Linearization of weak hand holds in Russian Sign Language*

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Russian Sign Language (RSL) makes use of constructions involving manual simultaneity, in particular, weak hand holds, where one hand is being held in the location and configuration of a sign, while the other simultaneously produces one sign or a sequence of several signs. In this paper, I argue that some weak hand holds can be analyzed using the formalism of External Remerge and Parenthetical Merge (de Vries 2008, 2009). I show that the syntactic structures that produce weak hand holds in RSL are also attested in spoken languages, but that the linearization rules are modality-specific due to the differences in articulators. I also demonstrate that RSL applies distinctive linearizations for External Remerge and Parenthetical Merge, thus overtly expressing the difference between these two operations.

1 Introduction

1.1 Weak hand holds

Fifty years of linguistic research have shown that sign languages are natural languages and that they share many fundamental properties with natural spoken languages on all levels of linguistic description (Sandler & Lillo-Martin 2006). Nevertheless, sign languages also display properties that are clearly different from spoken languages, and which can be attributed to the fact that the former belong to the visual-gestural and the latter to the aural-auditory modality. One of the obvious physiological differences is that sign languages use a different set of articulators, namely the hands, but also the body and the face. Hands, being the primary articulator for sign languages, are in many respects different from the vocal tract; the most important difference in the context of this paper is that the signer has two hands which are (partially) independent of each other and thus

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can potentially produce different signals at the same time.¹ An interesting question that arises in this respect is whether and how sign languages employ this potential, and, if linguistic differences between sign languages and spoken languages can be found in this domain, which level these differences belong to. In this paper, I argue, based on data from Russian Sign Language (RSL), that sign languages indeed show a greater use of simultaneous constructions (specifically, weak hand holds, which I define below), and I offer a formal analysis of the syntax of these constructions and the linearization procedure for them. In addition, I demonstrate that the difference between spoken languages and sign languages lies in linearization, not in syntax.

The issue of manual simultaneity in sign languages has received considerable attention (see Vermeerbergen, Leeson & Crasborn (2007) for an overview). Research on various sign languages has revealed that manual simultaneity is neither arbitrary nor unconstrained. For instance, in many sign languages, within single lexical signs, hands cannot be specified for different handshapes and different movement patterns: if the handshapes are different, only one of the hands moves (Battison 1978). Going beyond the lexical level, signers never sign two independent propositions simultaneously on the two hands. However, quite often the hands act partially independently, namely one hand is held in the handshape and location of a sign, while the other hand produces one or more other signs. This situation is called a *weak hand hold*² (Vermeerbergen, Leeson & Crasborn 2007).

¹ Another crucial instance of simultaneity in sign languages is simultaneous production of manual signs and non-manual markers (Pfau & Quer 2010). As long as some non-manuals are analysed as syntactic (see Sandler & Lillo-Martin (2006) for a discussion), the issues of syntactic representation and linearization rules for simultaneously expressed elements also applies to them. For instance, Kremers (2012) develops a theory of syntactically represented non-manuals and their linearization on manual and non-manual tiers, which has some similarities to the analysis offered here.

Yet another instance of simultaneous production concerns bimodal bilinguals: hearing children of deaf parents sometimes produce utterances in a signed and a spoken language simultaneously. There is some research on syntactic derivation and linearization of bimodal utterances (Donati & Branchini 2013; Quadros, Lillo-Martin & Chen Pichler 2016; Lillo-Martin, Quadros & Chen Pichler 2016), and researchers generally argue for a unified syntactic structure that interacts with two different phonological forms. This is quite different from the phenomenon analyzed here where two or more clearly different syntactic units interact in using the weak hand.

In general, it might be interesting to pursue a unified analysis for various manifestations of simultaneity, but this falls outside the scope of this paper.

 $^{^{2}}$ Other terms have been used to describe this phenomenon, such as perseveration of the nondominant hand, and buoys (Liddell 2003). For more details, see Vermeerbergen et al. (2007) and Kimmelman (2014).

Sometimes weak hand holds occur due to articulatory or phonetic reasons. However, in many cases the presence of a weak hand hold makes some semantic contribution. Consider the following examples from RSL. In (1), Figure 1, the signer produces three utterances: "She thinks it is a monkey. She looks at it. [She says:] It is nice!"; all utterances are produced with the right hand, while the left hand (starting after the first sign has been completed) produces a pointing sign IX-a simultaneously. This pointing sign refers to the cat (pretending to be the monkey).³ In Kimmelman (2014), I argued that this weak hand hold is used to emphasize the discourse topic of this episode.

- (1) H1: THINK MONKEY. LOOK. NICE. H2: IX-a------'She thinks it is a monkey. She looks at it. It is nice!'





IX-a+MONKEYIX-a+LOOKFigure 1. Stills of signs from example (1).

IX-a+NICE

³ Glossing conventions: Signs are glossed in SMALL CAPS using English words that are approximations of the meaning of the signs; dashes are used if a word is fingerspelled (R-I-T-A). IX stands for pointing signs (index), whereby IX-1 means pointing to the signer and IX-a pointing to some locus *a* in the signing space. CL marks classifier predicates. PU stands for the palms up gesture. H1 and H2 stand for the two hands when they are glossed separately. In glossed examples, --- marks that one hand (usually H2) is held in space while the other continues signing; the length of --- reflects the scope of a held sign in relation to signs on the other hand. In captions of figures, + is used to reflect simultaneity (e.g. MONKEY+IX-a).





THREE+IX-b

Figure 2. Stills of signs from example (2).

In (2), Figure 2, the signer also produces three utterances: "The first one was Davidenko, the second one Nadia, and the third one was Rita." Throughout the three utterances, the signer holds the left hand in the configuration and location of the sign THREE.LIST which can be translated as 'as for the three people'. In this type of construction, the weak hand thus is not a discourse topic, but a frame setting (Krifka 2008) or a scene-setting topic, delimiting the domain from which alternatives discussed in the sentences are chosen. This type of holds has been called "list buoy" in the literature (Liddell 2003).

In (3), Figure 3, the signer first talks about the low tide, and then she becomes unsure whether what she said was true, so she asks whether it was right, and then comments that she knew it. During the production of the second and third utterance, the weak hand is held in the configuration of the sign LOW.TIDE; what is produced by the active hand can be characterized as a parenthetical, while the weak hand maintains the last sign of the main utterance.

- (3) H1: EVENING LOW.TIDE RIGHT? IX-1 KNOW.
 - H2: EVENING LOW.TIDE------'In the evening, it's low tide. Right? I know it!'



LOW.TIDE



LOW.TIDE+RIGHT



LOW.TIDE+KNOW

Figure 3. Stills of signs from example (3).

1.2 Linearization problem

Examples (1–3) demonstrate that some weak hand holds have a meaning, and cannot be analyzed as a purely phonetic/prosodic process of feature spreading (as suggested by Nespor & Sandler (1999) for some other types of holds). As a result of this conclusion, we need to represent the weak hand holds in syntax.⁴ We have to postulate two tiers on which the lexical items are to be linearized: one for each hand. We further need to formulate the rules of linearization and to describe the restrictions that apply to the use of the second hand.

I am not the first one to discuss the issue of linearization in relation to weak hand holds.⁵ One hypothesis concerning linearization on two tiers in sign languages is briefly formulated by Woll (2007). It has been suggested that syntactic trees do not contain the ordering information (Chomsky 1995), so the order of elements is only assigned during the linearization process. Woll suggested that, in sign languages, this order need not be assigned because two articulators (two tiers) are available. However, this suggestion is problematic as it does not pose any restrictions on the potential manual simultaneity, while in fact it is quite restricted.

For instance, this theory predicts that, if signs X and Y are sisters in the syntactic tree [X Y], they can be linearized simultaneously: X on the right hand and Y on the left hand (4a). However, fully simultaneous realization of two independent signs (almost) never occurs. What one is much more likely to encounter is a structure like (4b): a sign X is produced with one hand, and then the hand is held in its final location and configuration, while another sign Y is produced. Moreover, even if we explain the fact that (4b) is common and (4a) is not through prosodic rules (as I am also going to do in my analysis), this still does not predict when weak hand holds should occur.

(4)	a. RH: X	b. RH:	Х	
	LH: Y	LH: Y	LH: Y	

Finally, and most importantly, a theory which allows syntactic trees to freely linearize on two separate tiers does not explain the semantic effects observed in (1-3). In order to account for the generation of such examples, the following

⁴ In some theoretical frameworks, prosodic elements can have semantic contribution without using syntax as an intermediary. In such a framework, it might be possible to analyse the data discussed in this paper in a different way. However, it is not clear how such an analysis would be able to account for various syntactic properties of constructions with weak hand holds discussed in Section 4.

⁵ In addition, there is some research on the issue of linearization of non-manuals in sign languages, and linearization of simultaneous sign and speech, as mentioned in footnote 1.

questions should be answered: 1. What is the syntactic position of the sign on the weak hand? 2. What are the rules of linearization for sign languages?

My hypothesis is as follows. In order to describe the syntax of weak hand holds, it is necessary to apply the notions of External Remerge (for examples (1) and (2)) and Parenthetical Merge (for example (3)), developed for spoken languages by de Vries (2008, 2009). The held sign is either a shared node (in (1) and (2)), or an element from the main clause when a parenthetical phrase is inserted (in (3)). The syntax of weak hand holds is thus not modality-specific. However, the rules of linearization for sign languages must be different, as they involve the simultaneous activation of the second tier – the second hand – which is simply not available in spoken languages. In the remainder of this paper, I explain this analysis in detail.

1.3 Methodology

The discussion in the following section is based on data from RSL. Note, however, that other sign languages have been reported to have the same or similar types of weak hand holds (see several chapters in Vermeerbergen et al. (2007) and Sáfár & Kimmelman (2015)), and I assume that this analysis can be applied to them as well. In this study, two types of data have been used. First, a dataset of naturalistic narratives in RSL has been analysed in order to describe the general properties of weak hand holds. Narratives by 12 RSL signers have been collected and annotated. Each weak hand hold has been identified and classified. The descriptive results of this analysis are reported in Kimmelman (2014), Sáfár & Kimmelman (2015), and Kimmelman, Sáfár & Crasborn (2016). We identified 350 instances of weak hand holds in the RSL data (and also a comparable amount in Sign Language of the Netherlands, not discussed here), and classified them according to their functions. Note that in these studies, we found many different types of weak hand holds, some of which do not appear to have a semantic contribution; here I only focus on the analysis of holds that do have a meaning. Based on these naturalistic examples, I formulated the hypothesis that many of the holds in RSL can be analysed using the formalism of External Remerge and Parenthetical Merge.

However, in order to confirm that weak hand holds indeed result from External Remerge and Parenthetical Merge, additional data have been elicited from two native signers of RSL. By means of elicitation, I wanted to establish that weak hand holds can be used in contexts which involve External Remerge and Parenthetical Merge in spoken languages and that the syntactic properties of External Remerge and Parenthetical Merge described for spoken languages are also valid for RSL.

Two signers participated in the elicitation sessions: one signer is a native Deaf signer, the other one a native hearing signer. They were consulted simultaneously and discussed examples with each other. The tasks that were offered to them involved acceptability judgments and evaluating possible interpretations of examples.

The remainder of the paper is structured as follows. In Section 2, I introduce the formalism of External Remerge and Parenthetical Merge, as developed for spoken languages. In Section 3, I discuss how weak hand holds found in my naturalistic RSL dataset can be analysed with the help of this formalism. In Section 4, I provide additional evidence for this analysis based on elicited data. Section 5 discusses some complications, and Section 6 concludes the paper.

2 Unconventional merges

Different researchers (e.g. Citko 2005; van Riemsdijk 2006; de Vries 2008, 2009; Bachrach & Katzir 2009) argued that multidominant structures are necessary to account for a class of phenomena in spoken languages, such as Right Node Raising (see Section 2.1 for examples). Different terms have been used to describe these structures, including *grafts* (van Riemsdijk), *Parallel Merge* (Citko), and *External Remerge* (de Vries). Below, I discuss the formalism developed in the works of de Vries (2008, 2009, 2012), as he explicitly formulated linearization rules for such structures. In addition, de Vries discusses both External Remerge and Parenthetical Merge, both of which play a role in my analysis of weak hand holds in RSL.

I want to emphasize that I am not arguing that weak hand holds in RSL have to be analysed by the formalisms suggested by de Vries; I am only showing that these formalisms can be applied (Section 3), and that they make some predictions that are fulfilled (Section 4). I am not providing arguments in favour of de Vries's proposal in comparison with other proposals that assume multidominance (e.g. Citko 2005 or Bachrach & Katzir 2009); it is possible to re-formulate the RSL analysis proposed here in different formalisms. In the next section, I do however cite some arguments for analysing structures like Right Node Raising as multidominant and not as arising from (regular) movement.⁶ In other words, my purpose is not to show that RSL data provides an argument in favour of one particular analysis of constructions such as Right Node Raising or parentheticals in spoken languages, but to show that an assumption of multidominance, which has already been applied to such constructions by

⁶ Apart from multidominance and movement, a third group of analyses of such constructions in spoken languages exists: instead of arguing that the constituent in question is shared or moved, one can suggest that it is deleted in one of the positions. This can be formulated in terms of ellipsis (Seungwan 2009) or PF-deletion (Abels 2004). See Sabbagh (2007), Bachrach & Katzir (2009), and de Vries (2009) for arguments against these analyses.

several theoreticians, and an assumption of a special type of merge for parentheticals (suggested by de Vries), also fits sign language data nicely. Moreover, I intend to show that sign languages appear to overtly mark multidominant structures and parentheticals.

2.1 External Remerge

De Vries (2009) claims (following Citko (2005) and van Riemsdijk (2006)) that within the standard assumptions of Generative Grammar, multidominance (that is, the situation in which one node is dominated by at least two other nodes) is a logically necessary type of construction. He argued that there are three basic types of Merge: (i) simple Merge, when two roots are joined (5a); (ii) Internal Remerge, when a root is joined with a constituent it is a part of – aka movement (5b); and (iii) External Remerge, when a root is joined with another root which is a part of a different constituent (5c). Given that movement already results in a multidominant construction, the third logical possibility (External Remerge) is not surprising; both Internal and External Remerge are visualized in (6).

(5) a. Merge: Merge $(A,B) \rightarrow [CAB]$

- b. Internal Remerge: Merge $(B, [CAB]) \rightarrow [EB[CAB]]$
- c. External Remerge: Merge (B,D), where $[_{C} BA] \rightarrow [_{E} D [_{C} B]_{E} A]_{C}$



Internal Remerge External Remerge

Apart from this general theoretical motivation for External Remerge, there are a number of constructions that are best analysed with this formalism. These constructions include Right Node Raising (7a), across-the-board movement (7b), free relatives, appositives, and others.

John admires , but Jill hates Bush. (7)a.

> Which man does John admire____but Bill hate___? b.

Consider example (7a): the stands for the missing constituent *Bush*, which is absent (or silent) in the first conjunct, but present in the second conjunct. This can be analysed in the following terms: Bush is a DP which is Merged with the verb hates, but then also Externally Remerged with the verb admires. If one does not accept External Remerge as a possible operation, one could say that the argument Bush has moved (= Internally Remerged) from its position in the first conjunct to the position in the second conjunct. However, such an analysis is confronted with serious problems, as discussed below (see also Bachrach & Katzir (2009) for further arguments, and also Sabbagh (2007) for a movement-based account). In (7b), the constituent *which man* is an argument of both *admire* and *hate*, too, but now the story is more complicated: it is first Merged with *admire*, then it is Externally Remerged with *hate*, and then at some point in the derivation, the constituent moves (is Internally Remerged) to the SpecCP position.

These constructions cannot be analysed through movement because they do not show the properties traditionally associated with movement, such as island effects. For instance, compare (8a) to (8b): the latter is ungrammatical because the wh-phrase *what* cannot move across the boundary of a complex noun phrase *men who sell* _____, while the former is grammatical, because, under the External Remerge analysis, no movement is involved. Further arguments in favour of External Remerge can be found in the works of van Riemsdijk and de Vries.

- (8) a. Mary likes [men who sell ___], but she hates [men who buy *cars*].
 - b. *What does Mary like [men who sell____]?

2.2 Parenthetical Merge

De Vries (2007, 2012) proposed yet another kind of merge, namely *Parenthetical Merge*, which is independent of the three types of merge mentioned above. In the examples above, merging of elements always creates a c-command relationship between them. However, Parenthetical Merge is invisible with respect to the c-command relationship: the elements of the parenthetical are not c-commanded by the elements of the main sentence and do not c-command them.⁷ De Vries (2012) demonstrated that indeed no dependencies involving c-command are possible between the main clause and the parenthetical clause. For instance, quantifiers in the main clause cannot bind pronouns in the parenthetical clause. In (9a), the quantifier *everybody* can bind the pronouns *he* and *his* because it c-commands them. In contrast, in (9b), the quantifier phrase *every guest* cannot bind the pronoun *he*, because the parenthetical clause is invisible to c-command.

⁷ Integrated parentheticals are more transparent to c-command, as discussed by Steinbach (2007). I do not investigate such constructions in RSL in this paper.

- (9) a. Everybody_i is somebody because he_i is a child of his_i parents.
 - b. *Every guest_i he_i just arrived was talking to Hank.

In addition, Principle C effects (Chomsky 1981) between the main clause and the parenthetical clause are absent. In (10a), the work of Principle C is demonstrated: *Jane* being an R-expression cannot be co-referent with a c-commanding antecedent. However, in a similar configuration involving parenthetical Merge, *Joop* can be co-referent with *he*, again because the parenthetical phrase is invisible to c-command (10b).

- (10) a. *She_i said that Jane_i was listening to music.
 - b. $He_i had said Joop_i no need for company.$

Finally, there is no Force or Mood dependency between the parenthetical clause and the main clause. In (11a), the main clause is a statement, while the parenthetical clause is a question. In (11b), the modal adverb *probably* scopes over the main, but not the parenthetical clause (*she is my sister* is not a probability, but a certainty). These facts can be explained by the fact that parenthetical clauses are not subject to c-command.

- (11) a. Jake said why am I not surprised? that he hates bicycles.
 - b. Jake probably said that Mary she is my sister took a few days off.

The data above can be analyzed in terms of de Vries' (2012) Parenthetical Merge. In this approach, Parenthetical Merge can combine with multidominance but is independent of it; the combination of both mechanisms is called "amalgams" (see also Kluck (2011)). For instance, (12) contains a parenthetical clause ParP *I think it's a didgeridoo*, merged by Parenthetical Merge, while the DP *a didgeridoo* is also shared, as it belongs both to the main clause and to the parenthetical clause.

(12) Joop got *I think it's a didgeridoo* for his birthday.

In examples like (12) and (13) where Parenthetical Merge and External Remerge are combined, interesting effects arise. For instance, (13a) is ungrammatical because of a Principle C violation. *Ed* in (13a) belongs to both the main and the parenthetical clause, and in the main clause it is c-commanded by the coreferential pronoun *he:* "He_i had seen Ed_i", which is a direct violation of Principle C. However, (13b) is grammatical because *Ed* only belongs to the

parenthetical clause. The main clause now is "He had seen Anna" with no coreference. Although *he* and *Ed* are still coreferential, the pronoun no longer c-commands the noun, because the parenthetical clause is not transparent for the c-command relation.

- (13) a. *He_i had seen *I think it was Ed_i* on TV yesterday.
 - b. He_i had seen $-Ed_i$ said it was Anna on TV yesterday.

2.3 Linearization

Since External Remerge and Internal Remerge create multidominance, it is necessary to explicitly formulate the linearization rules of such structures. Note that linearization rules for Internal Remerge and External Remerge should be different because, in the former case, the node is spelled-out in the leftmost position, while in the latter case, it is spelled-out in the rightmost position.

De Vries (2009) describes linearization as a graph traversal procedure. An assumption in this procedure is that the relation of precedence is defined for sisters in the tree (Langendoen (2003), contrary to Chomsky (1995)). A traversal mechanism is formulated in terms of selecting nodes and performing linearization (spell-out) of terminal nodes. One can imagine a virtual machine that goes through the graph (= traverses it), starting at the leftmost terminal node, and for every terminal node, this machine either linearizes it or skips it. For the present discussion, the relevant part of the rule is formulated in (14).

(14) Spell-Out of Remerged Nodes (De Vries 2009:381)

A node with more than one parent is linearized if and only if

- (i) the current parent is not dominated by any other parent, and
- (ii) every parent has been traversed, or
 - the current parent dominates every other parent that has not been traversed

Consider the linearization of a movement configuration (15). In this configuration, the terminal node α is dominated by three parents: γ_1 , γ_2 and γ_3 . The subscript 'c' represents the place at which the traversal machine is at this point in linearization, and + means that the node is being or has been traversed. When the machine reaches γ_1 , it checks the rule in (14). γ_1 is not dominated by any other parent of α , so (14i) is satisfied. According to the second part of the (14ii) condition, α will be spelled out in the left-most configuration (as a daughter of γ_1 , because γ_1 dominates both γ_2 and γ_3). To put it simply, with Internal Remerge the highest copy is spelled out.

(15) Linearization of Internal Remerge (de Vries 2009:380)



In (16), the linearization of an External Remerge configuration is visualized. γ_1 is not dominated by any other parent of α , so (14i) is satisfied. Since γ_1 , γ_2 and γ_3 do not dominate each other, according to condition (14ii), α will be spelled-out in the right-most configuration, when all other parents except for γ_3 will have been traversed. This agrees with the observed fact that in External Remerge, the right-most copy is spelled out, as in (7a).

(16) Linearization of External Remerge (de Vries 2009:379)



For Parenthetical Merge, no special linearization rules are necessary. In (17), the Parenthetical Phrase (ParP⁸) is merged with YP, not creating a multidominant structure, so the linearization procedure will simply linearize parenthetically merged constituents as all other constituents. In particular, the terminal nodes which are dominated by XP will be linearized first, and then the terminal nodes dominated by the lower YP will be linearized. For instance, in example (10b), repeated here as (18), the Parenthetical Phrase *said Joop* is adjoined to the VP, so when the whole structure is linearized, first the CP and IP layers of the main clause are linearized (which results in *he had*), then the ParP, and then the VP *no need for company* to which ParP is adjoined.

⁸ The dotted line with stars next to it represents the Parenthetical Merge operation.

(17) *Parenthetical Merge* (adapted from de Vries (2012))



(18) $He_i had - said Joop_i - no need for company.$

De Vries (2009) also discusses several complicated cases involving multiple instances of External Remerge and Internal Remerge and combinations thereof. He demonstrates that even in such cases, the linearization procedure formulated in (14) produces the correct linear order of terminal nodes.

3 Weak hand holds as External Remerge and Parenthetical Merge

I hypothesized that weak hand holds in RSL are syntactically similar to the constructions involving External Remerge and Parenthetical Merge described in the previous sections. In particular, weak hand holds for discourse topics and weak hand holds of lists are instances of External Remerge (further discussed in Section 3.1), and parenthetical weak hand holds are instances of Parenthetical Merge (further discussed in Section 3.2). Note that in both subsections, apart from describing the syntax of weak hand holds, I also need to explicitly formulate the linearization procedures.

3.1 External Remerge in RSL

First, let us consider the syntactic structure of examples (1) and (2), and then the linearization rules. Example (1) consists of three clauses sharing the node IX-a. This constituent has different syntactic roles within each of the clauses: it is the subject of an embedded clause in the first one (thinks *it* is a monkey), an object in the second one (looks at *it*), and again the subject in the third one (*it* is nice) (19). Since the node is shared, a multidominant structure is created.



'She thinks it is a monkey. She looks at it. It is nice.'

The structure for listing holds is also quite straightforward. As I discussed above, list buoys are functionally similar to scene-setting topics, as they also specify what the signer is talking about, and can be characterized as frame settings (Krifka 2008). In (2), the frame setting can be translated as 'as for the three people', and as such, this frame setting is shared between the three clauses: 'the first one was Davidenko', 'the second one was Nadia', and 'the third one was Rita' (20), which are coordinated to form a coordination phrase (CoP).⁹



⁹ One might ask whether the list buoy THREE.LIST could not be in SpecCP above the three coordinated CP's and scoping over all three. In fact, I do not have any good arguments against such an analysis, but this is not problematic. If the list is not shared, the prediction is that no weak hand hold will occur, and in fact lists are not always realized as weak hand holds. I will further discuss this in Section 5.

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I now turn to linearization. As de Vries (2009) noted, structures such as those in (19), namely multi-rooted trees, cannot be linearized by the standard linearization procedure, because it is not possible to define where the traversing starts. In order for linearization to apply, the sub-trees created by External Remerge should be merged together at some point to form a single-rooted tree. The most straightforward way to change a multi-rooted structure is coordination. In (7), the object *Bush* is dominated both by *John admires* and *Bill hates*. This would create a multi-rooted structure as in (21a), but due to coordination, the structure is single-rooted (21b) (de Vries 2009:361).



In the same vein, examples like (19) are probably also coordinated structures. For instance, (1) can be reformulated as follows: "She thinks it's a monkey, and looks at it, and says that it's nice." The question remains whether this is indeed syntactic coordination. There are no overt markers of coordination in this sequence, but RSL generally does not use any overt manual coordinative signs. Maybe the combination of clauses in (1) and (2) is actually a discourse-level phenomenon. However, the whole sequence in (1) and (2) must be the input to the linearization procedure – otherwise the generation of weak hand holds would be impossible. I therefore suggest that this is indeed true syntactic coordination, as also evidenced by the presence of the weak hand hold.

Leaving the problem of multiple roots aside, the main rule of linearization for External Remerge in RSL can be formulated as in (22).

(22) Spell-Out of Externally Remerged Nodes in RSL

A node with more than one parent (and the parents of which do not dominate each other) is linearized on the second tier¹⁰ when the first parent has been reached.



'She thinks it is a monkey. She looks at it. It is nice.'

¹⁰ I am using the term "second tier" and not "weak hand" here on purpose. The use of the term "weak hand" is complicated by the phenomenon of dominance reversal (Frishberg 1985): the signer who uses his right hand as dominant (strong) hand might also at some point use the left hand to produce one-handed signs, and use the right hand to maintain a hold. One can say that what has been the strong hand has become the weak hand, or distinctively use the terms weak and non-dominant hand. I am therefore using the term "second tier" to abstract away from the notions of weak/non-dominant hand and the dominance reversal. The second tier is the hand that realizes the hold, irrespective of whether it is the right/left hand or dominant/non-dominant hand for this particular signer, i.e. irrespective of the fact whether dominance reversal occurs or not. The issue of when dominance reversal happens and whether it is syntactically relevant or a purely prosodic phenomenon is left for future research. As I discuss below in the final paragraph of this section, using this definition also helps me generalize over holds originating in two-handed and one-handed signs.





'Of the three of them, the first one was Davidenko, the second one Nadia, and third the third one was Rita.'

The linearization of (1) and (2) can be visualized as (23) and (24). In (23) the shared node IX-a is linearized on the second tier. The tree traversal starts with THINK, then it reaches IX-a, which is a shared node, so the second tier is activated, and IX-a is immediately realized – unlike what happens in spoken languages, the linearization rule does not postpone the linearization of the shared node until the last parent has been traversed. This is due to the fact that delaying linearization is not necessary because a second tier – the second hand – is immediately available, and can be used to establish the link between the two parents of the shared node. For example (2), the linearization procedure is the same as for example (1): the overt shared node THREE.LIST is linearized on the second tier, while all other signs are linearized on the first tier. This is represented in (24).

If the shared node contains more than one sign, then two things could happen: either the whole constituent is linearized on the second tier, or only one element is linearized on the second tier, while the rest of the constituent is linearized on the first tier. In the examples discussed in this section, shared nodes are either phonologically empty or consist of one sign. However, in Section 4, I discuss examples of phrasal shared nodes. We can see that the two hands are synchronized: the weak hand hold ends when the utterance produced by the active hand ends. This is represented in (23) and (24) by specifying that both hands produce an utterance, and the right boundaries of the utterances coincide. I propose that the issue of synchronization is a matter of prosody, and it is independent of the issue of linearization. The linearization rule in (22) specifies the conditions in which the second tier is activated and the node that is linearized on the second tier, but says nothing about the prosodic units. Prosody is an independent component of grammar and it contains rules of synchronization of the two hands. Based on the examples from RSL, the following rules can be suggested:

(25) Prosodic alignment of tiers in RSL

- (i) If two tiers are active, each one is mapped onto a single utterance.
- (ii) If two utterances appear on two tiers, their right edges should be aligned.
- (iii) If one sign has to constitute an utterance, it is realized as a hold, not as repetition of the full sign. If more than one sign is linearized on the second tier, the last one is realized as a hold.

The first condition in (25) is descriptive: this is what I found in the data. The fact that the right edges of the utterances on the two tiers are synchronized is probably caused by the fact that only one structure is projected onto both tiers. The third condition is a phonological one. As discussed by Battison (1978) for lexical signs, if two hands have different handshapes, only one hand can move. It is clear that, in RSL, this rule also applies beyond the level of a sign (see Hendriks (2007) for a similar proposal based on Jordanian Sign Language).

Finally, note that linearization of one-handed and two-handed signs works slightly differently. When there is no node sharing and no weak hand holds, the second hand is of course active if a two-handed sign is articulated, but it seems unnecessary to say that two-handed signs always activate the second tier, because the second hand in such cases is not semantically or syntactically represented. If the shared node is a one-handed sign, as in both examples discussed in this section, then it is linearized on the second tier and held there, while other signs are linearized on the first tier, following the general rules. If the shared node is a two-handed sign, what happens is that the second tier is activated, and the sign is assigned to this second tier, but since it is two-handed, it is realized on both tiers. Importantly, however, after that, the following signs are linearized on the first tier, and one hand of the two-handed sign is preserved on the second tier.

3.2 Parenthetical Merge in RSL

As I discussed above, linearization of Parenthetical Merge in spoken languages does not require any special rules, because no multidominant structures are created by it. However, it appears that sign languages, and RSL in particular, do have a separate rule of linearization for Parenthetical Merge, because parentheticals are often linearized on one tier, while the other tier contains a weak hand hold of a sign from the main clause.

Consider example (3), repeated here as (26). The parenthetical phrase is linearized on one of the hands, while the weak hand maintains a sign from the main clause. The syntactic structure of this sentence can be represented as in (27), where the dotted line represents Parenthetical Merge.



The rule for linearization of Parenthetical Merge can be formulated as in (28). The phonological constraint in (25iii) predicts the realization of the last element of the main sentence as a hold.

(28) Spell-Out of Parenthetically Merged Nodes in RSL Spell out the Parenthetical Phrase on the second tier.

If I apply this rule to sentence in (26), the linearization can be visualized as in (29). LOW.TIDE is first linearized on both hands because it is a two-handed sign, but then linearization of a parenthetically merged phrase demands the activation of the second tier, while LOW.TIDE is realized as a hold.



'In the evening, it's low tide. Right? I know it!'

There is a crucial difference between the rules of linearization for External Remerge and for Parenthetical Merge. In the former case, the rule concerns one node, which is realized on the second tier as a weak hand hold. In the latter case, the rule concerns the whole parenthetical phrase, which is realized as a normal phrase, creating a hold on the other tier due to the phonological constraint (25iii). This difference also results in the difference in alignment: in the case of External Remerge, there is a full alignment of the right boundaries of the utterances on the two tiers, while in the case of parenthetical phrase ends (30); consequently, neither left nor right boundaries of utterances have to be synchronized.¹¹ Although in the examples of parentheticals discussed above, the right boundaries of the parenthetical and the main clauses coincided, this is not the case in examples (34) and (35) below which clearly illustrate the alignment pattern in (30b).

(30)	a.	Alignment of tiers with External Remerge in RSL	
		H1: [main clause]uttera	ance
		H2: [hold]uttera	ance

b. Alignment of tiers with Parenthetical Merge in RSL H1: [main clause--- [hold------]_{utterance} H2: [parenthetical]_{utterance}

¹¹ The current analysis makes no clear predictions for the amalgams which contain both a shared node created by External Remerge and a parenthetical, because it is impossible to satisfy the rules of realization for both in the same structure. One possibility is that amalgams are just not realizable in RSL, but another possibility is that one of the linearization rules (22) and (28) will override the other.

The most important theoretical consequence of this subsection is that RSL shows an overt distinct realization of Parenthetical Merge which confirms the status of this operation as distinct from other kinds of Merge.

4 Further evidence

In the previous section, I demonstrated that weak hand holds found in naturalistic RSL data can be analysed as instances of External Remerge or Parenthetical Merge, but that modality-specific rules of linearization are necessary. However, in Section 2, I discussed that both External Remerge and Parenthetical Merge show some syntactic peculiarities (such as obviation of islands and c-command invisibility, respectively). In this section, I test, based on elicited data, whether these peculiarities apply to weak hand holds in RSL as well.

4.1 Effects of External Remerge

One construction for which the formalism of External Remerge has been developed is Right Node Raising, as in (7a), repeated here as (31). Intuitively, node sharing happens if there is conjunction of clauses which are parallel to each other in structure, and which are contrasted with each other according to some properties (in this case, who feels what) but overlap according to one property (that the feeling is being directed towards Bush).

(31) John admires ____, but Jill hates Bush.

When I tried to elicit such examples in RSL, it turned out that they indeed can be translated with a weak hand hold. Consider example (32), the translation of which is an example of Right Node Raising. The noun phrase FENCE IX-a is a shared node (as it is the object of two verbs: FIX and PAINT). According to the rule formulated in the previous section (25iii), the final sign of the shared constituent is linearized on the second tier. Note that – also in accordance with the linearization rules introduced in the previous section – this happens as soon as the first parent of the shared node is traversed, not when the last parent is traversed, as it would happen in English.

Moreover, as discussed above, External Remerge is different from Internal Remerge because the latter but not the former causes island effects. If some weak hand holds in RSL indeed result from External Remerge, island effects should also be absent. The same example shows that this is the case.

As one can see, the shared node FENCE IX-a 'the fence', which is linearized on the second tier, is in fact embedded in a wh-island; movement from such a position is ungrammatical (33), but sharing a node turns out to be grammatical. Thus (32) is a clear example of a weak hand hold happening in a context which shows syntactic properties of External Remerge, in particular, obviation of island effects.

(33) * WHAT IX-1 KNOW WHO FIX? Intended meaning: 'What do I know who fixed?'

4.3 Invisibility to c-command

Weak hand holds, according to my analysis, also happen when Parenthetical Merge is applied. Thus, it should be possible to find examples which involve lack of c-command between elements in the main clause and elements in the ParP in the presence of a weak hand hold. Consider the following example:

(34) H1: TEACHER MASHA KNOW? CHILDREN LOVE IX-a PU GO RETIRE H2: IX-a----- PU GO RETIRE 'The teacher – you know Masha? – children love her – has retired.'

In (34), there are two parenthetical phrases. The first one is 'you know Masha', and the NP MASHA is co-referent with the NP TEACHER IX-a, so if MASH-A were c-commanded by TEACHER IX-a, it would be a Principle C violation. Since Principle C applies in RSL (Kimmelman 2009), and since the example is grammatical, it is clear that this is indeed an instance of Parenthetical Merge, and that Parenthetical Merge is realized as a weak hand hold (of a sign from the main clause).

Another piece of evidence that Parenthetical Merge does not create a ccommand relation is the fact that the illocutionary force of parenthetical clauses is not dependent on that of the host (de Vries 2007). Hence, the main clause might be a question, while the parenthetical clause is a statement (e.g. *Did Jake*, *John pondered, own a car?*), or vice versa. Example (34) above also demonstrates that this is the case for RSL as well: the main clause is a statement, while the first parenthetical is a question.

Finally, de Vries (2007) observed that parentheticals do not fall under the scope of modal operators in the main clause. For instance, in *Jake probably said that Mary – she is my sister – took off a few days ago*, the proposition *she is my sister* does not fall under the scope of the epistemic adverbial *probably*. This is

also true for RSL. Consider example (35), where the parenthetical MY NIECE 'she is my niece' does not fall under the scope of the modal sign MAYBE. This example again shows that a parenthetical in RSL involving a weak hand hold is invisible to c-command.¹²

(35) H1: MOTHER SAY-1 SASHA MY NIECE MAYBE GO O-M-S-K H2: IX-a----- MAYBE 'My mother said to me that Sasha – she is my niece – might have gone to Omsk.'

5 Discussion

In Section 3, I have formulated an account of weak hand holds in RSL in terms of External Remerge and Parenthetical Merge, and in Section 4, I demonstrated that it makes correct predictions concerning syntactic properties of the resulting structures. In this section, I address two complications. First, I discuss other holds that are less easily accounted for by the same analysis. Second, I address the issue of optionality of weak hand holds.

5.1 Other types of weak hand holds

Weak hand holds discussed above are not the only weak hand holds in RSL. There are two other types which are very common: weak hand holds expressing a locative relation, and weak hand holds expressing simultaneity (Kimmelman 2014).

The first type of holds concerns a locative construction in which a situation involving a Ground, a Figure, and a locative relation between the two is described. In such situations, the Ground is commonly realized as a weak hand hold (see, for instance, Pfau & Aboh (2012) for an elaborate syntactic analysis of such constructions). Consider example (36), Figure 4. The noun phrase PIPE SAME PIPE is the Ground, the Figure here is not expressed, and the locative relation is expressed by the predicate CL:GET.IN.

¹² I also tried to test the final prediction of De Vries's account to Parenthetical Merge, namely that quantifier binding into a parenthetical should be impossible. However, I did not succeed in eliciting examples with holds and quantifiers in the main clause. For reasons currently unclear to me, examples like (i) with a quantifier in the main clause and a weak hand hold are ungrammatical irrespective of the interpretation of the pronoun in the parenthetical clause.

⁽i) H1: *BOY EACH IX-a COME WANT EAT H2: IX-DISTR------'Each boy – he came – wanted to eat.'

(36) H1: PIPE SAME CL:GET.IN. H2: PIPE SAME PIPE------

'He gets in the same pipe.'



Figure 4. Stills of signs from example (36).

The problem with analysing this example in terms of what I proposed in Section 3 is that it does not seem to present an example of either node sharing or parenthetical relations. If PIPE SAME PIPE is an argument of the predicate CL:GET.IN, then it is not an argument of any other predicate. However, it is possible to assume that the sign PIPE is actually used predicatively, and that the structure actually involves two clauses: "There is a pipe. He gets in it." Under such an analysis, the sign PIPE is the predicate of the first clause, and it is the Ground in the second clause¹³, which implies that it is a shared node, and standard linearization rules apply. This solution is actually compatible with the analysis of such constructions by Pfau & Aboh (2012), as they also analyse them as bi-clausal, but explain the hold by a phonetic/prosodic process.

Another type of holds is used to iconically represent simultaneity of actions expressed by different verbs. Consider example (37), Figure 5. The signer produces three utterances: "He carries the suitcase and the cage. He doesn't need the suitcase. He throws it away." The active hand in this case is the left one: most signs are produced with it. Throughout the three utterances, the signer is holding the right hand in the configuration and location of the sign CL:CARRY₂ (the cat is holding the cage), thereby signifying that the actions described in the three utterances (the cat holding the suitcase, realizing that it is not needed, and throwing it away) happened simultaneously with the cat holding the cage.

¹³ In fact, in this particular case, two more locative clauses follow, and the Ground PIPE is being held during their production as well, so it is in fact shared between four predicates. But the analysis applies also to cases in which only one locative predicate is used.

- (37) H1: CL:CARRY₁. SUITCASE NEED.NOT. THROW.
 - H2: CL:CARRY₂------'He carries [the suitcase and the cage]. He does not need the suitcase. He throws it away.'







CL:CARRY₂+CL:CARRY₁ CL:CARRY₂+NEED.NOT CL:CARRY₂+THROW **Figure 5.** Stills of signs from example (37).

Can I account for this example with the analysis outlined in Section 3? It is not the case that the sign CL:CARRY₂, which is held, belongs to the three sentences. It is possible to suggest that the shared node in this case is a zero scene-setting topic (SST), similar to the overt scene-setting topic in the case of listing holds. The SST here sets the temporal and spatial framework for the situation described in the sentence. It is situated in the left periphery, and I therefore place it in a specifier in the extended C-projection, like other topics. The meaning of the first CP is '[At this time and place] he carries (the cage)', where the SST is interpreted as a particular time and place. The meaning of the second CP (which includes three separate daughter-CPs) is '[At this time and place] he carries (the suitcase), he realizes that he does not need it, and throws it away', where again the same shared SST is interpreted as a particular time and place. The fact that the node is shared produces the relevant semantic effect, namely that the activities described in the first CP and in the second CP occur simultaneously. The structure in (38) also suggests that the SST here is only shared by two CPs, because it is not the case that all four activities happen at the same time; rather the activity of carrying the cage happens during the same period that three other activities happen.



'He carries [the suitcase and the cage]. He does not need the suitcase. He throws it away.'

Since the shared node is a zero element, special rules of linearization have to be formulated. In particular, I have to modify the rule of linearization for External Remerge formulated in Section 3 by adding a second condition. The new version is in (39):

(39) Spell-Out of Externally Remerged Nodes in RSL modified

- (i) A node with more than one parent (and the parents of which do not dominate each other) is linearized on the second tier (= the weak hand) when the first parent has been reached.
- (ii) If the node is phonologically empty, the next node in the line gets linearized on the second tier.

In (38), the shared node is the zero scene-setting topic. Since a node is shared, the second tier is activated. Following the rule (39ii), the next node which should be linearized, namely $CL:CARRY_2$ is linearized on this second tier. The following node which is not shared, i.e. $CL:CARRY_1$, is linearized on the first tier, and so are the following signs (40).





'He carries [the suitcase and the cage]. He does not need the suitcase. He throws it away.'

One question that immediately arises is whether I have enough motivation to postulate a zero element, in this case, a zero scene-setting topic. As I have already mentioned, an argument in favour of this analysis can be that overt scene-setting topics can also be realized as weak hand holds in the case of the listing constructions. However, my corpus does not contain any examples of overt time or place adverbials which are held due to being a shared scene-setting topic. Further research is needed to find out whether this is possible. Should it turn out that overt time or place adverbials are never realized as holds, the analysis sketched in this subsection may have to be reconsidered.

5.2 Optionality of holds

As I mentioned above, weak hand holds appear to be optional in all contexts. Consider External Remerge cases. On the one hand, if every episode in a narrative has a discourse topic, then it is definitely not true that discourse topics are always realized as weak hand holds. Lists also do not have to be held throughout a part of discourse: the signer can raise the hand with the numeral anew each time at the beginning of a new clause. A Ground in a locative construction does not have to be held either.¹⁴

One obvious solution is to say that the linearization rule applies optionally, that is, that node sharing only optionally activates the second tier. Alternatively, it might be the case that when there is no weak hand hold, there is also no node sharing, so the syntactic structure is really different. For the discourse topic, if we remove node sharing, we just have the same constituent which happens to appear in several consecutive clauses. The same can be said for the Ground not realized as a hold in a locative construction. For the listing constructions, it is actually possible to say that the list is the only scene-setting topic which attaches above the CoP, so it is not shared but simply scopes over all clauses.

For spoken languages, it is clear that constructions involving External Remerge do not have the same properties as constructions where the potentially shared constituent is realized twice: there are, for instance, differences in the scope of quantifiers (Sabbagh 2007). One might expect to find similar differences between constructions with and without weak hand holds in RSL, but this is left to future research.

However, the second solution to optionality of holds does not seem to be applicable to the cases of Parenthetical Merge. First, semantically and pragmatically parenthetical utterances do not always lead to weak hand holds. Moreover, parentheticals that do not involve any holds also show the expected invisibility effects. Consider the following examples which mirror the parenthetical hold examples from Section 4: although no hold is used, the parenthetical is impervious to Principle C violations (41), and it does not show dependent mood (41) or modality (42). Therefore, I have to conclude that the rule activating the second tiers for parentheticals in RSL is indeed optional.

- (41) TEACHER IX-a M-A-SH-A KNOW? CHILDREN LOVE IX-a PU GO RETIRE 'The teacher – you know Masha? – children love her – has retired.'
- (42) MOTHER SAY-1 SASHA MY NIECE MAYBE GO O-M-S-K 'My mother said that Sasha – she is my niece – might have gone to Omsk.'

¹⁴ The same is true for holds expressing simultaneity. If they are analyzed within the same framework, the same problems apply.

6 Conclusions

In this paper, I have offered a formal analysis of (some of the) weak hand holds in Russian Sign Language. I hypothesized that weak hand holds occur when External Remerge or Parenthetical Merge applies in syntax. This hypothesis can be applied to holds which I found in naturalistic RSL data. In addition, I elicited RSL examples that showed that in contexts similar to Right Node Raising, holds also occur, and that sentences with weak hand holds in RSL show syntactic properties of External Remerge (obviation of island effects) and Parenthetical Merge (lack of c-command between the ParP and the main clause).

There are two important theoretical consequences of my analysis. First, I have shown that in sign languages, Parenthetical Merge leads to different linearization patterns. In spoken languages, Parenthetical Merge is not linearized in any peculiar way; however, in RSL, it produces weak hand holds (albeit optionally), which is a further confirmation of the fact that Parenthetical Merge is a distinct operation, different from both Merge and Remerge. This is yet another domain in which data from sign languages offer overt evidence for some theoretical claims developed for spoken languages. For instance, sign languages have overt instantiations of referential indexes (Lillo-Martin & Klima 1990), and overt expression of event structure (Wilbur 2008), thus confirming long-existing theories of these domains of semantics developed for spoken languages. If my analysis is correct, sign languages also overtly express the difference between Merge and Parenthetical Merge.

Second, in my analysis, the difference between sign languages and spoken languages lies not in syntax, but in the linearization procedure. The structures that I used to analyse weak hand holds are familiar from spoken languages, but the rules that guide linearization of these structures as strings are different. This is a welcome conclusion. Previous research (Sandler & Lillo-Martin 2006) allows us to expect fundamental similarities between spoken and sign languages at the semantic and syntactic levels; however, interfaces between syntax and prosody are obviously much more surface-oriented, so one would expect to find modality differences there. Similar ideas have also recently emerged in research on linearization of speech in bimodal bilinguals, where one syntactic computation is suggested for both spoken and signed language, but linearization procedures work in a modality-specific way due to the availability of two modalities (Donati & Branchini 2013; Quadros et al. 2016).

There are several questions that demand further research. First, data from different sign languages should be compared to my findings in RSL in order to scrutinize the role of modality. For instance, Nyst (2007) argued that Adamorobe Sign Language, a sign language used in a village in Ghana, does not have weak hand holds. Therefore, it seems that the modality-specific rules of

linearization do not necessarily apply in all languages in the visual modality. Second, as I mentioned in Section 3, a clear analysis of the interaction between weak hand holds and two-handed signs at the prosodic level is necessary, although this question is not crucial for the syntactic analysis offered here. Finally, some types of weak hand holds discussed in Section 5 have to be analysed further in order to find out whether they can be accounted for by the same formalism. In Sáfár & Kimmelman (2015), we also discussed several other types of holds in RSL which might or might not be analysable in similar terms.

7 References

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