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Oomen, M.; Santoro, M.; Geraci, C.

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Some properties of Neg-raising in three sign languages

Marloes Oomen (University of Amsterdam),
Mirko Santoro (Structures Formelles du Langage, CNRS) and
Carlo Geraci (Institut Jean Nicod, DEC, CNRS-EHESS-ENS | PSL)
{oomen.marloes, santmir81, carlo.geraci76}@gmail.com

Abstract

Neg-raising, the phenomenon whereby a negation in the main clause of a complex construction is interpreted as if belonging to the embedded clause, has been intensively studied in spoken languages. The same cannot be said for sign languages. In this paper, we investigate the properties of Neg-raising constructions in three sign languages: French Sign Language, Italian Sign Language, and Sign Language of the Netherlands. We report on two syntactic tests we applied to disambiguate Neg-raising and non-Neg-raising readings, showing that Neg-raising constructions have similar properties in the three sign languages that we studied, as well as in comparable constructions in spoken languages. We also discuss some intricate headshake spreading patterns we found in Neg-raising constructions in Sign Language of the Netherlands, a non-manual dominant sign language.

Keywords: Neg-raising, Negative Polarity Items, negative quantifiers, headshake

1 Introduction

Across languages, we find predicates that allow so-called Neg-raising (or negative transport) readings (Jespersen 1917). The readings are illustrated by the English sentences in (1) with the predicates *believe* and *expect*: in both cases, the most accessible reading of the sentence is one where the negation in the main clause is interpreted as having scope in the embedded one.

- (1) (a) ‘I **don’t** believe my daughters ate candy for dinner.’
 ≈ ‘I believe my daughters **didn’t** eat candy for dinner.’
 (b) ‘I **don’t** expect my daughters to eat candy for dinner.’
 ≈ ‘I expect my daughters **not** to eat candy for dinner.’

But not all complement-taking predicates have this property. Consider the sentences in (2) with the predicates *realize* and *claim*, for instance. In both cases, it is not possible to obtain a reading where the negation is interpreted in the embedded clause.

- (2) (a) ‘I **didn’t** realize my daughters ate candy for dinner.’
 ≠ ‘I realized my daughters **didn’t** eat candy for dinner.’

- (b) ‘I **don’t** claim that my daughters ate candy for dinner.’
 ≠ ‘I claim that my daughters **didn’t** eat candy for dinner.’

The contrast between the sentences in (1) and (2) have fascinated linguists for a long time. Indeed, a considerable amount of research has been dedicated to uncovering the properties of Neg-raising, and to theoretically accounting for the phenomenon, in spoken languages (for a recent overview chapter, see Horn 2020). However, Neg-raising has, as of yet, hardly been studied from the perspective of sign languages. In this paper, we will investigate at the properties of Neg-raising constructions in three different sign languages: French Sign Language (LSF), Italian Sign Language (LIS), and Sign Language of the Netherlands (NGT).

In Section 2, we first discuss three previous studies which have briefly touched on the topic of Neg-raising in different sign languages. We outline our study aims in Section 3 and describe the data collection process in Section 4. In Section 5, we investigate the properties of Neg-raising constructions in the three sign languages under study by applying several diagnostic tests from the literature on spoken languages. Section 6 focuses on headshake spreading patterns in Neg-raising constructions in NGT. We conclude the paper in Section 7.

2 Neg-raising in sign languages

As far as we are aware, there have thus far been three studies that mention or discuss Neg-raising in sign language. We discuss them in turn.

Firstly, in a study on complementation in Turkish Sign Language, Göksel and Keleşir (2016) use Neg-raising as a test for subordination. They argue that the example in (3) cannot be analyzed as involving conjunction, because a phrasal negation associated with a conjunct cannot be interpreted as negating the other conjunct.¹ This is contrary to what we observe in (3), which according to the authors has a Neg-raising reading (‘Melek wants to **not** meet her friends today.’). Therefore, they argue, the sentence must involve subordination rather than coordination.

- (3) MELEK [TODAY FRIEND MEET] $\overline{\text{ht}}$ WANT $\hat{\text{NOT}}$ [TİD]
 ‘Melek **doesn’t** want to meet her friends today.’ (Göksel and Keleşir 2016, 77)

Secondly, Johnston (2018) also briefly discusses the phenomenon for Australian Sign Language, presenting examples such as the one in (4 a). It is interesting to observe here that the headshake spreads over the entire sentence, yet according to Johnston, its interpretation unambiguously involves one single negation: ‘I don’t think it’ll work’. In other words, the sentence does *not* allow a reading in which both the main and the embedded clause are negated. As such, Johnston (2018) argues that in Auslan, negation is primarily expressed manually, while the function of headshake is more pragmatic or expresses a specific semantic function. Indeed, Johnston demonstrates that examples that have sustained headshake spreading but which contain a predicate that does *not* allow a Neg-raising reading, as illustrated with the predicate SAY in (4 b), similarly yield a single (lower) negation reading.

- (4) (a) $\overline{\text{hs}}$
 INDEX₁ NEG THINK [WORK] [Auslan]
 ‘I **don’t** think it’ll work.’ (Not: ‘I **don’t** think that it **won’t** work.’) (Johnston 2018, 217)

1. Examples from other works are slightly adapted for consistency in glossing conventions. NEG = basic clause negator; ‘ht’ = head tilt; ‘hs’ = headshake; ‘re’ = raised eyebrows; ‘fr’ = frown; ‘hn’ = head nod.

- (b) $\overline{\text{INDEX}_3 \text{ SAY [KNOW-NOT WHO]}}^{\text{hs}}$ [Auslan]
 ‘They say they **don’t** know who (it is).’ (Not: ‘They **don’t** say they **don’t** know who (it is).’) (Johnston 2018, 219)

Thirdly, Oomen, Pfau, and Klomp (2019) have previously investigated Neg-raising constructions in NGT; this work formed the starting point for the work presented in this paper. The authors show that that, similar to the example we just saw from Auslan, sustained headshake spreading over matrix and embedded clause in constructions with a presumed Neg-raising predicate like THINK yields an unambiguous reading involving a single negation, as in (5 a), which has a low negation reading. Although there is headshake in both matrix and embedded clause, the sentence is reported to only have one possible meaning: ‘I don’t think my sister is in love’. Note that in NGT, use of a headshake suffices to negate a sentence.

- (5) (a) $\overline{\text{INDEX}_1 \overline{\text{THINK [SISTER INDEX}_3 \text{ IN.LOVE]}}^{\text{hs}}}$ [NGT]
 ‘I **don’t** think my sister is in love.’ (Oomen, Pfau, and Klomp 2019)
- (b) $\overline{\text{INDEX}_1 \overline{\text{SAY [SISTER INDEX}_3 \text{ IN.LOVE]}}^{\text{hs}}}$ [NGT]
 ?‘I **didn’t** say my sister is in love.’
 ??‘I **didn’t** say my sister is **not** in love.’ (Oomen, Pfau, and Klomp 2019)

Importantly, the exact same headshake spreading pattern in a sentence with a purported non-Neg-raising predicate like SAY, as in (5 b), leads to ambiguity: the example can be interpreted as involving a single negation scoping over the main clause, or two negations. The sentence is also judged as degraded under both interpretations.

In NGT, we thus find a contrast between constructions with Neg-raising versus non-Neg-raising predicates with identical spreading patterns. This is different in Auslan, where constructions with sustained spreading unambiguously yield a single negation reading regardless of whether they contain Neg-raising or non-Neg-raising predicates, as shown in (4).

These three works all suggest that sign languages, like spoken languages, have Neg-raising readings, although only Göksel and Keleşir (2016) provide direct evidence that a negation in a main clause with a Neg-raising predicate can indeed get a lower interpretation. We also currently lack a detailed description of the properties of Neg-raising constructions in sign languages. This brings us to our study aims.

3 Study aims

The aims of this study are to:

- (i) verify the existence of Neg-raising constructions;
- (ii) investigate the properties of Neg-raising in LSF, LIS, and NGT;
- (iii) further investigate how headshake spreading patterns interact with Neg-raising.

The three languages in our study are LSF, LIS, and NGT. When it comes to sentential negation, the former two can be categorized as what Zeshan (2004) calls manual dominant sign

languages (see Millet 2019 for LSF and Geraci 2006; Branchini and Mantovan 2020 for LIS), while NGT is a non-manual dominant language (see Coerts 1992; Oomen and Pfau 2017). We illustrate the basic properties of sentential negation in these three languages with a couple of examples. The videos for these and the other examples from the data that are presented in this paper, are publicly available at <https://doi.org/10.17605/OSF.IO/PSJ5G>.

Firstly, both LSF and LIS are manual dominant because a manual negative sign is required to express negation: a non-manual marker like headshake alone does not suffice to negate a clause. LSF is a head-initial language, as example (6 a) shows. LIS is a head-final language, as shown in (6 b).

- (6) (a) PIERRE $\frac{\text{hs}}{\text{NEG}}$ PLAY [LSF]
 ‘Pierre didn’t play.’
- (b) MARIA CAT SEE $\frac{\text{hs}}{\text{NEG}}$ [LIS]
 ‘Maria didn’t see the cat.’

Note that both examples in (6) include a headshake, but it does not spread beyond the manual negator. It thus appears that in LIS and LSF, sideward headshake does not carry negative force. This is different in NGT, where negation can be expressed via non-manual markers only. This is illustrated by example (7 a). However, when negation is manually expressed, as in (7 b), the non-manual and manual components enter into what could be analyzed as a sort of negative concord. That is, the manual negative sign and the non-manual negative markers do not cancel each other, resulting in a simple negated sentence.

- (7) (a) $\frac{\text{re}}{\text{MARIA CAKE EAT INDEX}_3}$ $\frac{\text{hs}}{\text{INDEX}_3}$ [NGT]
 ‘Maria, (she) doesn’t eat cake.’
- (b) $\frac{\text{re}}{\text{MARIA NEG CAKE EAT INDEX}_3}$ $\frac{\text{hs}}{\text{INDEX}_3}$ [NGT]
 ‘Maria, (she) doesn’t eat cake.’

NGT allows both SOV and SVO word orders, and the manual negative sign may occur before or after the predicate (Oomen and Pfau 2017). Consultants often point out that an overt manual negator functions to express emphasis. Since of the three languages in our study, only NGT is a non-manual dominant sign language, headshake spreading patterns will be investigated for NGT only.

4 Data collection

We collected our data with one (LIS) or two (LSF and NGT) language consultants per language. We recorded constructions with one consultant for each language following the play-back paradigm (e.g. Schlenker, Lamberton, and Santoro 2013; Kuhn 2016) and, a couple of weeks later, played back these constructions to each consultant. They then gave acceptability ratings on a scale from one to seven for each target construction. Crucially, they also provided evaluations of the possible meaning or meanings of each construction. This allowed us to establish which constructions did or did not trigger Neg-raising readings.

We elicited constructions with the predicates listed in Table 1. For each language, we included several predicates that, based on what we know from other languages, were likely to trigger Neg-raising readings. We also included at least three predicates per language that were expected to be non-Neg-raisers.

Table 1: Predicates tested in the study.

Expected Neg-raising			Expected non-Neg-raising		
LIS	LSF	NGT	LIS	LSF	NGT
BELIEVE	BELIEVE	THINK	SAY	SAY	SAY
WANT	WANT	WANT	ANNOUNCE	ANNOUNCE	ANNOUNCE
SENSE	SENSE	EXPECT	BLURT-OUT	DECIDE	DECIDE
DESIRE	PONDER		AUTHORIZE		TELL

5 Properties of Neg-raising constructions

To investigate the properties of Neg-raising in our three sign languages, we turned to the literature on Neg-raising in spoken languages, where various diagnostics have been proposed which can disambiguate between Neg-raising and non-Neg-raising constructions (see e.g. Fillmore 1963; Klima 1964; Horn 1978; 1989, for earlier works in which many of these tests were first introduced). In Sections 5.2 and 5.3, we discuss two of the tests that we applied, involving NPI licensing and negative quantifiers. Space limitations prevent us from discussing further diagnostics; we aim to report on these elsewhere in the future. Before we go into the specifics of the diagnostic tests, we take a necessary preliminary step in Section 5.1 by first verifying that the predicates listed on the left in Table 1 indeed trigger Neg-raising readings in our study languages.

5.1 Verifying Neg-raising readings

We verified the presence of Neg-raising readings in constructions with different predicates with pre-recorded stimuli videos featuring a brief dialogue between two signers (a consultant and one of the authors, fluent in the relevant language of study). Each dialogue had the same structure, as illustrated with a representative example from NGT in (8).

- (8) **Signer 1:** INDEX₁ $\frac{hs}{EXPECT}$ [LUCAS LEAVE] ‘I don’t expect Lucas to leave.’
Signer 2: $\frac{fr}{INDEX_2 EXPECT WHAT}$ ‘What is it that you expect?’
Signer 1: A. LUCAS $\frac{hn}{STAY}$ ‘That Lucas stays (=doesn’t leave).’
 B. INDEX₁ EXPECT $\frac{hs}{NOTHING}$ ‘I expect nothing.’

In each stimulus, the target construction was signed by the first signer, after which the second signer reacted with a question of the form “What is it that you *verb*”. Then, the two continuation options A and B were presented, of which option A, with the negation of what is the embedded clause in the target construction, should be accessible only with Neg-raising predicates. Option B, with negation of the main clause predicate, is expected to be the only possible response in constructions with non-Neg-raising predicates.

For all three languages, the results of this verification task confirmed our expectations. For the predicates on the left side in Table 1, signers consistently indicated that option A,

compatible with a Neg-raising reading, was perfectly fine. For the predicates on the right side, consultants indicated that option B was the only compatible option.

5.2 NPI licensing

As first observed by Seuren (1974), an important property of Neg-raising predicates is that they can license Negative Polarity Items (NPIs) occurring in the embedded clause. As shown in (9), NPIs such as *anything* or *lift a finger* are polarity-sensitive items that must occur in negative environments. Without a licenser, like *not* in examples (9 a) and (9 c), the sentences become unacceptable, as illustrated by (9 b) and (9 d).

- (9) (a) ‘Mary didn’t buy anything.’
 (b) *‘Mary bought anything.’
 (c) ‘Simon hasn’t lifted a finger.’
 (d) *‘Simon lifted a finger.’

Some NPIs have stricter licensing restrictions than others, as is the case for minimizers like *lift a finger* in (9 c)-(9 d). Interestingly, such ‘strong’ NPIs can be licensed by Neg-raising predicates, but not by non-Neg-raising predicates, as shown in (10).

- (10) (a) ‘I don’t believe Simon has lifted a finger.’
 (b) *‘I didn’t claim Simon has lifted a finger.’

As it happens, NPIs appear to be rather difficult to find in sign languages (see e.g. Loos and Schulder 2022). Fortunately, we have previously demonstrated in another work (Geraci, Oomen, and Santoro 2022) that the sign *UNTIL* functions as an NPI in LIS, LSF, and NGT, just like its counterpart in languages like English.

English *until*, and its equivalent in various other spoken languages, has been argued to be an NPI under a punctual interpretation (e.g. Karttunen 1974; Swart 1996; Condoravdi 2008). This is illustrated by (11 a), which is an acceptable sentence in English under the interpretation that the bomb exploded only after midnight. The same sentence but without a negative licenser (11 b) is not an acceptable sentence, unless it is coerced into a durative interpretation, i.e. that the bomb continued to explode all the way up until midnight. In Geraci, Oomen, and Santoro (2022), we show that this same pattern is attested in the three languages in our study.

- (11) (a) ‘The bomb didn’t explode until midnight.’
 (b) *‘The bomb exploded until midnight.’
 (c) ‘I don’t think the bomb exploded until midnight.’
 (d) *‘I didn’t say the bomb exploded until midnight.’

Crucially, *until* is licensed in Neg-raising constructions in which the negation occurs in the matrix clause (11 c), but not in otherwise identical non-Neg-raising constructions (11 d), unless it is interpreted as modifying the main clause predicate. In fact, this pattern is one of the reasons that *until* is characterized as a strong NPI: its licensing conditions are stricter than those of weak NPIs like *any*, which would be licensed in such constructions regardless of whether the matrix clause predicate is a Neg-raiser.

We tested whether the same pattern was also attested in the sign languages under study. This is indeed what we found, as demonstrated by the sentence pair in (12) from LSF. Furthermore, consultants confirmed that constructions with Neg-raising predicates like the one in (12 a) get the expected punctual interpretation ‘I think that Marie left at or after 3pm.’

- (12) (a) $\overline{\text{INDEX}_1 \text{ BELIEVE.NOT}}^{\text{hs}}$ [MARIE LEAVE UNTIL 3.HOUR AFTERNOON] [LSF]
 ‘I **don’t** believe that Marie left until 3pm.’
- (b) $*\overline{\text{INDEX}_1 \text{ NEG ANNOUNCE}}^{\text{hs}}$ [MARIE LEAVE UNTIL 3.HOUR AFTERNOON] [LSF]
 Lit.: ‘I **didn’t** announce Marie left until 3pm.’

Thus, we have shown for all three sign languages that the strong NPI UNTIL is licensed in Neg-raising constructions, but not in non-Neg-raising constructions, replicating the pattern previously described for spoken languages like English.

5.3 Negative quantifiers

The second diagnostic we discuss in this paper involves negative quantifiers such as *nobody* in subject position (Horn 1989). This test shows that the negation incorporated in negative quantifiers can be interpreted in the lower clause in a Neg-raising constructions, yielding a Neg-raising reading involving positive universal quantification of the quantifier, as shown by the sentence in (13 a). Such a reading is not accessible for constructions with non-Neg-raising predicates (13 b).

- (13) (a) ‘**Nobody** wanted Lucas to leave.’
 ≈ ‘Everybody wanted Lucas to stay.’
- (b) ‘**Nobody** claimed Lucas left.’

We applied this test to the three sign languages in the study. For NGT and LIS, the test worked as expected. Our consultants indicated that a construction such as (14 a) from LIS yields the expected Neg-raising interpretation, while its counterpart with a non-Neg-raising predicate (14 b) does not.

- (14) (a) $\overline{\text{GIANNI LEAVE WANT NOBODY}}^{\text{re}}$ [LIS]
 ‘**Nobody** wanted Gianni to leave.’
 ≈ ‘Everybody wanted Gianni to stay.’
- (b) $\overline{\text{GIANNI LEAVE SAY NOBODY}}^{\text{re}}$ [LIS]
 ‘**Nobody** said Gianni left.’

Thus, we show for LIS and NGT that negative quantifiers in subject position license a Neg-raising reading involving positive universal quantification. However, for LSF, we were not able to replicate this test because a negative quantifier appears to be disallowed in subject position.

6 Headshake spreading in NGT

We now turn to the issue of headshake spreading in NGT. We elicited constructions with a wide variety of spreading patterns, from which it became evident that our primary consultant had a clear preference for the spreading pattern illustrated by example (15 a). In the example, headshake accompanies the Neg-raising predicate *EXPECT* in the matrix clause, is then briefly interrupted, before it comes back again toward the end of the embedded clause to mark the predicate. The consultant often signed this spreading pattern spontaneously, sometimes even when we attempted to elicit a different target sentence. Despite the interruption between the two headshakes, the interpretation of the sentence is clear, according to both NGT consultants. The sentence in (15 a) can only mean ‘I don’t expect Lucas will leave’, which has the Neg-raising reading ‘I expect Lucas will not leave’.

- (15) (a) $\text{INDEX}_1 \xrightarrow{\text{hs}} \overline{\text{EXPECT}} [\text{LUCAS} \xrightarrow{\text{hs}} \overline{\text{LEAVE}}]$ [NGT]
 ‘I **don’t** expect Lucas will leave.’
- (b) $\text{INDEX}_1 \xrightarrow{\text{hs}} \overline{\text{TELL}} [\text{LUCAS} \xrightarrow{\text{hs}} \overline{\text{LEAVE INDEX}_3}]$ [NGT]
 ‘I **didn’t** say Lucas **won’t** leave.’

In contrast, in constructions with a non-Neg-raising predicate, like the one in (15 b), the exact same spreading pattern leads to a degraded sentence, which consultants say appears to involve negation of both main and embedded clause, although they generally found it hard to interpret such sentences.

Our findings are thus largely in line with the ones reported by Oomen, Pfau, and Klomp (2019), although there are a couple of slight differences. Firstly, Oomen et al. (2019) observed sustained spreading from matrix to embedded clause in their data, while a brief interruption in headshake between matrix and embedded clause was favored by our consultants. They judged constructions with sustained spreading as degraded, although they could still obtain Neg-raising readings for them. The second difference is that we found headshake spreading in Neg-raising constructions from matrix to embedded clause to be preferred but not obligatory, contrary to what was reported by Oomen, Pfau, and Klomp (2019).

We do not know what the source is of these small divergences; still, it is evident from both studies that identical spreading patterns in Neg-raising versus non-Neg-raising constructions yield markedly different interpretations, and that a headshake present in both matrix and embedded clause in Neg-raising constructions in NGT is interpreted as involving a single negation, not negation of both clauses.

To obtain further confirmation that non-manuals can generate Neg-raising readings in NGT, we also tested Neg-raising constructions with an *UNTIL*-phrase in the embedded clause and the headshake spreading pattern as described above, as shown in (16).

- (16) $\text{INDEX}_1 \xrightarrow{\text{hs}} \overline{\text{EXPECT}} [\text{INDEX}_3 \text{ LUCAS} \xrightarrow{\text{hs}} \overline{\text{LEAVE INDEX}_3} \text{ UNTIL 5.HOUR AFTERNOON}]$ [NGT]
 ‘I **didn’t** expect Lucas to leave until 5pm.’

The sentence in (16) can be paraphrased as ‘I expect Lucas to stay until 5pm, but he may leave after’. That is, the example gets the expected Neg-raising interpretation in which the NPI *UNTIL* is licensed. Incidentally, this also clearly demonstrates that headshake suffices to license an NPI in NGT, providing further evidence supporting the claim that headshake carries negative force in NGT.

7 Conclusion

To conclude, the application of the two diagnostics discussed in this paper, and other ones we have applied but did not report here, yielded results in line with those reported for various spoken languages. This provides strong evidence that Neg-raising as a phenomenon exists in these three sign languages, and that it has properties that are shared among the three sign languages as well as spoken languages that have Neg-raising.

We have also shown that a particular headshake spreading pattern in NGT, in which the headshake is resumed at the end of the embedded clause, yields a difference in interpretation in Neg-raising versus non-Neg-raising constructions, in line with previous findings by Oomen, Pfau, and Klomp (2019).

Finally, we would like to point out again that Neg-raising constructions can be used as a diagnostic for complex sentences, as Göksel and Kelepir (2016) have shown previously for Turkish Sign Language (TİD). Once it is proven for a given sign language that Neg-raising exists, as we have done for the three languages in our study, their existence can be used to argue for genuine cases of subordination in sign language structure. Here it once more becomes highly interesting to consider constructions with strong NPIs, because their licensing environment requires some form of c-command, and we know that the low interpretation of negation can only be derived via embedding.

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