

# Quantifiers in Russian Sign Language

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## 1 Introduction

In this paper we describe the means of quantification in Russian Sign Language (RSL), focussing on lexical D- and A-quantifiers, but also paying attention to verbal morphology. The system of quantification in RSL has not been previously described in much detail (but see Zajtseva 1987 and Filimonova 2012), so this description can be a basis for further in-depth semantic and syntactic studies of quantifiers in this language. In addition, we hope that RSL can be used to test typological generalizations in the domain of quantification (Keenan and Paperno 2012). Finally, since RSL belongs to the visual modality,<sup>1</sup> it is possible to look for modality-specific and modality-independent aspects of this semantic field.

The paper is structured as follows. In Sect. 2 we provide the necessary background on RSL and introduce some notions of sign linguistics. In Sect. 3 we briefly summarize previous research on quantification in sign languages. Section 4 describes the methodology used in this project. In Sect. 5 the basic classes of quantifiers are discussed. Section 6 is devoted to other types of quantifiers, such as comparative and type (2) quantifiers. In Sect. 5 and 6 we focus on the semantic properties of quantifiers, while their syntax is addressed separately in Sect. 7. Scopal

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<sup>1</sup>The term *modality* in this paper is only used to refer to the channel of communication, and not to the linguistic category of modality.

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interactions of quantifiers are discussed in Sect. 8. Section 9 contains a discussion of modality-specific properties of quantification in RSL. Finally, Sect. 10 concludes the paper.

In addition, we created an appendix with figures illustrating most of the RSL quantifiers and quantifier-related signs. We consider this appendix a necessity, because the glosses of the signs used in the examples throughout the paper would not allow future researchers to identify the signs we are referring to, as there is no standard dictionary or database with established gloss-sign pairs. Some illustrations are also used throughout the paper. Sometimes we refer the reader to an on-line dictionary [www.spreadthesign.com](http://www.spreadthesign.com).

## 2 Background on Russian Sign Language

Russian Sign Language is a natural language used by deaf and hard-of-hearing people in Russia and some other former Soviet countries. In Russia, it is used by at least 120,000 people, according to the census organized in 2010. It has emerged in the beginning of the nineteenth century, when the first school for the deaf children was founded.

There is comparatively little research done on the grammar and use of RSL. In the recent years, some studies of syntax (Kimmelman 2012), prosody (Prozorova 2009), and pragmatics/discourse (Prozorova and Kibrik 2007; Kimmelman 2014) in RSL have appeared. There is also one paper devoted to quantifiers in RSL (Zajtseva 1987), see also Sect. 3. A relatively up-to-date review of research on RSL can be found in Kimmelman (2012).

In order to discuss quantifiers in RSL, some basic properties of this language<sup>2</sup> have to be introduced. We will not discuss all aspects of RSL grammar; instead, we mainly describe properties that might be unfamiliar to linguists not working in the field of sign linguistics.

Since the seminal work by Stokoe (1960), signs are usually analysed as consisting of meaningless phoneme-like components, namely the handshape, the orientation, the movement, and the location. For instance, RSL sign BOY (Fig. 1) has a flat palm as the handshape, the palm is oriented from the signer, the location is at the right temple, and the movement consists of touching the temple twice. Sometimes, the fifth component can be posited, namely the non-manual component, which can be a facial expression and/or mouth movements. The latter are quite common and are usually divided into two types: mouthing (soundless articulation of the corresponding word in the spoken language) and mouth gestures (some articulation not related to any spoken word) (Boyes Braem and Sutton-Spence 2001). For example, the RSL sign BOY is often accompanied with mouthing of the Russian word *maljčik* ‘boy’, while the RSL sign MANY2 (see Fig. 9) is accompanied with a mouth gesture that resembles the articulation of the sequence [af]. In the

<sup>2</sup>These properties are shared between RSL and most other Western sign languages.



**Fig. 1** Stills for example (5): signs BOY with raised eyebrows and LATE

appendix we provide additional information about the components of the sign if they are not deducible from the picture.

In RSL, as in other sign languages, signs can be one-handed, two-handed symmetrical (when both hands share the same handshape and movement pattern) or two-handed asymmetrical (when the hands have different handshapes and/or only one of the hand moves). These different types of signs have different phonological processes associated with them (Brentari 1998).

Another important property is that RSL uses space to localize referents, to refer back to them through pointing sign (pronouns) and for verbal agreement. For first and second person, the pointing to the signer (IX-1) and the addressee (IX-2) are used, as in (1); other referents are assigned arbitrary locations in the signing space, which we will gloss as *a*, *b* etc., as in (2).

- (1) IX-1 IX-2 SEE-2 SELDOM<sup>3</sup>  
'I seldom see you.'
- (2) IX-a IX-b a-SEE-b  
'He sees him.'
- (3) IX-a IX-PL A-SEE-PL  
'He sees them.'
- (4) IX-1 IX-b LOVE  
'I love him.'

<sup>3</sup>Sign are glossed in SMALL CAPS. The gloss is an approximate translation of the sign. Fingerspelled items are hyphenated (A-L-L). Glosses with similar meaning but different form

Examples (1) and (2) also demonstrate that verbs can agree with these locations, which phonologically means that the verbal sign either moves from the location of the subject to the location of the object, or it is oriented towards the object. If the object is plural, the pointing sign and the verb can move in an arc shape to agree with it (3), or the verb movement can be repeated. However, not all verbs are agreeing: plain verbs, such as the RSL sign LOVE, do not change the form depending on the locations associated with their arguments (4).

Possessive pronoun POSS also uses the locations to specify the reference (8). In addition, nominal signs can be localized in space as well (by producing the sign not in its neutral position, but in a marked location), and then their locations can be used by pronouns or verbal agreement. Note that there is a discussion in sign linguistic literature as to the linguistic status of locations, pointing signs, and verbal agreement (Lillo-Martin and Meier 2011).

Another important property of sign languages, including RSL, is the extensive use of non-manual markers (facial expressions and head and body movements) fulfilling a variety of grammatical functions (Pfau and Quer 2010). For instance, yes/no questions in RSL are marked with raised eyebrows. More relevant for the present paper is the fact that eyebrow raise is also used to mark topics (Kimmelman 2014). For instance, in (5) the topic BOY is accompanied with eyebrow raise (*er*), see also Fig. 1. Another common non-manual marker is the negative expression (which we gloss as *neg*), consisting of the headshake, furrowed eyebrows and wrinkled nose. This expression obligatorily accompanies the manual negative markers, such as NOT (6), but it can also spread over other signs within the scope of negation (7).

- (5)  $\overline{\text{er}}$   
BOY LATE  
'As for the boy, he is late.'

- (6)  $\overline{\text{neg}}$   
BOY LATE NOT

- (7)  $\overline{\text{neg}}$   
BOY LATE NOT  
'The boy is not late.'

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are accompanied by a number: NEVER1, NEVER2. If one sign is translated with several words, the words are separated by a dot (ON.FOOT); the same is applied to signs with incorporation (TWO.PIECE). IX stands for index and is used to refer to pointing signs. POSS is a possessive pronoun, AT is yet another personal pronoun used in some syntactic contexts, CL is a classifier. Pronouns, agreeing verbs, and classifiers can be also provided with agreement indexes: -1 and -2 for first and second person; no index for the third person if there is only one third person referent in the clause, -a, -b, -c etc. for third person if there are multiple referents in the clause, -PL for plural marking, -DISTR for distributive marking. Subject agreement precedes the verbal stem, while object agreement follows it (1-SEE-2 'I see you'). A comma marks a prosodic boundary. Non-manual markers are placed above the glosses, with the underlying showing the extent of the marking. *Er* stands for eyebrow raise, *neg* stands for a complex facial expression and head movement which expresses negation. In examples taken from other sources other conventions may apply; they are explained separately at the relevant places.

Another important syntactic property of RSL (and many other sign languages, see the discussion in Kimmelman (2013)), is that it uses doubling of different types of constituents. For instance, in (8) the verb MEET occurs both before and after the object. Doubling usually has pragmatic functions, such as emphasis and foregrounding. There are different syntactic analyses of doubling in sign languages (see for instance Nunes and de Quadros 2008) which we will not discuss further.

- (8) MEET IX POSS FRIEND MEET  
'He met his friend.'

One of the differences between sign languages and spoken languages is the amount of iconicity on all levels of grammar. Sign languages, existing in the visual modality, have more potential for iconic expression (Perniss et al. 2010). Quite naturally, lexical signs are often iconic, that is, they have formal similarity with the object they denote. For instance, the RSL sign FLOWER (Fig. 4) resembles a flower. Moreover, iconicity has effects in sign language phonology and morphology as well: for instance, some phonological restrictions can be violated for the sake of iconicity of signs (van der Kooij 2002). As we will show in the following section, iconicity can sometimes play a role in the domain of quantification, too.

One aspect relevant to the topic of quantification in RSL is the fact that RSL does not have determiners, but a pointing sign can accompany a noun to mark definiteness (9), in other words, to function as a demonstrative<sup>4</sup> (see the discussion of different functions of pointing in Johnston 2013).

- (9) IX CAT  
'that/the cat'

The final important aspect of RSL concerns its sociolinguistic status. As is the case for most sign languages, most RSL users are not native signers, as the majority of deaf children are born in hearing families.<sup>5</sup> Almost all RSL signers are bilingual, as they can speak or write in Russian. Furthermore, in addition to RSL, there exists an artificial visual communication system, Signed Russian, which is essentially Russian conveyed with signs. Within this system, the signer tries to follow the word order of spoken Russian; some grammatical elements absent in RSL, such as prepositions and conjunctions, are added through artificially invented signs or fingerspelling (finger alphabet), while sign language specific tools, such as the use of space and non-manual markers, are avoided. Due to educational policies (for more information on the history of deaf education in Russia see Pursglove and Komarova

<sup>4</sup>Note that for ASL at least some researchers have analyzed pointing signs as definite determiners (MacLaughlin 1997), while more recently others have argued that these signs are better analyzed as demonstratives, as their properties differ from both definite determiners and personal pronouns (Koulidobrova 2012, Koulidobrova & Lillo-Martin to appear). Nobody has looked at pointing signs in RSL in detail so far.

<sup>5</sup>Mitchell & Karchmer (2004) assessed the percentage of deaf children in the United States with at least one deaf parent at 4.2 %. There are no such measurements for RSL, but we expect results of the same order.

2003), Signed Russian has a status higher than RSL: the former is considered to be a sign of literacy and higher education, and interpreters and teachers at deaf schools almost exclusively use Signed Russian.

Because most signers are non-native and bilingual, and because of the existence of Signed Russian, which is a bridge between spoken Russian and the visual modality in which RSL is used, it is not surprising that RSL is strongly influenced by Russian. This can be seen in the borrowing of many lexical items, and even in some syntactic constructions that clearly originated in Russian but are now used in RSL. We will therefore pay attention to the patterns in the domain of quantification which RSL could have developed under the Russian influence. Note, however, that sometimes it can be difficult to say whether the Russian-like structures found in the data is instances of borrowing or code-switching. We will discuss this issue further in the Sect. 4.

### 3 Quantifiers in Other Sign Languages

There exists some research on quantification in sign languages, the majority of papers focussing on American Sign Language (ASL). Not aiming at a comprehensive outline, we present here some highlights of this research.

Strikingly, probably the first work related to quantification in sign languages is based on RSL data (Zajtseva 1987). Zajtseva argued that RSL has several lexical universal (both distributive and non-distributive) and existential quantifiers, and that all basic quantification-related meanings can be expressed in this language through a combination of lexical quantifiers and verbs.

Zajtseva (1987) also pointed out that the spatial nature of RSL plays a role in the expression of quantification as well. She gives an example of distributive universal quantification being expressed by locating elements in different spatial locations. In (10) squares and circles are located in three different locations in space (locations glossed here as -a, -b, and -c); the signs SQUARE, CIRCLE and TWO in each of the three clauses are made in the same spatial region, which is interpreted as every square having a couple of circles in it. As other examples in this section show, this strategy can also apply to verbs.

- (10) SQUARE-a CIRCLE-a TWO-a, SQUARE-b CIRCLE-b TWO-b, SQUARE-c  
CIRCLE-c TWO-c [RSL]  
'There are a couple of circles in every square.' (Reconstructed from  
Zajtseva 1987: 10–11)

In addition, Zajtseva (1987) argued for the use of experimental settings involving visual stimuli instead of translating sentences from Russian in the study of quantifiers in RSL (see Sect. 4).

The first works on quantification in ASL are Petronio 1995 and Partee 1995. Petronio (1995) did not look at lexical quantifiers; instead, she investigated the interpretation of bare NPs in combination with different types of verbs. She found out that, with plain verbs, bare NPs can have either singular or plural

interpretation, while with agreeing and spatial verbs the verbal morphology specifies the interpretation. For instance, in (11) the noun WOMAN can have either singular or plural interpretation, while in (12) the same noun only gets the plural interpretation, because of the plural marking on the verb. She also showed that verbal morphology can express distributive quantification: in this case, the verb moves toward several locations one by one (12). Her most important conclusion is that ASL has verbal markers used to quantify arguments.

- (11) \_\_\_\_\_t  
MOVIE, WOMAN LOVE<sup>6</sup> [ASL]  
'The woman/the women loved the movie.'
- (12) \_\_\_\_\_t  
WOMAN, IX-1 FINISH ASK-PL [ASL]  
'I already asked the women/\*the woman.' (adapted from Petronio 1995:603)
- (13) \_\_\_\_\_t  
STUDENT, BOOK ANN GIVE-DISTR [ASL]  
'Ann gave a book to each student.' (adapted from Petronio 1995:611)

Partee (1995) discussed similar data on verbal markers of quantification in ASL, but also mentioned the existence of D-quantifiers, such as the quantifier A-L-L. According to her, this quantifier is not adjacent to the NP it quantifies over. Instead, the NP is topicalized, while the quantifier is separated from the rest of the sentence by a prosodic break (14). This means that ASL overtly divides the quantifier, the restrictor of the quantifier (the topic), and the nuclear scope (the main clause). Quer (2012) demonstrated that the same strategy is possible (and even preferable, although not obligatory) in Catalan Sign Language. He also argued that the tripartite structure in Catalan Sign Language is used for both A-, and D-quantification. In the following sections (see especially Sect. 7), we will see that RSL also uses a similar strategy, although it is by no means the only possible syntactic construction for quantifiers.

- (14)  $\overline{\text{t}}$  STUDENT GROUP A-L-L, IX-1 LIKE [ASL]  
 ‘I like all of the students.’ (adapted from Partee 1995:550)

Recently some interesting research on modality-specific aspects of quantification in ASL and Catalan Sign Language has appeared.<sup>7</sup> This research shows that quantification can be related to the frontal spatial plane. In particular, in Catalan Sign Language, pointing toward a high location is used to express non-specific indefinites (Barberà 2014). In ASL, the frontal plane is used to express the size of the domain

<sup>6</sup>We keep the notation *t* for non-manual marking of topics in ASL, as used in the original sources.

<sup>7</sup>In addition, Philippe Schlenker has recently published several papers on quantification, anaphora, and iconicity in ASL and French Sign Language (see for instance Schlenker 2011, Schlenker et al. 2013).



of quantification (Davidson and Gagne 2014). In particular, if a pointing sign with an arc-shaped movement is used, it can mean ‘everyone’; however, the domain of quantification would be different depending on the height of the sign: a low sign might mean ‘everyone in this room’ while a high sign might mean ‘everyone in the world’. The same mechanism also applies to indefinite pronouns and negative quantifiers (NO-ONE). This research shows the importance of looking for modality effects in the domain of quantification.

Finally, Filimonova (2012) described distributive marking in RSL. This paper is a detailed study of expression of different types of distributivity in RSL.

## 4 Methodology

In order to study the expression of quantifiers in RSL, we used traditional elicitation tasks with four signers of RSL. The signers worked in pairs which allowed them to freely discuss the tasks among themselves. The first pair of signers consisted of a hard-of-hearing signer with deaf parents and a deaf signer with hearing parents. The second pair consisted of a native deaf signer coming from a deaf family and a hearing native signer coming from a deaf family. The majority of the data discussed in the paper was produced by the native deaf signer from the second pair. Any variation between the signers is discussed in the text. The data collection happened in Moscow in July 2014.

The signers were asked to translate written Russian sentences into RSL, and also to discuss the exact meaning of the translated sentences, as well as to judge the grammaticality of constructed sentences and possible word order permutations. The sentences and the signers’ comments were recorded with a video recorder. In addition, in order to study word order and scopal interactions of quantifiers, we applied a slightly more advanced technique. For word order, sentences with quantifiers were recorded showing several theoretically possible word orders on 1 day, and then on one of the following days these sentences were shown to the signers in order to elicit grammaticality judgements. In the case of scopal interactions, several sentences with two quantifiers were recorded on 1 day, and then they were shown to the signers on one of the following days together with visual depictions of the different scopal interpretations. The visual stimuli were thus used in order to avoid the influence of the spoken language in this task. Note that although we tried to elicit as many quantifiers expressing a certain meaning as possible, the list of quantifiers discussed in this paper can hardly be exhaustive.

The appropriateness of using stimuli in a written language for sign language elicitation has been questioned previously (Van Herreweghe and Vermeerbergen 2012), even specifically for studying quantifiers (Zajtseva 1987). However, in order to collect the necessary data on quantifiers the use of this technique seems unavoidable in the absence of extensive corpora or specifically developed visual stimuli. The signers we worked with were aware of the possible influence of the spoken Russian and of the difference between RSL and Signed Russian, and were



consciously using RSL. In addition, it seems that working with pairs of signers helps diminish the influence of the spoken language, as the signers can check each other's intuitions and also adapt their language to the conversational partner. Undoubtedly further studies should test our findings using other techniques.

## 5 Basic Types of Quantifiers

### 5.1 Generalized Existential (Intersective) Quantifiers

As in other sign languages (see Sect. 3), bare noun phrases in RSL can be interpreted existentially, but RSL also has a number of generalized existential quantifiers, both D-quantifiers and A-quantifiers. D-quantifiers include numerals: ONE, TWO, THREE,<sup>8</sup> etc. (15), and quantifiers SOME (Fig. 6), A.BIT (Fig. 7), MANY1 (Fig. 8), MANY2 (Fig. 9), FEW (Fig. 10) (16), SOMEONE (Fig. 11), NOBODY (Fig. 12) (17), NOTHING.<sup>9</sup> There are also interrogative quantifiers HOW.MANY1 (18), HOW.MANY2 (Figs. 13 and 14), and WHICH.<sup>10</sup> There is no negative determiner similar to English *no* which would combine with NP's to build decreasing GQs.<sup>11</sup> An A-quantifier like NEVER1 can bind a bare NP to express the corresponding meaning (19).

- (15) IX-1 BUY ORANGE ONE APPLE TWO BANANA THREE LEMON SIX  
'I bought one orange, two apples, three bananas, and six lemons.'

- er
- (16) CLASS WINDOW WAS FEW  
'There were few windows in the class.'

- neg
- (17) NOBODY COME NOT<sup>12</sup>  
'Nobody came.'

- er
- (18) SUMMER PERIOD READ BOOK WAS HOW.MANY1?  
'How many books have you read during the summer?'

- er
- (19) IX-1 BOOK READ NEVER  
'I have never read any books.'

<sup>8</sup>We do not provide illustrations of the RSL numeral signs, as they can be easily found elsewhere, for instance, on this web-site: <http://www.spreadthesign.com/>

<sup>9</sup>This sign can be found at [www.spreadthesign.com](http://www.spreadthesign.com) (search for "nothing" or ничего).

<sup>10</sup>This sign can be found at [www.spreadthesign.com](http://www.spreadthesign.com) (search for "which" or какой).

<sup>11</sup>However, decreasing GQs can be built through a combination of a universal quantifier ALL and negation; NOBODY is also a decreasing quantifier. We do not know if there are any negative polarity items in RSL.

<sup>12</sup>As this example shows, RSL is a Negative Concord language, so negative pronouns combine with sentential negation, like in spoken Russian. However, example (19) below shows that Negative

RSL has optional plural marking on nouns, and this marking is also optional in the presence of quantifiers. More details follow in Sect. 7.

A-quantifiers include ONE.TIME, TWO.TIME (20), and others derived from cardinals (see Sect. 9.1 for further details), SOMETIMES<sup>13</sup> (21), HAPPENS ‘sometime’ (22), OFTEN (several signs, the meaning differences are not clear at the moment, Figs. 16 and 17), SELDOM (Fig. 18) (23), NEVER (several signs, the meaning differences are not clear at the moment, see Figs. 19, 20, and 21) (19).

- (20) IX-1 LIFE PERIOD WAS SEE TWO.TIME  
‘I have been to the see twice in my life.’
- (21) SOMETIMES SLEEP CANNOT NIGHT PERIOD  
‘Sometimes I cannot sleep the whole night long.’
- (22) IX-1 SLEEP CANNOT HAPPENS  
‘Sometimes I cannot sleep.’
- (23) IX-1 SEE-2 SELDOM  
‘I seldom see you.’

Some of the quantifiers are morphologically related to interrogative pronouns. In particular, signs for SOMEONE and WHO (Fig. 22) are only different in movement, and the sign NOBODY combines the sign WHO with a negative affix. Here we can observe a parallel with Russian, where all these pronouns are also morphologically related (*kto* ‘who’, *kto-to* ‘someone’, *nikto* ‘nobody’). Similarly, SOMETHING and WHAT (Figs. 23 and 24) are related to each other, but NOTHING<sup>14</sup> is an unrelated sign (compare to Russian *što* ‘what’, *što-to* ‘something’, *ništo* ‘nothing’). Signs HOW.MANY1 and SOME are formally very close as well (compare to Russian *skoljko* ‘how many’ and *neskoljko* ‘several, some’). In addition, there are some morphologically related quantifiers which do not have parallels in Russian, namely sign FEW and A.BIT only differ in (the size of) movement (see Figs. 10 and 7).

Note also that A-quantifiers ONE.TIME, TWO.TIME, etc. are morphologically more complex than D-quantifiers ONE, TWO, etc. However, such quantifiers as SOMETIMES, SELDOM, and different versions of NEVER and OFTEN are not morphologically complex and not derivable from D-quantifiers. We do not know of any D-quantifiers that could be analysed as derived from A-quantifiers.

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Concord is not obligatory. Based on our dataset, it appears that Negative Concord does not happen, if the whole sentence except for the negative pronoun or adverb is topicalized, as is the case in (19). In general, sentential negation in RSL can be expressed by two main syntactic strategies: the sentential negation is either adjacent to the focused constituent, or the whole clause is topicalized and followed by negation (see (116)–(118)).

<sup>13</sup>This sign can be found at [www.spreadthesign.com](http://www.spreadthesign.com) (search for “sometimes” or иногда).

<sup>14</sup>This sign can be found at [www.spreadthesign.com](http://www.spreadthesign.com) (search for ничеро).

## 5.2 Generalized Universal (Co-intersective) Quantifiers

RSL also has both A- and D- generalized universal quantifiers. D-quantifiers include ALL (24) (Fig. 25) and EVERY (for a detailed discussion of EVERY see Sect. 6.3).

- (24) er  
CLASS BOY ALL WAS SMART  
'All boys in the class were smart.'

As for A-quantifiers, there are several signs that could be translated as *always* (25), the meaning differences being unclear at the moment (see Figs. 26, 27, 28, and 29).

- (25) er  
IX-1 WORK WALK ALWAYS1 ON.FOOT  
'I always go to work on foot.'

Another set of universal quantifiers in RSL can be translated as *whole* or *completely*, as they quantify over parts of the nominal argument (see Figs. 30, 31, 32, 33, 34, and 35). Interestingly, different signs have different compatibility. Thus, WHOLE1 (26) and WHOLE2, morphologically related to the sign ALL, can quantify over different types of objects (books, food, drinks, a wall). WHOLE3 iconically depicts reducing of volume and is compatible with food or drinks (27), but also with books if they are conceptualized as a pile. WHOLE4 also iconically depicts reducing of volume, but this time in a narrow container, and is only compatible with drinks (28). WHOLE5 is very similar formally and is compatible with drinks, money, or a battery charge. WHOLE6 is related to the sign NAKED and is compatible with food only (probably connected to the concept of eating until leaving the plate empty). Further research is needed to uncover the exact compatibility of these signs and the relation between compatibility and iconicity.

- (26) WALL WHITE WHOLE1  
'The wall is all white.'
- (27) IX-1 PASTA EAT WHOLE3  
'I ate all the pasta.'
- (28) er  
WINE IX-1 DRINK WHOLE4  
'I drank all the wine.'

RSL also has a free-choice quantifier ANY, illustrated by example (29). This sign is not used as a negative-polarity item.

- (29) IX-1 ANY BOOK NEED IX-1  
'I need any book.'

### 5.3 Proportional Quantifiers

Several proportional D- and A-quantifiers are present in RSL as well. D-quantifiers include HALF1 (30) and HALF2 (Figs. 36 and 37), and MORE (Fig. 38) (31) (which can mean both *more* and *most*). Complex expressions, like percentages, are also possible (see example (34)). Several A-quantifiers discussed in the previous section that could be translated as *usually*, *often* and *always* can be classified as proportional as well (32).

- (30)  $\frac{\text{er}}{\text{GIRL ROW HALF LATE LESSON}}$   
 ‘Half of the girls were late for class.’
- (31)  $\frac{\text{er}}{\text{BOY ROW MORE COME TIME EXACT}}$   
 ‘Most boys came in time.’
- (32) IX-1 ALWAYS1 SIX MORNING  
 ‘I always wake up at six in the morning.’

In addition, morphologically complex proportional D-quantifiers can be formed by a productive mechanism of signing fractions, like  $\frac{1}{2}$  or  $\frac{3}{4}$ , which are a combination of the corresponding numerals, with the numerator signed above and the denominator below (see Fig. 39).

### 5.4 Complex Quantifiers

There are several possibilities to form complex quantifiers based on the simple quantifiers described above. For instance, cardinal numerals and A-quantifiers based on these numerals, as well as proportional quantifiers, can be modified by such modifiers as EXACTLY (33), APPROXIMATELY (34), or MAXIMUM ‘at most’. On the other hand, modifiers like MORE or LESS cannot combine with numerals directly (\*MORE FIVE.TIMES), instead they attach to the whole sentence containing a quantifier and negation (35). There is no modifier meaning *almost*.

- (33) NEED SIT.DOWN EXACTLY TEN TIMES  
 ‘You need to sit down exactly ten times.’
- (34) NEW YEAR CHAMPAGNE PEOPLE DRINK APPROXIMATELY 60 PERCENT  
 ‘Approximately 60 % of people drink champagne at New Year.’
- (35) YESTERDAY WAS CALL-PL FIVE.TIMES  $\frac{\text{neg}}{\text{NO}}$  MORE  
 ‘Yesterday I called you more than five times [*lit.* not five times, more].’

Value judgement cardinals like MANY can be modified in order to form intensional quantifiers like *too many*, but this again takes the form of a bi-clausal

construction, the modifier attaching to the whole preceding sentence. The modifiers that can be used in such constructions can be glossed based on literal translations as WHERE, ABSURD, and WHY. They are all accompanied with raised eyebrows, which might mean that the second clause in this construction is in fact a question (36), although such an analysis is difficult to apply to the sign ABSURD.

- (36)  $\text{YOU TEA MILK POUR MANY1. IX WHERE/ABSURD/WHY}$   
 ‘You poured too much milk in the tea. [*lit.* You poured a lot of milk in the tea. Why/What for?]

Exceptional modifiers in RSL are also bi-clausal. There is no sign that would attach to quantifiers like ALL or NOBODY to form an exceptional phrase; instead, two clauses are contrasted to each other (37), (38).

- (37)  $\text{LAPTOP IX-1 BRING ONLY ONE. NOBODY BRING NOT}$   
 ‘Nobody except me brought a laptop. [*lit.* I am the only one to bring my laptop. Nobody brought (their laptops).]’
- (38)  $\text{ALL COME NEW COAT. ONLY V-A-N-J-A NOT}$   
 ‘All except Vanja came wearing a new coat. [*lit.* All came wearing a new coat. Only Vanja didn’t.]’

As for Boolean compounds of quantifiers, RSL lacks overt conjunctions, so there are no signs for *and* or *or* (see Davidson 2013 for similar findings in ASL). However, conjunction of quantifiers can be expressed by juxtaposition (39). Note also that juxtaposition of cardinal numerals or A-quantifiers based on cardinal numerals is a productive way to express the meaning of approximation (40).

- (39) WALL PICTURE HANG TWO THREE MAXIMUM FOUR  
 ‘There are two or three pictures, four at most on the wall.’
- (40) TWO.TIME THREE.TIME  
 ‘A couple of times.’

Negation can be applied to some quantifiers as well. For instance, a negative sign can be combined with a universal quantifier ALL (42), or it can attach to the whole sentence, again scoping over the quantifier (41). The same is true for the A-quantifier ALWAYS. Partitives are discussed separately in Sect. 7.

- (41)  $\text{POSS-1 FRIENDS DEAF ALL NOT}$   
 ‘Not all my friends are deaf.’
- (42)  $\text{POSS-1 FRIENDS ALL DEAF NOT}$   
 ‘Not all my friends are deaf.’

## 6 Other Types of Quantifiers

### 6.1 Comparative Quantifiers

Some languages have comparative quantifiers which, such as English *more students than teachers*, behave like one constituent. In RSL, the corresponding meaning can be expressed through a variety of constructions. First, two clauses can be contrasted, as in (43); there is no NP that could be characterized as a comparative quantifier in such a case (see Aristodemo and Geraci 2015 for similar findings in Italian Sign Language, and also for the discussion of the role of iconicity in comparatives). In order to express the meaning similar to *as many men as women*, RSL uses the sign EQUAL.DUAL, which is also used in non-quantificational contexts, however, in (44) it is used to specify that the plurality of men is equal to the plurality of women. In the next section we will show that this sign is also used to express the meaning associated with type (2) quantifiers.

- \_\_\_\_\_er
- (43) COME BOY MORE GIRL LESS  
'More boys than girls came.'
- (44) CINEMA WOMAN MAN PLURALITY EQUAL.DUAL  
'There were as many men as women in the cinema.'

Another strategy to express comparison involves the sign Č-E-M 'than' (see Fig. 40). This sign is a fingerspelled version of the Russian word *čem* 'than' also used in comparative constructions in Russian. However, despite the obvious connection to the Russian word, this sign belongs to RSL proper. Our consultants unanimously agreed that it is not a part of Signed Russian, but a borrowed lexical item used in RSL. Their intuition is confirmed by the fact that this sign is both semantically and syntactically different from its Russian counterpart.

As for the syntax, Č-E-M in RSL can be used in bi-clausal comparatives (45), similar to (43). Note that a direct translation of (45) into Russian would be ungrammatical. Note also that this sign is agreeing: in this example it agrees with the location associated with V-A-N-J-A. As for semantics, Č-E-M in RSL has an obligatory connotation of quality judgment, which it lacks in Russian. Č-E-M can be only used if the comparison is of a disadvantage to one of the participants, but not when the comparison is purely quantitative; therefore, (45) and (46) are grammatical (more salary and being smart is considered advantageous), while (47) is not (because only the quantities are compared).

- \_\_\_\_\_er
- (45) SALARY IX-I GET MANY1 Č-E-M-a V-A-N-J-A FEW  
'I get more salary than Vanja.'

- (46) CLASS SMART BOY MORE Č-E-M GIRL IX  
 ‘There are more smart boys than girls in the class.’
- (47) \*CLASS BOY MORE Č-E-M GIRL IX  
 ‘Intended reading: There are more boys than girls in the class.’

## 6.2 Type (2) Quantifiers

Type (2) quantifiers are quantifiers that express a property of binary relations not reducible to a combination of two type (1) functions (Keenan 2006). RSL has adjectives DIFFERENT<sup>15</sup> (two signs with no apparent meaning difference) and SIMILAR that can be characterized as such. (48) illustrates the use of DIFFERENT. There are three signs that can be translated as ‘equal’: one of which (EQUAL.DUAL, Fig. 41) is only applied to pairs of people/situations (49), another one ALL.THE.SAME (Fig. 42) is applied to plural entities only (50), the sign SIMILAR<sup>16</sup> is neutral and can be applied to any number of entities (>1) compared. Signs EQUAL.DUAL and ALL.THE.SAME agree with the locations of the entities they refer to.<sup>17</sup>

- (48) PEOPLE DIFFERENT LIKE THINGS DIFFERENT  
 ‘Different people like different things.’
- er
- (49) STUDENT TWO ANSWER QUESTION EQUAL.DUAL  
 ‘Two students answered the same question.’
- er
- (50) STUDENT ALL ANSWER QUESTION ONE ALL.THE.SAME  
 ‘All students answered the same question.’

## 6.3 Distributive Quantification

Distributive quantification can be expressed through a variety of means in RSL. The first way involves a distributive universal quantifier EVERY (Fig. 43). There is some disagreement among my consultants with respect to the status of this sign. One of the consultants argued that this sign is only used in Signed Russian, and only one rigid expression EVERY DAY really belongs to RSL, while the other three

<sup>15</sup>This sign can be found at [www.spreadthesign.com](http://www.spreadthesign.com) (search for “diversity” or разнообразие).

<sup>16</sup>This sign can be found at [www.spreadthesign.com](http://www.spreadthesign.com) (search for “similar” or похожий).

<sup>17</sup>In my examples the entities referred to by these signs do not necessarily have to be localized in advance; in such cases it is not clear whether the signs EQUAL.DUAL and ALL.THE.SAME have a neutral form, or whether they have the additional function of localizing the referents that have not been previously localized.



(including the deaf signer from a deaf family) disagreed saying that it is used in RSL as well. Note that Zajtseva (1987) mentioned a distributive universal quantifier in RSL which she translated with the Russian word *každyj* ‘every’. Corpus data may be used in future to clarify this issue. In the following we take the position that this sign is indeed a part of RSL.

The sign EVERY expresses universal distributive quantification, as in (51). This quantifier is also used in the one-to-one dependency contexts (Boolos 1981) (52). Note that although semantically this quantifier is distributive, it combines with both plural and singular nouns (53).

- er
- (51) EVERY BOY IX-PL DISTR-GIVE.PRESENT-1  
‘Every boy gave me a present.’
- er
- (52) EVERY SEED IX-1 WAS PLANT-DISTR GROW FLOWER  
‘For every seed I planted a flower has grown.’
- (53) EVERY QUESTION. EVERY QUESTION.PL  
‘every question’

In addition, distributive quantification can be expressed by the distributive agreement pattern on the verb, similar to what have been described for other sign languages (Petronio 1995, see also Quer 2012 for Catalan Sign Language, and Kuhn and Aristodemo 2015 for French Sign Language). The objects that are distributed over are located in space, and the verbal sign moves towards these locations in turns. Interestingly, distributive agreement can apply both to objects and subjects: see (54) and Fig. 2, and (55) and Fig. 3. In addition, similar to other sign languages, RSL also has the form of non-distributive plural agreement, when the hand follows an arc shape or is repeated to denote a plurality of objects.



**Fig. 2** Stills for example (54). Movement from the signer towards several (four) locations



**Fig. 3** Stills for example (55). Movement from several (four) locations towards the signer



**Fig. 4** Stills for example (57). Sign FLOWER-DISTR

- (54) 1-GIVE.PRESENT-DISTR  
 ‘I gave everyone a present.’  
 (55) DISTR-GIVE.PRESENT-1  
 ‘Everyone gave me a present.’

Pointing signs can also be inflected in a similar way, so the pointing sign IX-PL with the arc-shaped movement can be translated as ‘they’, and the pointing sign IX-DISTR consisting of multiple movements can be translated as ‘each of them’.

Finally, distributive quantification can be expressed by spatially associating numerals or nouns with several locations in space. Example (56) shows that the sign ONE-DISTR is repeated in several locations thereby producing the distributive interpretation ‘one each’. However, it is not correct to say that RSL has a special morphological class of distributive numerals similar to Russian, as nouns can be forced distributive interpretation through the same spatial strategy: see (57) and Fig. 4. Interestingly, the sign EVERY can also be realized in several spatial locations, which we gloss as EVERY-DISTR (Fig. 44), but there seems to be no

meaning difference associated with this inflection. Recall that Zajtseva (1987) also described this strategy of locating nouns in space to express distributive universal quantification.

- (56) er  
MAN BUY BEER ONE-DISTR  
'Every man bought a beer.'

- (57) FLOWER-DISTR  
'a flower each'

Note that this way of expressing distributivity through locations has a parallel in spoken languages, where distributivity is often expressed by reduplication of nouns or numerals (see for instance Stolz et al. 2011). However, in RSL the nouns and pronouns are not just reduplicated, but also localized; a simple reduplication without the use of space could be used to express plurality but not distributivity.

Filimonova (2012) showed that distributivity in RSL can be expressed in a number of different ways, in addition to the spatial reduplication described above, depending on the semantic type of the distributive situation. For instance, two hands can be involved in expressing distributive events, and they can move either in synchrony or in alternating fashion; in addition, there is a special classifier that can be used to express movement of multiple objects to or from a location. Further research is needed to determine the exact semantics of different markers.

## 6.4 Quantification of Mass and Count Nouns

Although many quantifiers in RSL combine with both mass and count nouns, there are some exceptions. For example, the quantifier FEW only combines with count nouns (58), while the quantifier A.BIT only combines with mass nouns (59). Numerals can be combined with mass nouns with the interpretations of *n* typical units of the substance (60). Note also that even with this meaning the preferred position of the numeral is postnominal, which will be relevant in the discussion of syntactic properties of quantifiers in Sect. 7.

- (58) BOY FEW; \*MILK FEW  
(59) MILK A.BIT; \*BOY A.BIT  
(60) WATER TWO  
'Two glasses/bottles of water.'

RSL also has a sign PIECE that can be used as a nominal classifier with count nouns; it can also be used with mass nouns with the similar meaning effects as regular numerals (61). It usually incorporates the numeral (up to five, see Sect. 9.1). Mass nouns like MILK or FLOUR can be combined with other nominal classifiers, such as GLASS (62). One can demonstrate that GLASS is indeed used as a nominal

classifier/measure phrase, because in this role it cannot be combined with PIECE (63), while when used as a noun it can (64).

- (61) LEMON TWO.PIECE, WATER TWO.PIECE  
 ‘two lemons, two glasses of water’  
 (62) FLOUR GLASS TWO  
 ‘two glasses of flour’  
 (63) \*FLOUR GLASS TWO.PIECE  
 (64) GLASS TWO.PIECE  
 ‘two glasses’

### 6.5 *Existential Construction*

RSL has an elaborate existential construction which uses the sign EXIST (Fig. 45). This sign is an agreeing verb, agreeing with the locations, as for instance with the location HOUSE IX-a in (65). This construction is only used for alienable possession (66). Inalienable possession is expressed without any overt copula (67). There is also a special negation EXIST.NEG used in existential contexts (68).

- \_\_\_\_\_er  
 (65) HOUSE IX-a EXIST-a TEN PEOPLE  
 ‘There are ten people in the house.’  
 (66) \*HOUSE IX-a EXIST-a TEN FLOOR  
 \_\_\_\_\_er  
 (67) HOUSE IX TEN FLOOR  
 ‘The house has ten floors.’  
 \_\_\_\_\_neg  
 (68) ROOM BOY EXIST.NEG  
 ‘There are no boys in the room.’

The existential construction is not compatible with strong quantifiers, similar to what happens in many (spoken) languages. In particular, it can be used with numerals (65), and such quantifiers as MANY1 (69) and FEW, but not with ALL (70).

- \_\_\_\_\_er  
 (69) ROOM IX-a EXIST-a MANY1 BOY  
 ‘There are many boys in the room.’  
 \_\_\_\_\_er  
 (70) \*ROOM IX-a EXIST-a ALL BOY



this strategy might involve a bi-clausal structure, the sign ONLY.FINISHED being a separate clause translated as ‘that’s all’. One argument against such a theory is that ONLY.FINISHED need not be preceded by any prosodic boundary.

- (78) YESTERDAY COME WAS V-A-N-J-A ONE ONLY.FINISHED  
 ‘Yesterday only Vanja came.’

## 7 Syntactic Properties of Quantifiers

In this section we primarily discuss the syntactic properties of D-quantifiers, although we start with a couple of word on the syntax of A-quantifiers.

A-quantifiers can appear in different positions within the sentence, including the position before the VP (79). In addition, sometimes the A-quantifiers are doubled, occurring in two positions (80).<sup>18</sup> However, some A-quantifiers which, according to my consultants are perceived as being RSL-only (they are not used in Signed Russian and do not have exact translation equivalents in Russian; they are also often accompanied by mouth gestures, but not by mouthing of Russian words), are predominantly clause-final (81). This might mean that the clause-internal position of A-quantifiers is a contact-phenomenon due to the Russian influence.

- (79) BOY IX OFTEN1 UNDERGROUND GO  
 ‘The boy often takes the underground.’  
 \_\_\_\_\_  
 er

- (80) NEVER1 WALK ALONE NEVER1  
 ‘She never walks alone.’

- \_\_\_\_\_  
 er  
 (81) POTATO EAT OFTEN2  
 ‘[I] often eat potatoes.’

If we turn to D-quantifiers, there are several questions that have to be addressed, namely number marking on nominal signs, word order within the QNP and position of the QNP within the sentence, partitive constructions, and distribution of QNPs. As we will show, some of these issues are interconnected and have to be discussed together.

RSL has optional morphological number marking on nouns (Burkova and Filimonova 2014). The form of number marking depends on the phonological and semantic properties of the noun, but most often it is realized as reduplication of the noun. The fact that plural marking is optional can be also seen in the case of quantifiers: quantifiers which semantically combine with plural entities usually

<sup>18</sup>In our examples this happened only to the negative quantifier NEVER, so the doubling might be related to negation, not to the quantifier per se. However, adverbs in general can be doubled in RSL as well (Kimmelman 2014), so this question needs further research.

combine with nouns not marked for plural number, although they can combine with plurally marked nouns as well (82). In addition, the plurality of the referent denoted by the noun can be expressed by using a plural form of the pointing sign IX-PL, or the sign PLURALITY (see Fig. 15). Again, these devices are optional, also in combination with quantifiers (83).

(82) MANY1 QUESTION. MANY1 QUESTION-PL  
'many questions'

(83) MANY1 MAN IX-PL. MAN PLURALITY MANY1  
'many men'

However, there are some exceptions to the optionality of plural marking on nouns. Some nouns are indexical in nature: they use pointing to the object as a part of the sign. For instance, the sign TOOTH is basically pointing at one of the signer's teeth, and the sign RIB traces one of the signer's ribs with the thumb and index finger. The plural form of TOOTH is thus pointing at several teeth with an arc-shaped movement, and the plural form of the RIB is tracing several of the ribs. When these signs are combined with quantifiers such as ALL or SOME, the plural marking is obligatory (84), (85). This can be seen as a manifestation of the effects of iconicity on the grammar of sign languages.

(84) \*SOME TOOTH. SOME TOOTH-PL  
'all teeth'

(85) \*SOME RIB. SOME RIB-PL  
'all ribs'

Although the singular form of nouns is unmarked and can be used in plural contexts, the plural form can only denote pluralities, so for instance the plural nouns do not combine with the numeral ONE (86).

(86) \*ONE QUESTION-PL

Turning to word order within the QNP, quantifiers can be in pre-nominal or post-nominal position (both orders are demonstrated throughout the paper, for instance, they are both present in (83)). In addition, doubling of quantifiers is also possible (87).

(87) MANY1 FRIEND MY MANY1 LEAVE-PL BORDER  
'Many of my friends have left the country.'

We would argue, however, that for most quantifiers the pre-nominal position is basic, and the post-nominal position is more marked. There are several types of examples that show that the post-nominal position of quantifiers has special semantic effects. Firstly, partitives are obligatorily expressed by the post-nominal placement of quantifiers. That is, if there is a definite plural NP which specifies the domain to be quantified over, the quantifier is placed post-nominally (88). From this it also naturally follows that proportional quantifiers, such as HALF, should be



placed post-nominally.<sup>19</sup> This is indeed the case: although HALF can be used pre-nominally, the post-nominal position is preferred (89). Similarly, in English *half* has to combine with definite NPs (*\*half girls*).

- (88) MAN PLURALITY MANY1 IX-DISTR IX-1 KNOW  
'I know many of these men.'

- \_\_\_\_\_er  
(89) GIRL IX PLURALITY HALF BEAUTIFUL  
'Half of the girls are beautiful.'

In addition, some asymmetry between post- and pre-nominal quantifiers emerges when we look at the number on the noun. As we argued above, the number is not marked obligatorily on nouns in RSL. However, if the noun is marked with plural, some restrictions apply. In particular, the numeral ONE cannot combine with the plural noun (86). Nevertheless, in the postnominal position this numeral can be used, yielding the partitive interpretation (90). The same applies for nouns which have to be plural in combination with quantifiers like SOME (84), (85): in post-nominal position this restriction can be violated (91). Finally, recall that mass nouns when combined with numerals prefer the postnominal placement of the numeral (92).

- \_\_\_\_\_er  
(90) CHILDREN ONE SICK  
'One of the children is sick.'
- \_\_\_\_\_er  
(91) RIB SOME  
'some ribs'
- (92) WATER TWO  
'Two glasses/bottles of water.'

One way to analyse the pattern in (90)-(92) is to say that the noun in the prenominal position in this examples is not a part of the QNP, but is a base-generated topic which licences the ellipsis of the noun with the QNP ([CHILDREN]<sub>TOP</sub> [ONE  $\in$  HLED]<sub>QNP</sub>), so there is no violation of compatibility restrictions.

It is also worth noticing that complex quantifiers are always postnominal (see Sect. 5.3 for examples). In addition, the noun PIECE with incorporated numerals (TWO.PIECE, THREE.PIECE) can only be used in postposition, too. It might be the case that the pre-nominal position is restricted to quantifiers which are heads, while morphosyntactically complex quantifiers are strictly post-nominal.

Quantifiers are not always adjacent to the NP they quantify over in RSL. It seems that most quantifiers can move rather freely within the clause, with the preference falling on the clause-final position. Examples (93), (94), (95) demonstrate it for the quantifier ALL, but the other quantifiers have the same syntactic behaviour, as examples (96), (97), and (98) demonstrate for HALF.

<sup>19</sup>Note also that the quantifier does not have to be adjacent to the NP, see (98) below.

- (93) ALL BOY LATE  
 (94) BOY ALL LATE  
 (95) BOY LATE ALL  
       ‘All boys were late.’  
 (96) GIRL HALF SICK  
 (97) HALF GIRL IX-PL SICK  
 (98) GIRL IX-PL SICK HALF  
       ‘Half of the girls are sick.’

It is also noticeable that when a quantifier is not adjacent to the NP, the NP (99), or the whole clause apart from the quantifier (100), is usually marked with eyebrow raise, and can therefore be analysed as topicalized.<sup>20</sup> Even when the quantifier is adjacent to the NP, but postnominal, the NP is often marked with eyebrow raise (101). However, examples (94) and (95) above demonstrate that this marking is not obligatory. Our initial hypothesis had been that quantifiers are base-generated in the pre-nominal position, and they can only move if the noun is topicalized first; however, this analysis would predict obligatory non-manual marking on nouns when the quantifier is postnominal or floating, contrary to what we find. Examples like (99)–(101) also remind of the ASL and Catalan Sign Language data (Partee 1995; Quer 2012), because in these examples RSL overtly marks the nuclear scope of the quantifier by topicalization. Further research is necessary to find out the exact conditions on non-manual marking and the interaction between non-manual marking and word order in RSL.

- (99)        er  
             BOY LATE ALL  
 (100)      er  
             BOY LATE ALL  
 (101)      er  
             BOY ALL LATE  
             ‘All boys were late.’

QNP formed by D-quantifiers have a wide distribution in RSL. In particular, they can function as subjects and objects (as many examples above demonstrate), and as possessors (102), (103). However, if the QNP is used as a possessor, the quantifier often occurs outside of the QNP (104).

<sup>20</sup>The term “topicalization” here is used to describe a syntactic process of fronting, not necessarily referring to the information structural notion of topic (see Kimmelman 2014). It is likely that (99)–(101) are different with respect to information structure as well; however, this needs further research.

- (102) er  
APARTMENT IX POSS POSS-1 FRIEND SOME  
'This is the flat of several of my friends.'
- (103) er  
BAG IX POSS BOY PLURALITY HALF  
'These are bags of the half of the boys.'
- (104) er  
BOOK POSS SOVIET WRITER I READ ALL  
'I read some books of all soviet writers.'

D-quantifiers can be used without the noun, if the reference of the noun is deducible from the context (105), (106), (107). At the moment it is not clear to us how to test whether all quantifiers can be used as predicates, as there are no reliable tests to distinguish predicates from arguments.

- (105) er  
COME ALL  
'All [of them] came.'
- (106) er  
COME SOME  
'Several [of them] came.'
- (107) er  
HALF COME  
'A half [of them] came.'

## 8 Scope Ambiguities

When two (or more) quantifiers in RSL occur within the same clause, scope ambiguities sometimes arise. The possibility of scope ambiguities depend on the quantifiers involved. For instance, when both the subject and the object contain numerals, the cumulative interpretation is the only acceptable one (108). In contrast, using the distributive quantifier EVERY and/or the distributive locations for the object forces the wide-scope interpretation of the subject (109).

- (108) er er  
GIRL THREE PAINT FINISHED FLOWER TEN  
'Three girls painted ten flowers. (only: there is a group of three girls who painted the group of ten flowers)'
- (109) er  
THREE GIRL EVERY IX-PL PAINT FINISHED FLOWER TEN-DISTR  
'Three girls painted ten flowers each.'

On the other hand, when the subject contains the quantifiers *EVERY* or *ALL*, and the object is a singular indefinite NP, two different scopes are possible, as in (110), (111). Notice that when *ALL* is used, there is a preference for this quantifier to have the narrow scope.

- (110) er  
 VACATION STUDENT EVERY IX-PL READ BOOK PUSHKIN POSS  
 ‘During the vacation every student read a book by Pushkin. (a. everyone read the same book: one > every. b. everyone read one book, maybe different ones: every > one)’
- (111) er  
 VACATION STUDENT ALL READ BOOK PUSHKIN POSS  
 ‘During the vacation all students read a book by Pushkin. (a. everyone read the same book: one > all, preferred. b. everyone read one book, maybe different ones: all > one)’.

Scope ambiguities also arise when a universally quantified subject is combined with a *wh*-word in the object position, as in (112), (113). Again, when *ALL* is used, there is a preference for this quantifier to have the narrow scope.

- (112) er  
 STUDENT EVERY IX-PL ANSWER QUESTION WHICH  
 ‘Which question did every student answer? (a. everyone answered the same question: one > every. b. everyone answered one question, maybe different ones: every > one)’
- (113) er  
 STUDENT ALL ANSWER QUESTION WHICH  
 ‘Which question did every student answer? (a. everyone answered the same question: one > every, preferred. b. everyone answered one question, maybe different ones: every > one)’

However, if the subject is a bare NP, and the object contains a universal quantifier, then the universal quantifier has to take the narrow scope, as (114) demonstrate.

- (114) WOMAN READ BOOK ALL  
 ‘A woman read all the books (one > all)’

D-quantifiers can also interact with A-quantifiers giving rise to ambiguities. For instance, (115) has both the interpretation that there were three occasions on which two boys came together, or that each boy came on three occasions (probably separately).

- (115) BOY TWO COME THREE.TIMES  
 ‘Two boys came three times (three times > two boys, two boys > three times)’

What we do not observe are scopal ambiguities between quantifiers and negation. In particular, if the negative sign NOT attaches to the whole sentence (116), or it follows the quantifier and the negative non-manual marking spreads across the quantifier sign (117), the negation has to scope over the quantifier. On the other hand, if the verb is followed by the negative sign NOT, and the non-manual marking spreads across the verb, then the negation is interpreted as having scope below the quantifier (118).

- (116)  $\frac{\text{er}}{\text{POSS-1 FRIEND ALL DEAF NOT}} \frac{\text{neg}}{\text{neg}}$
- (117)  $\text{POSS-1 FRIEND DEAF} \frac{\text{ALL NOT}}{\text{neg}}$   
 ‘Not all my friends are deaf.’
- (118)  $\text{POSS-1 FRIEND ALL DEAF} \frac{\text{NOT}}{\text{neg}}$   
 ‘All my friends are not deaf.’

## 9 Modality-Specific Issues

The previous sections have shown that RSL is not very unusual typologically with respect to the types of quantifiers and their properties. However, we also mentioned some aspects that are connected to the visual modality of the language. In this section we discuss these aspects, namely numeral incorporation, various uses of space, and iconicity, in more detail.

### 9.1 Numeral Incorporation

Sign languages use fingers as the basis for building numerals – this is a natural effect of the fact that hands are the primary articulators. In addition, many sign languages use the handshapes representing numerals in combination with various movements and locations in order to express other concept related to quantity (see for instance Zeshan et al. 2013). This is usually called “numeral incorporation”, as it is often possible to find a lexical sign which in isolation means some concept (for instance, *hour* or *week*), but which can incorporate the numerical handshape in order to express quantity.

RSL uses numeral incorporation very extensively.<sup>21</sup> Numeral incorporation exists in the following domains: time (minutes, seconds, hours (both duration and the time

<sup>21</sup>Note that in some cases the term *incorporation* may be misleading. For instance, the lexical sign MINUTE has a movement different from the movement in the signs ONE.MINUTE, TWO.MINUTE

of the day), days (+ over  $n$  days), weeks, months, years (+  $n$  years back)), nominal classifiers (pieces, persons, times), money (roubles), and also kilograms and places (in sports). Moreover, expressions like “with the  $n$  of them” can be analysed as numeral incorporation as well. Finally, numerals can be incorporated into some verbs of movement. In most cases, numerals up to five are incorporated, while in some cases numeral up to ten or even fifteen are incorporated.

It is clear that numeral incorporation is used for quantification in RSL. It is not clear whether using a noun or a verb with numeral incorporation is semantically different from using a non-incorporated numeral. This might be an interesting question for future research.

## 9.2 *Use of Space*

As we discussed in Sect. 2, one of the main modality-specific properties of sign languages is the use of space. We have seen that space can also be used for quantification in RSL. Agreeing verbs can inflect, and nouns or numerals can be localized in space to express distributivity as well. Interestingly, there are some phonological and lexical restrictions on the signs that can be localized. In particular, nouns that can be localized are one-handed signs (119), or two-handed symmetrical signs (120); two-handed asymmetrical signs are not localized (121): in (122) a classifier (which is a one-handed sign) is localized instead. However, for numerals the restriction is looser: two-handed asymmetrical signs can be localized as well: in (123) the two-handed asymmetrical sign SIXTY is localized. However, complex numerals, like SIXTY ONE consisting of more than one lexical sign are not localized.

- (119) FLOWER-DISTR  
‘a flower each’ (one-handed)
- (120) BOOK-DISTR  
‘a book each’ (two-handed symmetrical)
- (121) \*BREAD-DISTR
- (122) BREAD CL-DISTR  
‘a book each’ (two-handed asymmetrical)
- (123) SIXTY-DISTR  
‘sixty each’ (two-handed asymmetrical)

Another interesting use of space not discussed above is that numerals can be localized on a virtual scale in front of the signer in order to express the meaning of intervals or approximation. In (124), (Fig. 5) the numeral TWO is signed lower

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etc. Probably this process can be better analysed in terms of ion-morphs (Fernald and Napoli 2000), and not incorporation.



Fig. 5 Stills for example (124), signs TWO INTERVAL FIVE

and to the left, and the numeral FIVE – higher and to the right in the signing space. The meaning is not unique to sign languages: it can be expressed by conjunction of quantifiers in spoken languages, too. However, in RSL, the meaning is expressed through a modality-specific strategy involving space.

- (124) er  
WALL PICTURE-A PICTURE-B TWO INTERVAL UP.TO FIVE  
'There are two to five pictures on the wall.'

We also investigated whether the frontal plane is related to definiteness/specificity, as reported for ASL and Catalan Sign Language (Davidson and Gagne 2014; Barberà 2014), and whether it is also related to the size of the domain of quantification, as reported for ASL (Davidson and Gagne 2014). It turns out that RSL does not use the frontal plane in any of these functions. Indefinites are expressed by a lexical pronoun SOMEONE, and there is no overt expression of the size of the domain of quantification.

### 9.3 Iconicity

In Sect. 2 we argued that sign languages are naturally more iconic than spoken languages. Schlenker et al. (2013) argued that iconicity in sign languages has fundamental effects for semantics, and should be incorporated in any formal models of meaning in sign languages. Throughout the paper we have shown that effects of iconicity can be seen in the grammar of RSL, including quantification.

As we discussed in Sect. 5.2, the quantifiers expressing the meaning 'whole' are compatible with different objects, depending on the visual nature of the quantifier. For instance, the quantifier which iconically depicts the lowering of the level of fluid in a narrow container is only compatible with drinks. At the moment we do not have enough data to evaluate how common such effects of iconicity are, but since many



of the quantificational meanings in RSL can be expressed by multiple signs, it is worth keeping in mind that iconicity may explain some of the differences in usage of these quantifiers.

Another domain where we have seen the effect of iconicity, or, more precisely, indexicality, is plural marking. Although in general singular nouns can be interpreted as plural, this is not the case for nouns which involve pointing, as they are interpreted more directly: a single sign refers to a single object, and a plural sign to a plurality of objects. This mechanism is actually a combination of two modality effects: the use of space, and the iconicity of signs.<sup>22</sup>

## 10 Conclusion

To sum up, RSL has a variety of means of quantification, involving lexical D- and A-quantifiers, and also verbal morphology used for quantification, as well as some modality-specific tools, such as localization.

If we go through the concluding spot checks mentioned in the questionnaire,

- RSL has several monomorphemic signs for *all*;
- RSL has a monomorphemic sign ONE;
- RSL has monomorphemic value judgement quantifiers, like MANY and FEW;
- RSL does not have a monomorphemic Det translating *no*;
- RSL makes a lexical distinction between distributive and universal quantification; this distinction is also expressed within the verb;
- Some A-quantifiers are derivable from D-quantifiers, but no D-quantifiers are derivable from A-quantifiers;
- RSL has lexical signs for *only*, namely ONLY and ONLY.FINISHED.

RSL conforms to all the generalizations formulated in Keenan and Paperno (2012) to which all languages in their sample conform, namely Gen 1–15. It also patterns with the majority of languages according to generalizations 16–21, 24, and 25. Since it does not have exception phrases, it patterns with a minority of languages according to generalization 22. We do not yet have reliable methods of testing generalization 23.

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<sup>22</sup>Another potential area where iconicity can play a role is comparatives, as shown for Italian Sign Language by Aristodemo and Geraci (2015). Unfortunately, we did not look at comparatives in any detail.

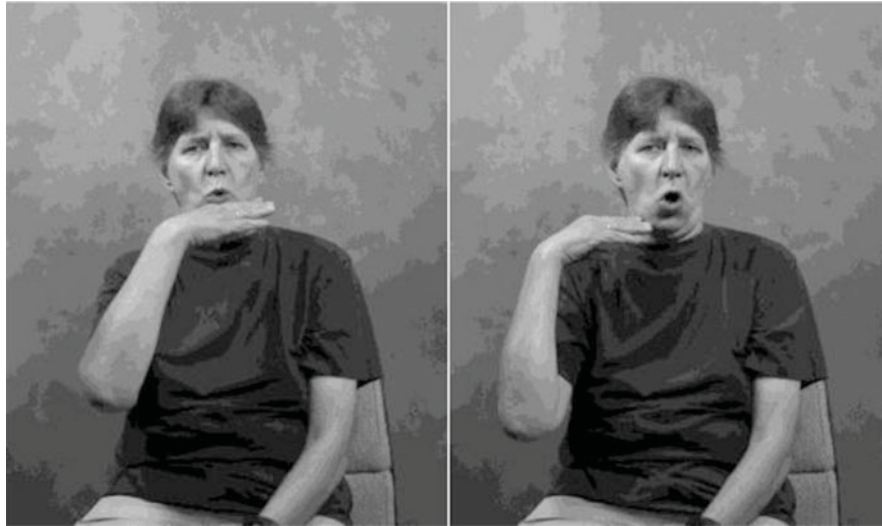
## Appendix: Pictures of Quantifiers



**Fig. 6** SOME. In addition to movement from left to right, the fingers wiggle



**Fig. 7** A.BIT. Contains small repeated circular movements. The facial expression is lexical



**Fig. 8** MANY1



**Fig. 9** MANY2. Obligarily accompanied by the mouth gesture [af]



**Fig. 10** FEW. Contains larger repeated circular movements



**Fig. 11** SOMEONE. Contains very short repeated movements forward and backward



**Fig. 12** NOBODY



**Fig. 13** HOW.MANY1. The movement is wiggling the fingers





**Fig. 14** HOW.MANY2



**Fig. 15** PLURALITY. The right hand moves in small repeated circles



**Fig. 16** OFTEN1

**Fig. 17** OFTEN2. The finger touches the nose several times







**Fig. 18** SELDOM. The movement is repeated



**Fig. 19** NEVER1



**Fig. 20** NEVER2. Repeated circular movements



**Fig. 21** NEVER3. This is a sequence of letters N-I, probably an instance of borrowing from Russian (*nikogda* 'never')



**Fig. 22** WHO. Repeated movements



**Fig. 23** SOMETHING. Very small repeated movements from side to side



**Fig. 24** WHAT. Repeated movements from side to side



**Fig. 25** ALL



**Fig. 26** ALWAYS1. Repeated circular movements



**Fig. 27** ALWAYS2. Repeated circular movements





**Fig. 28** ALWAYS3. Repeated movements



**Fig. 29** ALWAYS4. Repeated movements



**Fig. 30** WHOLE1



**Fig. 31** WHOLE2



**Fig. 32** WHOLE3



**Fig. 33** WHOLE4





**Fig. 34** WHOLE5



**Fig. 35** WHOLE6



**Fig. 36** HALF1



**Fig. 37** HALF2



**Fig. 38** MORE. Also means ‘most’. If the movement is reverted, the sign means ‘less’



**Fig. 39** 1/2



**Fig. 40** Č-E-M. Fingerspelling of the Russian word *čem* 'than'. The letter *e* is not clearly formed



**Fig. 41** EQUAL.DUAL



**Fig. 42** ALL.THE.SAME



**Fig. 43** EVERY. The movement is repeated





**Fig. 44** EVERY-DISTR. The sign EVERY is repeated in several locations



**Fig. 45** EXIST. Obligatorily accompanied with the mouth gesture [shhh]



**Fig. 46** ONLY



**Fig. 47** ONLY-FINISHED. The movement is repeated

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