses from the native speakers. This may also explain why the learners were more accurate than the native speakers: if the learners translated *každyi* as ‘every’ (rather than ‘each’), they would be more willing to allow it in a non-distributive context. However, evidence against this possibility comes from performance on the English version of the study (see section 2.2), where native English speakers tested on *every* in English also often produced ‘false’ responses to unambiguously true sentences in the context of subject- and object-oriented pictures. We leave this issue for further research; follow-up studies need to ensure the felicity of all scope readings.

⁴ In reporting all results, we report only the percentage of ‘true’ responses. Recall that ‘true’ and ‘false’ were the only possible response options. All tables report the means, with the standard deviations in parentheses.

Table 3. Results for the object-oriented picture (Figure 2): truth-values and %true responses

quantifier configuration	word order	truth-value	NS (N=43)	All L2 (N=18)	High L2 (N=8)	Low L2 (N=10)
universal subject, indefinite object	SVO (5a)	TRUE	80 (25)	90 (15)	94 (12)	88 (18)
	OVS (5b)	TRUE	84 (22)	89 (13)	88 (13)	90 (13)
indefinite subject, universal object	SVO (6a)	FALSE	3 (8)	1 (6)	0 (0)	3 (9)
	OVS (6b)	FALSE	5 (12)	4 (10)	3 (9)	5 (11)

2.1.4. Results for the test context

The results for the distributive picture type (Figure 3, the test context) are reported in Table 4. They show that both surface-scope and inverse-scope readings were accessed, but with differences across conditions as well as across groups. The native speaker results are clearly incompatible with Russian having frozen scope: for the sentences in (5b) and (6a), the ‘true’ response (which indicates the inverse-scope reading) is given more than 50% of the time. The L2-learners have an even stronger tendency, compared to native speakers, for giving the ‘true’ response to (5b) and (6a). Somewhat surprisingly, the low-proficiency L2-learners perform more like the native speakers than do the high-proficiency L2-learners. However, given the small sample size, this may not be a meaningful difference. Given that the numerical differences between the two L2-groups are fairly small, all L2-learners were grouped together for the statistical analysis.

Table 4. Results for the distributive picture (Figure 3): truth-values and %true responses

quantifier configuration	word order	truth-value on surface-scope	truth-value on inverse-scope	NS (N=43)	All L2 (N=18)	High L2 (N=8)	Low L2 (N=10)
universal subject, indefinite object	SVO (5a)	TRUE	FALSE	86 (30)	86 (23)	88 (19)	85 (27)
	OVS (5b)	FALSE	TRUE	73 (38)	83 (30)	91 (26)	77 (32)
indefinite subject, universal object	SVO (6a)	FALSE	TRUE	53 (37)	67 (30)	72 (25)	62 (36)
	OVS (6b)	TRUE	FALSE	76 (34)	61 (36)	56 (37)	65 (36)

Since the results in Table 4 indicate availability of inverse-scope readings in Russian, we next consider whether inverse scope is freely accessible. If inverse-scope readings are always accessible, then the response of ‘true’ should be given about equally often when it corresponds to the inverse-scope reading (for (5b) and (6a)) as when it corresponds to the surface-scope reading (for (5a) and (6b)), and near-ceiling rates of ‘true’ responses are expected in both cases (per the *Principle of Charity*). If, in contrast, the surface-scope reading is preferred (as predicted by the PSE), then we expect higher rates of ‘true’ responses for (5a) and (6b) than for (5b) and (6a).

In order to investigate this, we subjected the data to a repeated-measures ANOVA, with word order and quantifier configuration as the two independent variables, and rate of ‘true’ responses as the dependent variable. The ANOVAs were run separately for the native speaker group and the L2-learner group (the high- and low-proficiency learners were grouped together), since our focus is on within-group patterns of performance rather than between-group comparisons (additionally, the very different sample sizes make a direct statistical comparison inappropriate).

For the native speakers, the results revealed a significant effect of quantifier configuration ($F(1, 42) = 25.7, p < .001$), indicating a higher rate of ‘true’ responses when the universal QP is in subject position. There was only a marginal effect of word order ($F(1, 42) = 3.35, p = .07$), but word order interacted significantly with quantifier configuration ($F(1, 42) = 19.3, p < .001$). To explore the interaction, four

paired samples t-tests were conducted; to avoid inflating the Type I error, the alpha level was set to .0125 (Bonferroni correction: .05 divided by 4, the number of comparisons). The paired samples t-tests showed the following. In the configuration with an indefinite in subject position, ‘true’ responses were significantly more frequent in OVS than in SVO order (76% vs. 53%, $p < .001$). In the configuration with a universal in subject position, ‘true’ responses were marginally more frequent in SVO than in OVS order (86% vs. 73%, $p = .019$). For the two SVO orders, the ‘true’ response was significantly more frequent ($p < .001$) when it corresponded to the surface-scope reading (universal in subject position, 86%) than when it corresponded to the inverse-scope reading (indefinite in subject position, 53%). In contrast, there was no difference ($p = .54$) in the rates of ‘true’ responses for the two OVS orders (76% when the ‘true’ response corresponded to the surface scope reading, 73% when it corresponded to the inverse scope reading). To sum up, in SVO order, there is a clear preference for surface scope: the native speakers gave overwhelmingly ‘true’ responses when the SVO sentence was true on the surface-scope reading, but gave half ‘true’ and half ‘false’ responses when the SVO sentence was false on the surface-scope reading and true on the inverse-scope reading. This is fully consistent with a processing-based preference for surface scope. In contrast, there was no clear preference for surface scope in the OVS order, and inverse scope was quite readily accessible: the native speakers opted for the ‘true’ response to an OVS sentence regardless of whether it corresponded to the surface-scope or the inverse-scope reading. Performance on the OVS sentences is thus more consistent with the *Principle of Charity*, which states that participants give the ‘true’ response whenever at least one reading of the sentence makes it true.

Turning to L2-learners, the repeated-measures ANOVA on their results yielded a significant effect of quantifier configuration ($F(1, 17) = 5.59$, $p = .03$): the rate of ‘true’ responses was significantly higher when there was a universal in subject position than when there was an indefinite in subject position. There was no effect of word order ($F(1, 17) = 1.42$, $p = .25$) and no interaction ($F(1, 17) = .17$, $p = .68$). The learners made no distinction between SVO and OVS orders. Basically, they gave high rates of ‘true’ responses when the SVO sentence was true on the surface-scope reading and lower rates of ‘true’ responses when the SVO sentence was true only on the inverse-scope reading (a finding consistent with the PSE). The OVS sentences received similar rates of ‘true’ responses as their SVO counterparts; even when the OVS sentence was true on the surface-scope reading (the sentence type in (6b), with an indefinite in subject position), the rate of ‘true’ responses was quite low, about the same as for the corresponding SVO sentence (in (6a)).

The learners’ performance on the SVO sentences is quite likely to stem from L1-transfer of processing preferences from English, on the assumption that the inverse-scope reading is available in English but dispreferred. In order to test this L1-transfer assumption with our methodology, we conducted an English study using the same materials as in the Russian study. We turn to this next.

2.2. English study

In order to compare scope readings in Russian and in English, an English-language version of the study was conducted. The same pictures were used as in the Russian study (see Figures 1 through 3). In order to keep the same test format in the English study as in the Russian study, we needed to have four sentence types; however, since English disallows scrambling, we could not use the exact equivalents of (5b) and (6b). One possibility would have been to use passive sentences instead of scrambled sentences, but this would have meant introducing an entirely different structure. Instead, we opted to create four conditions with SVO order, corresponding to the two sentence types in (5a) and (6a), and further varying the determiner between *a* and *one*. The rationale for this was that, given the lack of articles in Russian, L1-English L2-Russian learners could potentially map the Russian *odin* to either *a* or *one*. Thus, in order to examine potential transfer effects from English to Russian, we needed to know whether *a* and *one* behave any differently with regard to scope preferences. The four target sentence types (4 tokens per sentence type) are exemplified in (8). Twenty-nine native speakers of English residing in the U.S. (none with any knowledge of Russian) participated in the English study.⁵

⁵ Three more participants were excluded: two who were bilingual in English and another language, and one who was an outlier in terms of age.

- (8) a. Every girl is stroking a kitten.
 b. Every girl is stroking one kitten.
 c. A girl is stroking every kitten.
 d. One girl is stroking every kitten.

Table 5 presents the English study results. Each of the last three columns shows both the truth-values for the given sentence/picture combination, and the percentage of ‘true’ responses. For the subject-oriented and object-oriented pictures, the responses are largely at ceiling when the sentence is unambiguously false, but not when it is unambiguously true – exactly as was found for the corresponding conditions in the Russian study (see Tables 2 and 3; see also footnote 3).

Turning to the distributive picture, the English results in Table 5 are very similar to those for the SVO sentences in the Russian study (see Table 4). When the context makes the sentence true on surface-scope reading (8a-b), the rate of ‘true’ responses is near ceiling. When the context makes the sentence false on the surface-scope and true on the inverse-scope reading (8c-d), the responses are split almost evenly between ‘true’ and ‘false’. This suggests that, as predicted by the PSE, the inverse-scope reading in English is dispreferred relative to the surface-scope reading.

Table 5. Results for the English version: truth-values and %true responses (N=29)

sentence type	subject-oriented picture	object-oriented picture	distributive picture
Every girl is stroking a kitten (8a)	all readings FALSE %true responses: 10 (31)	all readings TRUE %true responses: 78 (42)	TRUE on surface scope %true responses: 94 (23)
Every girl is stroking one kitten (8b)	all readings FALSE %true responses: 3 (16)	all readings TRUE %true responses: 82 (38)	TRUE on surface scope %true responses: 84 (37)
A girl is stroking every kitten (8c)	all readings TRUE %true responses: 78 (42)	all readings FALSE %true responses: 9 (28)	FALSE on surface scope %true responses: 63 (49)
One girl is stroking every kitten (8d)	all readings TRUE %true responses: 85 (36)	all readings FALSE %true responses: 3 (18)	FALSE on surface scope %true responses: 57 (50)

A repeated-measures ANOVA was conducted on the results for the distributive context, with quantifier configuration and determiner type as the within-subject variables, and the proportion of ‘true’ responses as the dependent measure. The ANOVA yielded a significant effect of quantifier configuration ($F(1, 30) = 23, p < .001$): there were significantly more ‘true’ responses for the configuration with a universal in subject position (the configuration in which the ‘true’ response corresponds to the surface-scope reading). There was also a significant effect of determiner ($F(1, 30) = 5.45, p = .027$), due to significantly more ‘true’ responses for sentences with *a* than for those with *one*. The reason for this effect is not clear. Importantly, quantifier configuration did not interact with determiner ($F(1, 30) = 1.00, p = .33$), which means that the preference for surface scope readings holds regardless of the type of indefinite determiner.

3. Discussion

We have reported on an experimental study of quantifier scope in native and non-native Russian. For native Russian speakers, we found that scope is not frozen (contra Ionin 2002, and consistent with Antonyuk 2006), but that the relative accessibility of inverse scope depends on word order: while surface scope is clearly preferred for SVO order, surface scope and inverse scope are equally accessible on the OVS order. A possible explanation for the word order effect is that in the scrambled OVS order, inverse scope does not incur a processing cost: reconstructing the object QP to its base position is no more costly

than interpreting it in its scrambled position. Another possibility is that the native speakers were assigning different information-structure configurations to SVO vs. to OVS word orders, and that this was influencing their scope interpretation: the participants may assign topic interpretation to the preverbal subject in SVO order more often than to the scrambled object in OVS order. If, per Ionin (2002), frozen scope is tied to the topic-focus configuration, this would explain the greater preference for surface scope in SVO order (see Stoops and Ionin 2013, for more discussion). When native speakers allow inverse scope, this may be because they are assigning a different information-structure configuration (e.g., contrastive focus) to the sentence. Future research needs to control for the information-structure properties of the target sentence, through context and/or through prosody (e.g., by using neutral intonation in order to rule out a contrastive interpretation).

Turning to the L2-Russian learners, we found that they transferred the preference for the surface-scope reading of SVO sentences from English to Russian. While this led to fairly target-like performance on Russian SVO sentences, the learners were non-target-like on OVS sentences. Unlike the native speakers, the L2-learners interpreted OVS sentences exactly like their SVO counterparts. The L2-learners' performance on OVS sentences goes against the predictions of the PSE: for OVS sentences, the L2-learners gave 'true' responses more frequently to the sentence type in (5b), where the 'true' response indicates the inverse-scope reading, than to the sentence type in (6b), where it indicates the surface-scope reading. It is not clear what caused this puzzling finding. A possible explanation is that the learners were translating the Russian sentences into English, and subsequently basing their judgments on their scope preferences for English. An SVO sentence and an OVS sentence which have the same quantifier configuration (e.g., indefinite in subject position and universal in object position) are equivalent to the same active-voice English sentence (e.g., 'One girl strokes every kitten'). The learners' preference for the surface-scope reading of the English sentence then leads them to prefer the surface-scope reading for the corresponding SVO Russian sentence, but to prefer the inverse-scope reading for the corresponding OVS Russian sentence. See Chung (2013) for a similar claim about L1-Korean L2-English learners translating sentences with negation-quantifier scope interactions into Korean, and imposing the Korean interpretative preferences onto the corresponding English sentences.

Our findings suggest that the learners are unaware of the contribution of scrambling to information structure and scope interpretation, and that they interpret sentences based on morphosyntactic information (case marking) without reference to topic-focus structure (cf. Unsworth 2007 on the L2-acquisition of the relationship between scrambling and referentiality in Dutch).

4. Conclusion

This paper addressed the interpretation of scopally ambiguous sentences by native and non-native speakers of Russian. Our findings indicate that native Russian speakers have a preference for the surface-scope reading of SVO sentences, but freely allow both surface-scope and inverse-scope readings of scrambled OVS sentences. These findings can be interpreted in at least two ways: (i) the inverse-scope reading incurs a processing cost in SVO sentences (where inverse scope requires covers QR) but not in OVS sentences (where inverse scope can be derived via reconstruction); and/or (ii) surface-scope is preferred whenever the preverbal element is interpreted as the topic, and speakers are more likely to treat the subject than the object as the topic. In contrast, the L2-Russian learners interpreted OVS sentences exactly like their unscrambled SVO counterparts, which suggests that they are unaware of the contribution that scrambling makes to scope interpretation. The learners' behavior is consistent with an explanation of L1-transfer; results from the English version of our study indicate that native English speakers have a preference for the surface-scope reading of SVO sentences.

A number of avenues remain open for further research. First, the link between scope and information structure needs to be addressed more directly, through the use of context that establishes the topic. Second, auditory presentation of the stimuli will ensure that the prosodic contour is consistent with the topic-focus configuration. A follow-up study with both of those modifications is currently underway. Once the native-speaker results establish whether information structure plays a role in scope preferences, future research should address whether learners and native speakers assign the same information-structure configuration to scrambled and non-scrambled sentences, and how this may affect judgments of quantifier scope.

Finally, while our findings are consistent with an L1-transfer explanation, we cannot be certain that L1-transfer is at work without testing additional L1/L2 configurations. It is possible that the preference

for surface-scope that we have found for L1-English L2-Russian learners is a general processing preference which is independent of the learners' L1. In order to test the role of L1-transfer, it is necessary to test L2-Russian learners whose L1 either has frozen scope (allowing only surface-scope readings) or else exhibits a preference for inverse scope. If L1-transfer is at work, then such learners are expected to behave differently from English speakers, whose L1 exhibits a preference for surface-scope while also allowing inverse-scope. It would also be fruitful to test learners whose L1 allows scrambling; depending on the relationship between scope and scrambling in the learners' L1, specific predictions for L1-transfer can be formulated and tested.

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Selected Proceedings of the 5th Conference on Generative Approaches to Language Acquisition North America (GALANA 2012)

edited by Chia-Ying Chu,
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Utako Minai, and Annie Tremblay

Cascadilla Proceedings Project Somerville, MA 2014

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to Language Acquisition North America (GALANA 2012)
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This paper can be cited as:

Ionin, Tania, Tatiana Luchkina, and Anastasia Stoops. 2014. Quantifier Scopepe and Scrambling in the Second Language Acquisition of Russian. In *Selected Proceedings of the 5th Conference on Generative Approaches to Language Acquisition North America (GALANA 2012)*, ed. Chia-Ying Chu et al., 169-180. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #3078.