Proceedings of SALT 32: 125–143, 2022

As strong as an NPI in LSF, NGT and LIS*

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Abstract Negative polarity items emerge from the interaction between some properties of the semantic module of human language and its lexicon. This leads to the expectation that they should be equally common in spoken and sign language, contrary to what has been documented. We describe the sign UNTIL in French Sign Language, Italian Sign Language and Sign Language of the Netherlands. We show that under its punctual reading, UNTIL behaves as a strong negative polarity item, just like English *until*. We also discuss why more prototypical cases of polarity items like *any* or *ever* are much harder to find in sign language.

Keywords: UNTIL, sign language, negative polarity items, NPI, LSF, NGT, LIS

1 Introduction

Given the growing interest in the formal properties of the semantics of sign languages and their interaction with iconicity (Schlenker 2018), it stems as odd that the domain of negative polarity items (NPIs) has not been systematically investigated yet. The key ingredients determining adequate environments for NPIs to be licensed do not seem to be *prima facie* affected by modality issues. Nonetheless, NPIs have been reported to be extremely rare in sign language (Quer 2020). In fact, no entry has been documented for the equivalent of English *any*, the most prototypical NPI in

* We thank the audience of SALT 32 and GLOW 45 for helpful comments we received during and after question time. Thanks are also due to Jeremy Kuhn for discussion of and suggestions for various aspects of this paper. Finally, but most importantly, many thanks are due to Merel van Zuilen and Thomas Lévêque, our NGT and LSF consultants who patiently checked with us all the data presented in this paper. The research leading to the results presented in this paper received funding from a Niels Stensen Fellowship awarded to Marloes Oomen, and from the European Research Council under the ERC H2020 program (Grant Agreement No.788077–Orisem, PI: Schlenker). Research was conducted at Institut d'Etudes Cognitives (ENS), which is supported by grants ANR-10-IDEX-0001-02 PSL*, ANR-10-LABX-0087 IEC, and ANR- 17-EURE-0017 FrontCog).

spoken languages, in any of the 43 languages listed in the international dictionary for sign languages SpreadTheSign (www.spreadthesign.com).

In this paper, we will show that while NPIs of the *any*-type and perhaps other potential candidates like *yet* and *ever* are indeed hard to find in sign languages, the sign UNTIL (words in small capitals represent sign glosses) shows consistent and robust NPI behavior under its punctual reading in the three sign languages under investigation. Note, incidentally, that 32 languages on SpreadTheSign have an entry for UNTIL, indicating that perhaps this offers a better starting point for exploring the properties of polarity-sensitive items in sign languages.[1]

The paper is organized as follows. First, we show that the visual modality *per se* does not induce any particular blocking effects for creating the downward entailing contexts in which NPIs thrive (Section 2). We then present the key properties that makes *until* a strong NPI in English (Section 3). Section 4 will provide preliminary evidence that UNTIL behaves like a strong NPI in French Sign Language (LSF), Italian Sign Language (LIS) and Sign Language of the Netherlands (NGT). We will then discuss why more prototypical cases of NPIs are not normally found in sign languages, and we also speculate on the reasons why the equivalent of English *any* is particularly difficult to find (Section 5). Section 6 concludes the paper.

2 Human Language and polarity sensitivity

The impact negation has on a sentence is not limited to reversing the conditions making it true. Polarity inversion also affects the direction of possible inferences that we draw from statements (Ladusaw 1980). For example, the situations that make the LSF sentence in (1a) true are opposite to those that make (1b) true.[2] In addition to that, if the sentence in (1b) is true, it generates the entailment that Jean ate pizza. In other words, if it is true that Jean ate pizza Margherita, then it must be true that he ate pizza, because pizza Margherita is a member of the set of pizzas. This entailment from subset to superset is not preserved under negation: if it is true that Jean did not

1 Of course, the fact that there is a lexical entry for UNTIL does not guarantee that it has NPI status in the language. The kind of evidence which we offer in this paper must be also provided.

2 Notational conventions for sign language examples: SMALL CAPS provide the sign-by-sign glosses of the examples in the local spoken language and English. Non-manuals are indicated only when relevant by means of a line above the glosses of the signs they co-occur with. A superscript abbreviation indicates the function of the non-manuals (e.g, $\overline{\text{SIGN}}^{\text{neg}}$ = non-manuals signaling negation). The main prosodic contours of the non-manual markers reported in this study are: if (conditional) = raised eyebrows, neg = headshake, topic = raised eyebrows, y/n (polar question) = raised eyebrow and forward head movement. Negation is highlighted in boldface when relevant, and italics is used to highlight polarity items when relevant. Punctuation between two glosses (e.g. 5.HOUR) indicates sign incorporation, namely the morphological process that fuses together two independent signs, while pointing pronouns are glossed as IX, with the subscript number indicating first/second/third person.

eat pizza Margherita, as in (1b), it is not necessarily true that Jean did not eat any pizza. In fact, Jean may have had another flavor of pizza. Thus, negative sentences do not allow for inferences of the subset-superset type. However, negation permits inferences of the opposite type, namely from superset to subset. This is shown by the example in (2a): if Jean didn't eat pizza, he necessarily didn't eat pizza Margherita, or Capricciosa, etc. This second type of inference is not available with affirmative sentences like (2b).

(1) a. JEAN MANGER PIZZA MARGHARITA
JEAN EAT PIZZA MARGHARITA
'Jean ate pizza Margharita.' **Inf.** = Jean ate pizza.

b. JEAN **NEG** MANGER PIZZA MARGHARITA
JEAN NEG EAT PIZZA MARGHARITA
'Jean didn't eat pizza Margharita.' **Inf.** ≠ Jean didn't eat pizza.

(2) a. JEAN **NEG** MANGER PIZZA
JEAN NEG EAT PIZZA
'Jean didn't eat pizza.' **Inf.** = Jean didn't eat pizza Margherita, Capricciosa, etc.

b. JEAN MANGER PIZZA
JEAN EAT PIZZA
'Jean ate pizza.' **Inf.** ≠ Jean ate pizza Margherita.

Environments like the one created by negation in (2a) are called downward entailing and have been subject to extensive research in spoken language (Ladusaw 1980; Zwarts 1998; Chierchia 2013, i.a.). The reason for this interest lies in how the grammar of human language capitalizes on this property to license NPIs. The most prototypical of these elements is probably the English word *any*, which can be licensed by negation, as shown by the contrasts between the examples in (3) and (4). Crucially, the meaning intended in the ungrammatical affirmative counterpart in the examples in (4) is carried by *some* in the grammatical examples in (5).

(3) a. John did**n't** see *any*body.
b. John did**n't** eat *any* pizza.
c. John did**n't** go *any*where.

(4) a. * John saw *any*body.
b. * John ate *any* pizza.
c. * John went *any*where.

(5) a. John saw somebody.
b. John ate some pizza.
c. John went somewhere.

The key point is that the licensing environments of NPIs are created by the logical properties of the semantic component of human language and are preserved across modalities: downward entailing environments are found both in spoken and in sign languages. A very strong prediction, then, is that the grammar of sign languages should exploit the same properties to license NPIs as well.

Contrary to expectations, though, NPIs have scarcely been documented in the realm of sign language. We suspect that this is not just because sign languages are understudied languages in general and formal approaches to sign language semantics are even rarer, but precisely because NPIs are indeed rarer in sign language, as already noted by Quer (2020). Antzakas (2006), for instance, points out that no equivalent of English *any* has been documented in Greek Sign Language. A similar situation is found for American Sign Language (Abner & Wilbur 2017, but see Schlenker 2018 for some potential cases of ANY as an NPI). Concerning the three languages under investigation in this study, recently published grammars do not discuss any clear case of NPIs either (see Millet (2019) for LSF, Klomp (2021) for NGT and Branchini & Mantovan (2020) for LIS). Our own investigation confirms that no obvious equivalent of *any* can be found in these three languages.

This is true also for NPI's next of kin, namely Free Choice Items. Apart from Nicola (2008), who describes the distribution and the semantics of the Quebec Sign Language expression N'IMPORTE-Q ('whatever') and concludes that it functions as a Free Choice Item, to our knowledge, nobody else has identified or discussed the semantics of other Free Choice Items in sign language.

Against this background, the question whether the visual-gestural modality employed by sign languages affects the emergence of NPIs becomes more than legitimate. If that is the case, then the finger cannot be pointed at the lack of licensing environments. In fact, nothing in the visual-gestural modality seems to block the generation of downward entailing contexts. The answer, we believe, should be found in the lexical properties of NPIs themselves and how the grammar of sign language manages them. We shall come back to this in Section 5, after having shown that not *all* NPIs are hard to find in sign language.

3 The hallmarks of *until* in English

Proof that UNTIL is an NPI in LSF, NGT and LIS is based on their virtually identical distribution to English *until*, whose key properties are briefly illustrated in this section. While the debate on the most appropriate analysis of *until* is still ongoing,

with the field split between a lexical ambiguity approach and a scope ambiguity approach, the literature is largely in agreement on the properties that make *until* a strong NPI (Karttunen 1974; Mittwoch 1977, 2001; Giannakidou 2002; Declerck 1995; Condoravdi 2009; Iatridou & Zeijlstra 2021).

A key property of English *until* is its ambiguity between a durative reading and a punctual reading, paired with a sensitivity to the types of predicate it combines with. Specifically, the durative interpretation of *until* is only accessible with atelic predicates (activities and states), as in (6), while only the punctual reading is accessible with telic predicates (accomplishments and achievements), as in (7).

(6) ***Until* & atelic predicates**

a. The baby slept *until* 5pm.

b. The baby did**n't** sleep *until* 5pm.

(7) ***Until* & telic predicates**

a. * The bricklayer built a house *until* 5pm.

b. The bricklayer did**n't** build a house *until* 5pm.

Crucially, the NPI nature of *until* becomes apparent when looking at its punctual uses. The minimal pair in (7a)-(7b) clearly show that positive sentences with punctual *until* are ungrammatical, while they are perfectly fine when negated.

A second property concerns the distribution of punctual *until* when compared to that of weak NPIs, like *any*, and that of strong NPIs, like minimizers and the temporal expression *in years*: the fact that *until* patterns with the latter is taken as evidence that it is a strong NPI. That is, like strong NPIs and unlike weak NPIs, *until* is not licensed in polar questions, in the antecedent of conditionals, and when embedded under a negated non-neg-raising predicate, as shown in (8), (9) and (10).

(8) ***Until* & polar questions**

a. Has *any* firecracker exploded?

b. * Has the firecracker exploded *until* 5pm?

c. * Have you seen a firecracker explode *in years*?

d. * Have you *lifted a finger* to help John?

(9) ***Until* & antecedents of conditionals**

a. If *any* firecracker exploded, I would have heard it.

b. * If a firecracker exploded *until* 5pm, I would have heard it.

c. * If a firecracker exploded *in years*, I would have heard it.

d. * If you *lifted a finger* to help me, I would have been done by now.

(10) ***Until* & non-neg-raising predicates**

a. John has**n't** argued that Peter blew up *any* firecracker.

b. * John has**n't** argued that Peter blew up a firecracker *until* 5pm.

c. * John has**n't** argued that Peter blew up a firecracker *in years*.

d. * John has**n't** argued that Peter *lifted a finger* to help him.

However, like all NPIs, including strong ones, *until* is licensed by local negation, as we have seen in the examples in (7) above. This is also true for complex constructions with neg-raising predicates, as illustrated in (11).

(11) a. I do**n't** think you *lifted a finger* to help the doorman.

b. I do**n't** think you helped the doorman *in years*.

c. I do**n't** think you helped the doorman *until* 5pm.

Until generates a punctual and a durative reading depending on the predicate it combines with; under its punctual reading, it behaves as a strong NPI.

4 The patterns of UNTIL in LSF, NGT and LIS

The main properties of UNTIL in LSF, NGT and LIS are presented in this section. The data come from three native signers, one per language, and have been collected over several on-line meetings using the playback method to elicit acceptability and felicity judgments (Schlenker 2014; Davidson 2020).[3]

The procedure involves three separate steps which are carried out with language consultants. Firstly, videos of target sentences are recorded. Secondly, in subsequent sessions, general acceptability judgments on a 7-point scale are collected for the recorded sentences. Finally, we collect felicity judgments of these sentences embedded in various contexts. Contexts are introduced by showing images, creating pre-recorded short dialogues, or having short narratives preceding the target sentence. LSF, LIS and NGT were the only languages used during elicitation. An example of an image used in the elicitation phase is given in Figure 1.

3 Data from LSF come from Thomas Lévêque, while those of NGT are from Merel van Zuilen. Data from LIS come from Mirko Santoro, who is also a co-author of the paper.

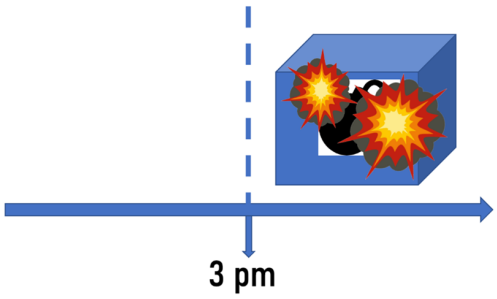

Figure 1 Example of a picture prompt used to elicit UNTIL sentences.

Still images of the signs UNTIL in the three sign languages are given in Figure 2. All signs have an iconic component represented by the movement of the hand. This could be either as prominent as the more or less arc-shaped side-to-side movement in LSF and LIS or more local like the wrist rotation in NGT. In either case, the trajectory of the hand somehow iconically references the temporal interval of the UNTIL phrase. Notice that the length, the speed and the intensity of the movement can be iconically modulated to incorporate shorter or longer time intervals. The position of the hand at the end of the sign locates the temporal boundary that is lexically specified by the UNTIL phrase on an abstract time-line that extends side-to-side in the signing space.

LSF NGT LIS

Figure 2 The sign UNTIL in LSF, NGT and LIS.

4.1 Until as an NPI in Sign Language

The examples in (12)-(15) replicate for LSF, NGT and LIS the distribution observed for English *until*.[4] When combined with atelic predicates like SLEEP or PLAY, the UNTIL phrase is found both in positive and negative sentences, as shown in (12)-(13). Crucially, UNTIL is only acceptable in negative sentences with telic predicates like EXPLODE, LEAVE or BE-BORN, as shown by the contrasts in (14)-(15).

4 To ease the reader, sign language examples are presented in triplets with the order LSF – NGT – LIS.

(12) **UNTIL with atelic predicates in positive sentences**

a. BÉBÉ DORMIR JUSQU'À 5.HEURE APRÈS-MIDI
BABY SLEEP UNTIL 5.HOUR PM
'The baby slept until 5pm.'

b. MARIA SPELEN TOT 5.UUR MIDDAG
MARIA PLAY UNTIL 5.HOUR PM
'Maria played until 5pm.'

c. topic
FINO 5.ORA POMERIGGIO BAMBINO DORMIRE
UNTIL 5.HOUR PM BABY SLEEP
'The baby slept until 5pm.'

(13) **UNTIL with atelic predicates in negative sentences**

a. BÉBÉ **NEG** DORMIR JUSQU'À 5.HEURE APRÈS-MIDI
BABY NEG SLEEP UNTIL 5.HOUR PM
'The baby didn't sleep until 5pm.'

b. neg
MARIA SPELEN TOT 5.UUR MIDDAG
MARIA PLAY UNTIL 5.HOUR PM
'Maria didn't play until 5pm.'

c. topic
FINO 5.ORA POMERIGGIO BAMBINO DORMIRE **NEG**
UNTIL 5.HOUR PM BABY SLEEP NEG
'The baby didn't sleep until 5pm.'

(14) **UNTIL with telic predicates in positive sentences**

a. * BOÎTE EXPLOSER JUSQU'À 5.HEURE APRÈS-MIDI
BOX EXPLODE UNTIL 5.HOUR PM
Intended: 'The box exploded until 5pm.'

b. * BOM ONTPLOFFEN TOT 5.UUR MIDDAG
BOMB EXPLODE UNTIL 5.HOUR PM
Intended: 'The bomb exploded until 5pm.'

c. * topic
FINO 5.ORA POMERIGGIO SCATOLA ESPLODERE
UNTIL 5.HOUR PM BOX EXPLODE
Intended: 'The box exploded until 5pm.'

(15) **UNTIL with telic predicates in negative sentences**

a. BOÎTE **NEG** EXPLOSER JUSQU'À 5.HEURE APRÈS-MIDI
   BOX NEG EXPLODE UNTIL 5.HOUR PM
   'The box didn't explode until 5pm.'

b. BOM ONTPLOFFEN$^{\text{neg}}$ TOT 5.UUR MIDDAG
   BOMB EXPLODE UNTIL 5.HOUR PM
   'The bomb didn't explode until 5pm.'

c. FINO 5.ORA POMERIGGIO$^{\text{topic}}$ SCATOLA ESPLODERE **NEG**
   UNTIL 5.HOUR PM BOX EXPLODE NEG
   'The box didn't explode until 5pm.'

The unacceptability of the examples in (14), which parallel that of their English counterparts, clearly demonstrates the NPI behavior of punctual UNTIL in the three sign languages. Despite their overall unacceptable status, the examples in (14) may receive an interpretation according to which the same object (e.g., the box or the bomb) has repeatedly exploded throughout the UNTIL time span. The reading emerges because a durative interpretation of UNTIL is coerced. Interestingly, this reading is mildly accessible even when the predicate is not inflected to iconically encode pluractionality (Kuhn & Aristodemo 2017).[5]

Two aspects concerning differences among the three languages are worth noting. The first concerns the means used to license the NPI; the second concerns the canonical position of the UNTIL phrase in the sentence.

At the macroscopic level, there are two main ways in which negation can be expressed in sign language: one is lexical and requires specific manual signs, the other is prosodic and requires the use of non-manual articulators (typically a headshake in western sign languages). Typologically, sign languages are divided into manual dominant languages and non-manual dominant sign languages (Zeshan 2004). In the former group of languages, negation is expressed via manual signs. This can be an independent sign, like the negative sign glossed as NEG in the examples above, negation incorporated into another sign (e.g., a modal), or a suppletive form. Non-manual markers, such as headshake, may accompany negative manual signs, but do not tend to spread over larger parts of the sentence. In the latter group of languages, the unmarked way of expressing negation is via non-manual articulators, while manual forms are optionally used in addition to non-manual markers. In

5 Pluractionality in sign language is typically encoded via morphological reduplication of the predicate. These repetitions may be further morphologically colored to convey either a reading in which a single event is repeated multiple times, or a plurality of events is performed (at the same time).

this respect, LSF and LIS can be classified as manual-dominant languages (see also Millet 2019 and Geraci 2006), while NGT can be classified as a non-manual dominant language (see also Coerts 1992; Oomen & Pfau 2017). The spreading of the negative non-manual marker in NGT is either limited to the verb or it extends to the VP, typically including the (direct) object, but does not typically extend over the UNTIL phrase. What is of particular relevance is that in some sign languages, the spreading of non-manual markers associated with functional heads is also assumed to mark c-command/scope domain, the most notable case being ASL (Neidle, Kegl, Maclaughlin, Bahan & Lee 2000). If this is to be maintained for NGT as well (but see Oomen, Pfau & Aboh 2018), the consequence is that in the surface syntax, the UNTIL phrase has moved to a position higher than NegP. In turn, this requires that the syntactic environment licensing the NPI is met either at first merge of Neg_0 (i.e., before movement of the UNTIL phrase) or via reconstruction at LF. Alternatively, we can simply assume, in line with Oomen et al. (2018), that the prosodic domain marked by the spreading of the non-manual components does not reflect the c-command/scope domain of NegP in NGT. It would just mark the constituent represented by the verbal head plus its complements, namely the VP. Either way, what is relevant for us is that NGT shows NPI licensing via prosodic means, that is, via use of headshake only.

The second difference concerns the syntactic position of the UNTIL phrase in the languages. While the UNTIL phrase follows the VP in LSF and NGT, the canonical position for the UNTIL phrase in LIS is at the beginning of the sentence, where it is normally accompanied by raised eyebrows, a typical indicator of topicalized constituents. Similarly to the case of NGT, here too there are two possible analyses. According to one analysis, the constituent has moved to a high topic position, hence requiring licensing either at deep-structure or after LF reconstruction. The other analysis would capitalize on the fact that negation is generated very high in the structure of LIS (Geraci 2006) and stipulates that topicalization does not always require overt movement of the constituent but can be simply marked by non-manual markers *in situ*. In this latter case, the UNTIL phrase would be located below NegP.

4.2 Until as a strong NPI in Sign Language

Now that we have cleared that UNTIL is an NPI in LSF, NGT and LIS, it remains to be proven what kind of NPI it is. In this section, we provide evidence that it is a strong NPI, like English *until*. The examples in (16)-(18) illustrate that punctual UNTIL is unacceptable in contexts where weak NPIs are normally licensed, namely the antecedent of conditional sentences, polar questions like and the sentential complement of non-neg-raising predicates, as shown in the examples in (16)-(18).

(16) **Punctual UNTIL is not licensed in conditionals**

a. * SI BOÎTE EXPLOSER JUSQU'À 5.H APRÈS-MIDI IX_1 FLEE
IF BOX EXPLODE UNTIL 5PM I FLEE
Lit.: If the box exploded until 3pm, I would have fled.

b. * ALS BOM ONTPLOFFEN TOT 5.UUR M., IX_1 THUIS BLIJVEN
IF BOMB EXPLODE UNTIL 5.H PM I HOME STAY
Lit.: If the bomb exploded until 5pm, I would have stayed home.

c. * FINO 3.ORA POMERIGGIO SCATOLA ESPLODERE, OBBLIGO
UNTIL 3.HOUR PM BOX EXPLODE FORCE
IX_1 POLIZIA AVVISARE
I POLICE WARN
Lit.: If the box didn't explode. until 3pm, I would have warned the police.

(17) **Punctual UNTIL is not licensed in polar questions**

a. * BOÎTE EXPLOSER JUSQU'À 5.HEURE APRÈS-MIDI
BOX EXPLODE UNTIL 5.HOUR PM
Lit.: Did the box explode until 5pm?

b. * BOM IX_3 ONTPLOFFEN TOT 5.UUR MIDDAG
BOMB THAT EXPLODE UNTIL 5.HOUR PM
Lit.: Did the box explode until 5pm?

c. * FINO 3.ORA POMERIGGIO SCATOLA ESPLODERE
UNTIL 3.HOUR PM BOX EXPLODE
Lit.: Did the box explode until 3pm?

(18) **Punctual UNTIL is not licensed in non-neg-raising constructions**

a. * JEAN **NEG** DIRE BOÎTE EXPLOSER JUSQU'À 5.H. AP-MIDI
JEAN NEG SAY BOX EXPLODE UNTIL 5.H. PM
Lit.: Jean didn't say that box exploded until 5pm.

b. * IX$_1$ VERTELLEN^{neg} IX$_1$ IX$_3$ LUCAS VERTREKKEN^{neg}
I TELL I PRO.3S LUCAS LEAVE
TOT 5.UUR MIDDAG
UNTIL 5.HOUR PM
Lit.: I didn't say that Lucas left until 5pm.
'I didn't say that Lucas didn't leave until 5pm.'

c. * FINO 5.ORA POMERIGGIO^{topic} AMICO VENIRE IX$_1$ DIRE **NEG**
UNTIL 5.HOUR PM FRIEND COME I SAY NEG
Lit.: I didn't say that (your) friend would have come until 5pm.

Crucially, punctual UNTIL is licensed in neg-raising constructions, as shown in (19).

(19) **Punctual UNTIL is licensed in neg-raising constructions**

a. JEAN **NEG**.PENSER BOÎTE EXPLOSER JUSQU'À 5.H. AP-MIDI
JEAN NEG.SAY BOX EXPLODE UNTIL 5.H. PM
'Jean didn't think that box exploded until 5pm.'

b. IX$_1$ VERWACHTEN^{neg} IX$_3$ LUCAS VERTREKKEN^{neg} IX$_3$ TOT
I EXPECT PRO.3S LUCAS LEAVE PRO.3S UNTIL
5.UUR MIDDAG
5.HOUR PM
'I didn't expect that Lucas would leave until 5pm.'

c. FINO 5.ORA POM.^{topic} AMICO VENIRE IX$_1$ VOLERE.**NEG**
UNTIL 5.HOUR PM FRIEND COME I WANT.NEG
'I didn't want (your) friend to come until 5pm.'

One important aspect of the NGT example in (19b) is worth a discussion. As shown in the glosses, a headshake co-occurs with the matrix predicate and is also found in the embedded clause, where it prosodically aligns with the predicate and the pronominal subject copy that follows it (also see Oomen et al. 2018). Although this pattern is the most preferred one by our informant, the headshake on the embedded

predicate can optionally be suspended. It is important to note, however, that the double headshake in (19b) does not generate two distinct interpretations of negation, but rather they enter in a sort of concord. Contrast this with the example in (18b), where the same spreading pattern yields a (marginally acceptable) reading in which both matrix and embedded clause are negated.

5 Discussion

The data presented in the previous section showed that UNTIL is a well-behaved strong NPI in LSF, NGT and LIS, sharing the same distribution as its English counterpart. This is an important empirical finding which illustrates that while it is definitely true that the most prototypical NPIs in spoken languages are hard to find in sign language, punctual UNTIL is not so hard to detect, after all. On the one hand, this indicates that the grammar of sign language does make use of downward entailing environments in a similar way as the grammar of spoken language, a point that can be taken as further and perhaps deeper evidence that the architecture of signed and spoken languages is essentially the same. On the other hand, it raises another more intriguing question, namely why the equivalent of English *until* has been easier to find than, say, the equivalent of English *any*, *yet* or *ever*. The answer to this question comes in three steps. First, we are going to show that the NPI status of UNTIL is a germane fact of the grammars of LSF, NGT and LIS. Second, we offer a tentative explanation for why the equivalents of *ever* and *yet* are hard to find in sign language. And finally, we offer some speculations as to why the equivalent of *any* is also difficult to find in sign language.

Sign languages are minority languages and their principal users, namely Deaf people, are typically bilingual with the sign language being their main means of communication and the spoken language used by the dominant community being a second language learned at school. In this sociolinguistic setting, language contact is far from rare, even in those signers who have a strong linguistic and Deaf identity. Given this, one must ensure that the properties of UNTIL that are documented for LSF, NGT and LIS in Section 4 do not amount to borrowings from the dominant spoken languages, namely French, Dutch and Italian. This is, in fact, very easy to show for the LSF-French and NGT-Dutch language pairs, as neither French nor Dutch have the equivalent of English punctual *until*. The French and Dutch temporal adverbs *jusqu'à* and *tot*, which we used to gloss the LSF and NGT UNTIL, can be used with durative interpretation in positive sentences, but do not yield a punctual NPI reading with telic predicates and cannot be found in negative sentences, as shown by the examples in (20) and (21). Instead, the equivalent of *before* must be used in these environments, namely *avant* and *voor*, as shown in (22).

(20) **Durative *until* in French and Dutch**

a. Le bébé a dormi *jusqu'à* 17 heures.
'The baby slept until 5pm.'

b. * Le bébé **n'**a **pas** dormi *jusqu'à* 17 heures.
Intended: 'The baby didn't sleep until 5pm.'

c. Maria speelde *tot* vijf uur 's middags.
'Maria played until five pm.'

d. * Maria speelde **niet** *tot* vijf uur 's middags.
Intended: 'Maria didn't play until five pm.'

(21) **Punctual *until* is not available in French and Dutch**

a. * Le pétard a explosé *jusqu'à* 17 heures.
Intended: The firecracker exploded until 5pm.

b. * Le pétard **n**'a **pas** explosé *jusqu'à* 17 heures.
Intended: 'The firecracker didn't explode before 5pm.'

c. * De bom ontplofte *tot* vijf uur 's middags.
Intended: 'The bomb exploded until 5pm.'

d. * De bom ontplofte **niet** *tot* vijf uur 's middags.
Intended: 'The bomb didn't explode until 5pm.'

(22) ***Before* in negative sentences in French and Dutch**

a. Le pétard **n'**a **pas** explosé avant 17 heures.
'The firecracker didn't explode before 5pm.'

b. De bom ontplofte **niet** voor vijf uur 's middags.
'The bomb didn't explode before 5pm.'

It is slightly trickier to show the independence of LIS FINO from the Italian *fino a*, as they both behave as NPIs. The examples in (23) shows the relevant contrast for Italian. One small difference between LIS and Italian can be found in the most natural position of the *until* phrase in the two languages. While it is normally found in sentence-initial position in LIS, it occurs in sentence-final position in Italian.

(23) **Punctual until is not available in French and Dutch**

a. * Il petardo è esploso *fino alle* 5.
Lit.: The firecracker exploded until 5pm.

b. Il petardo **non** è esploso *fino alle* 5.
'The firecracker didn't explode until 5pm.'

We now turn to an explanation why the equivalent of *yet* and *ever* are not documented as NPIs in sign language. In many sign languages, negation tends to incorporate into certain predicates, like those expressing cognition, emotion, volition and modals (Quer, Cecchetto, Donati, Geraci, Kelepir, Pfau & Steinbach 2017). Something similar happens with *yet* and *ever*, which in fact are frequently encoded in sign languages as NOT.YET and NEVER. In a certain sense, then, these signs are NPIs, except that they never occur separated from their negative licensor.[6]

More complex is the situation of the equivalent of *any*, for which we can only offer some speculation at this stage. Considering that downward entailing environments are equally active in both sign and spoken language, they cannot be considered an impediment for an NPI like ANY to emerge. A more promising place to look, we believe, is the lexical meaning of NPIs. Giannakidou (1998, 2001, 2011) proposes that the core nature of NPIs (and Free Choice Items) lies in the fact that they contain a non-deictic variable. It is this particular type of variable that requires special licensing domains (e.g., non-veridicality). Giannakidou's definition is given in (24).

(24) **Non-deictic variables** (Giannakidou 2011: 1667)
A variable is non-deictic iff *x* cannot be interpreted as a free variable.

We speculate that this requirement may be at odds with an important property of (pro-)nominal elements in sign language. That is, (pro-)nominal elements, including quantifiers, are associated with locations in the signing space. These locations are interpreted as variables with a clear deictic status (Lillo-Martin & Klima 1990, a.o.). We propose that this spatial requirement is at odds with the requirement of non-deictic variables not to be interpreted as free. Adverbial elements like UNTIL are not necessarily localized in space, hence are free to become NPIs. A similar analysis may extend to the sign N'IMPORTE-Q documented for Quebec Sign Language, whose behavior is that of a Free Choice Item (Nicola 2008). In this respect, our position is aligned with Giannakidou (2011), who claims that referential deficiency in the form of non-deictic variables is the kernel to the development of NPIs.

Crucially, non-deictic variables are a necessary but not a sufficient condition to generate NPIs. Indeed, "the path from being a non-deictic variable to being grammaticalized as an NPI may be longer or shorter for various items across languages, and other factors in grammar and, especially, use are expected to play a role" (Giannakidou 2011: 1697). In this respect, it is worth pointing out that sign languages

6 It should be noted that in LSF and NGT, there are signs in which the negative morpheme is not so easily identifiable, such as the sign NOT.YET in both languages. For these, it is only the non-manual component that contributes to the negative meaning. We leave this issue for future research.

are young languages with iconic requirements imposed by the visual modality (e.g., spatial localization of pronominal elements) that may delay or even block the natural development of NPIs of the *any*-type. Indirect evidence for this may come from the literature of indefinite and impersonal pronouns in sign language. Both in LIS and in LSF, a mouth-corner down facial expression is used as an indefinite marker when it accompanies the manual signs for SOMEONE and the classifier for PERSON (Mantovan & Geraci 2018). The morphological contribution of this facial expression could be seen as a backgrounding mechanism that in the long run might defuse the deictic component of space in signs like SOMEONE and PERSON, turning them into candidates for becoming polarity items. Whether this is a viable path towards more canonical NPIs in sign language remains an open issue. If proven true, then sign language may reveal further hidden aspects of the compositional properties of NPIs.

6 Conclusions

In this paper, we provided evidence that punctual UNTIL is a strong NPI in three sign languages, namely LSF, NGT and LIS. We did that by showing that the sign in each of the three languages has the same distribution as English *until*. We argued that the NPI status of UNTIL is an indigenous property of these sign languages, rather than it being imported from the spoken languages used by the surrounding dominant communities. Finally, we discussed why other potentially more prototypical NPIs like *yet*, *never* and *any* are much harder to find in sign language. On the one hand, we took the observation that negation easily incorporates functional elements and (light) predicates in sign language to explain why YET and EVER may not be easily found as independent lexical items. On the other hand, we speculated that spatial *loci*, a key ingredient of the sign language (pro-)nominal and quantifier system, may prevent or slow down the development of NPIs from indefinite pronouns.

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As strong as an NPI

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