

Subordination in LSF : nominal and sentential embedding

Charlotte Hauser

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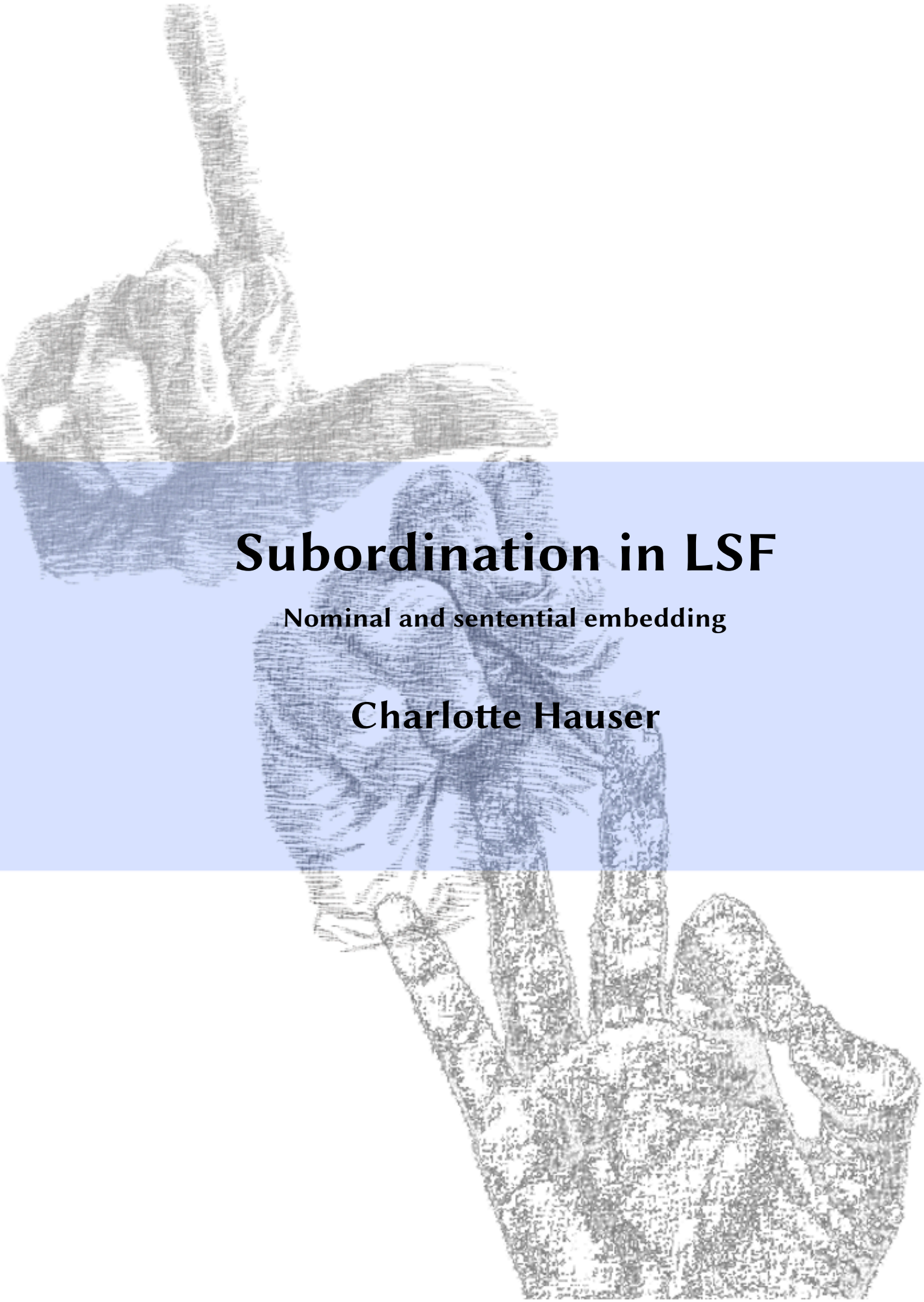
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Subordination in LSF

Nominal and sentential embedding

Charlotte Hauser

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Abstract

In this dissertation, we aim at investigating the syntactic complexity of LSF. We start with the well studied (in other sign languages) case of relativization strategies, which instantiates both subordination and recursive embedding. These properties have repeatedly been argued to be at the heart of human languages; hence, relative clauses are the flag holder of every understudied language aiming at seeing its status recognized. Regarding LSF, we describe two manual markers that we analyze as d-like relative pronouns, as well as a non-manually marked alternative strategy, and we show that LSF has both internally and externally headed relative clauses. We show that, depending on the relative pronoun used, the relatives instantiates different semantic properties. We integrate our findings in a generative formal framework. We also investigate the processing of subject and object relative clauses in this language, through the adaptation of a well-known eye-tracking paradigm. Through this experimental study, we find the existence of a Subject advantage in LSF. In the second part of the dissertation, we investigate several complex sentences: temporal constructions, question-answer pairs and sentential complements. While we know from spoken languages researches that temporal constructions surface through a variety of syntactic strategies such as subordination, juxtaposition or coordination, finding their equivalent in sign languages is often a challenge due to the absence of overt complementizers and other function words such as coordinators. This dissertation explores temporal constructions in LSF and frames them within a broad typological perspective. We show that LSF temporal clauses are very different from those of LIS. In particular, LSF constructions use two coordinated clauses, and the temporal marker is part of the second conjunct. Regarding Question Answer Pairs (QAP), a growing literature has emerged on sign languages describing this particular construction, which looks like a question followed by its fragment answer, but which crucially is not interpreted as such. In Kimmelman and Vink (2017), the authors propose the existence of a grammaticalization process, starting with information-seeking questions and ending with a question-answer constituent, creating a bridge between two of the main analyses that have been proposed in the literature to account for these constructions across sign languages. We demonstrate, based on an extensive depiction of LSF QAP properties, that the grammaticalization scale proposed in Kimmelman and Vink (2017) has to be further developed to integrate free-relatives as its ending point. Finally, we provide a rather extensive investigation of sentential complements in LSF, showing that, in their vast majority, they are subordinated to the main predicate. We also show that LSF displays various types of complements, either finite, non-finite, or introduced by a complementizer.

Keywords

French Sign Language; Grammar; Subordination; Coordination; Relative clauses; Temporal clauses; Question-Answer-Pairs; free-relatives; Sentential complements; complementizer

Résumé

Dans cette thèse, nous visons à étudier la complexité syntaxique de la LSF. Nous commençons par le cas bien étudié (dans d'autres langues des signes) des stratégies de relativisation, qui instancient à la fois la subordination et l'enchâssement récursif. On a maintes fois fait valoir que ces propriétés sont au cœur des langues humaines ; par conséquent, les clauses relatives sont le porte-drapeau de chaque langue sous-étudiée visant à faire reconnaître son statut. En ce qui concerne la LSF, nous décrivons deux marqueurs manuels que nous analysons comme des pronoms relatifs de type D, ainsi qu'une stratégie alternative non marquée manuellement, et nous montrons que la LSF a des clauses relatives à la fois à tête interne et externe. Nous montrons que, selon le pronom relatif utilisé, les propositions relatives instancient différentes propriétés sémantiques. Nous intégrons nos résultats dans le cadre formel de la grammaire générative. Nous étudions également le traitement des propositions relatives sujet et objet dans cette langue, à travers l'adaptation d'un paradigme bien connu d'occulométrie. À travers cette étude expérimentale, nous trouvons l'existence d'un avantage Sujet en LSF. Dans la deuxième partie de la thèse, nous étudions plusieurs phrases complexes : constructions temporelles, fausses questions et compléments sententiels. Bien que nous sachions, d'après les recherches sur les langues parlées, que les constructions temporelles émergent à travers une variété de stratégies syntaxiques telles que la subordination, la juxtaposition ou la coordination, trouver leur équivalent dans les langues des signes est souvent un défi en raison de l'absence de complémenteurs et autres mots fonctionnels tels que les conjonctions de coordination. Cette thèse explore les constructions temporelles en LSF et les inscrit dans une large perspective typologique. Nous montrons que les clauses temporelles en LSF sont très différentes de celles trouvées en Langue des Signes Italienne (LIS). En particulier, les constructions LSF utilisent deux clauses coordonnées, et le marqueur temporel fait partie de la seconde conjonction. En ce qui concerne les fausses questions (QAP), une littérature de plus en plus abondante sur les langues des signes décrit cette construction particulière, qui ressemble à une question suivie d'une réponse fragmentaire, mais qui n'est pas interprétée comme telle. Dans Kimmelman and Vink 2017, les auteurs proposent l'existence d'un processus de grammaticalisation, commençant par des questions de recherche d'information et se terminant par une composante question-réponse, créant un pont entre deux des principales analyses qui ont été proposées dans la littérature pour prendre en compte ces constructions dans les langues des signes. Nous démontrons, sur la base d'une description détaillée des propriétés des QAP en LSF, que l'échelle de grammaticalisation proposée dans Kimmelman and Vink 2017 doit être développée davantage pour intégrer les relatives sans tête comme point final. Enfin, nous présentons une étude assez approfondie des compléments sententiels en LSF, qui montre que, dans leur grande majorité, ils sont subordonnés au verbe principal qu'ils suivent. Nous montrons également que la LSF présente différents types de compléments, qu'ils soient finis ou non finis, ou introduits par un complémenteur.

Mots-clés

Langue des Signes Française ; grammaire ; subordination; coordination ; propositions relatives ; clauses temporelles ; question/réponse ; relative sans tête ; compléments sententiels ; complémenteurs

À compter de ce jour j'entamai une progression fulgurante, j'absorbais tous les signes que je voyais, naviguant de découvertes en découvertes. Je mettais enfin du sens sur ce qui s'offrait à mes yeux. Des possibilités infinies se profilaient devant moi […]. Sans le savoir, j'avais enfin accès à une langue.

Victor Abbou (2017)
Une clé sur le monde.

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Sign Languages names

ASL	American Sign Language.
AUSLAN	AUstralian Sign LANguage.
BSL	British Sign Language.
DGS	German Sign Language - *Deutsche Gebärdensprache.*
HKSL	Hong Kong Sign Language.
Irish SL	Irish Sign Language - *Teanga Chomharthaíochta na hÉireann.*
JSL	Japanese Sign Language - *Nihon Shuwa, NS.*
LIBRAS	Brazilian Sign-Language - *Língua de sínaís Brasíleíra* .
LIS	Italian Sign Language - *Lingua dei Segni Italiana.*
LSC	Catalan Sign Language - *Llengua de Signes Catalana.*
LSF	French Sign Language - *Langue des Signes Française* .
NGT	Sign language of the Netherland - *Nederlandse Gebarentaal* .
TÍD	Turkish Sign Language - *Türk Íşret Dili* .

Abbreviations

AOI	Area Of Interest.
ARC	Adjunct Relative Clause.
Comp.	Complementizer.
EEG	Electroencephalogram.
EHRC	Externally Headed Relative Clause.
fMRI	functional Magnetic Resonance Imagery.
HM	Head Matching.
HR	Head Raising.
IHRC	Internally Headed Relative Clause.
LAN	Left Anterior Negativity.
LCA	Linear Correspondance Axiom.
LF	Logical Form.
NMMs	Non Manual Markers.
NPI	Negative Polarity Items.
ORC	Object Relative Clause.
PET	Positron Emission Tomography.
PF	Phonological Form.
PPC	Predicational PseudoCleft.
QAP	Question Answer Pairs.
RC	Relative Clause.
RelM	Relative markers.
RelP	Relative Pronoun.
ResP	Resumptive pronoun.
SL	Sign Language.
SPC	Specificational PseudoCleft.
SRC	Subject Relative Clause.
VWP	Visual World Paradigm.

Glosses conventions

$_1$SIGN$_3$ subscript numbers indicate points in the space used in verbal agreement and pronominalization. We use subscript '1' for a sign directed towards the body of the signer, '2' for a sign directed towards the addressee, and '3' for all other loci (can be subdivided into '3a', '3b', etc.).

-CL indicates the use of a classifier handshape that may combine with verbs of movement and location, the CL may be further specified using either a shape characteristic or the entity that is classified (e.g. ROUND-CL or VEHICLE-CL).

S-I-G-N indicates that a word is fingerspelled.

INDEX$_3$/IX$_3$ a pointing sign towards a locus in space; subscripts are used as explained above.

SIGN^SIGN indicates the combination of two signs, be it the combination of two independent signs by compounding or a sign plus affix combination.

SIGN-SIGN indicates that two words are needed to gloss a single sign.

SIGN++ indicates reduplication of a sign to express grammatical features such as plural or aspect.

SIGN As is common convention in the sign language literature, signs are glossed in small caps (SIGN) in the examples as well as in the text. Glosses are in English, irrespective of the sign language.

/xxx/ lexical marker: a mouth gesture or mouthing (silent articulation of a spoken word) associated with a sign; whenever possible, the phonetic form is given.

Lines above the glosses indicate the scope (i.e. onset and offset) of a particular nonmanual, be it a lexical, a morphological, or a syntactic marker. Some of the abbreviations refer to the form of a non-manual marker while others refer to the function.

bf body lean forward.

bt/ht body or head turn.

cdm corned down mouth.

emo± emotion marker (positive + or negative -).

gt grinded teeth.

hn head nod.

hs chin down.

hs headshake.

lc low chin.

le low eyebrows.

lg left gaze.

neg syntactic negation marker: side-to-side headshake.

re raised eyebrows (e.g. topic, yes/no-question).

rg right gaze.

se squinted eyes.

top syntactic topic marker: raised eyebrows, head tilted slightly back.

urg upward right gaze.

wh syntactic wh-question marker, frowned eyebrows and mouthing of the wh-word in French.

woe wide opened eyes.

y/n syntactic yes/no-question marker: raised eyebrows, forward head tilt.

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Chapter 1

Introduction

1.1 General introduction

Sign language research has been at the heart of growing literature over the past few decades, but a lot is still missing as far as grammatical descriptions of specific sign languages are concerned. Complete descriptions of most sign languages are not yet available, and this has negative consequences not only for linguists but also for a whole range of professionals who need to rely on a full description of the language, such as teachers, interpreters, or clinicians. Investigating sign language grammar is also very important for the concerned Deaf community itself; it provides arguments and tools to defend their status.

Indeed, researching subordination in sign languages has a broad impact on general approaches to sign language linguistics and a specific impact on the study of LSF. The broad impact concerns the status of language in the visual modality. Early research showed that SL have a phonological and a morphological domain (Stokoe Jr 1960/2005) and that some level of syntactic organization is also accessible. However, clear cases of genuine embedding at the sentential level are very hard to document and demonstrate. The main reasons being the lack of overt complementizers and, in part, the poor understanding of the role of non-manual components. The question about sentential subordination intersects an even broader and more delicate issue. In the relatively recent works by Chomsky (Hauser, Chomsky, and Fitch 2002 or Fitch, Hauser, and Chomsky 2005) and the debates stemming from them (Pinker and Jackendoff 2005) pushed the idea that the core component of human language understood in the strictest way is the recursive property (i.e., one specific characteristics of human language syntax). The power of recursivity can be easily detected once looking at cases of multiple embedding, which are instantiated both with sentential complementation and relative clauses. This debate about the core aspects of human language brought back the unsolved issue of subordination, embedding and recursivity in SL. The specific impact of our work with the study of LSF is related to the fact that, despite (Old) French Sign Language being probably at the root of many European SL, and of ASL too, very little research has been done on the syntax of this language. In this respect, we hope that our work will provide an important contribution to the empirical documentation of LSF.

In this dissertation, we aim at investigating LSF grammar with a focus on complex sentences.

At the nominal level, we start by investigating relativization strategies in LSF, a well-studied topic in sign languages (see Section I.2.2 for a review). After presenting the state of the art of both typological (Section I.2.1) and formal (Section I.2.3) accounts of relative clauses, we show

in Chapter I.2 that LSF has genuine cases of relative clauses and that they can be both internally and externally headed. We will show that relative clauses are marked in three different ways: by using prosodic cues only (i.e., facial expressions and body postures), or by using one of the two manual signs. One is the classifier for person, which is specific to human referents. The other is a particular kind of pointing sign and is available for all kinds of referents. In the last Chapter I.4, we present two experiments, one in French and one in LSF, to test the processing of relative clauses on a broader population, using an eye-tracking protocol. Doing so, we show 1) that it is possible to adapt a pre-existent audio-visual paradigm into a visual-only display. This finding paves the way for studying sign languages with the same fine-grained methodologies from which spoken languages theories benefit. We also show 2) that LSF presents the Subject Advantage in the processing of relative clauses, a process that appears universally attested in spoken languages.

In the second part of this dissertation we investigate a number of complex sentences found in LSF with always the same question in mind: how are the two clauses related to each other? We start by comparing LIS and LSF temporal clauses (Chapter II.5) and, through their different patterns across several syntactic tests, show that *prima facie* resemblance between two signed languages is by no means indicative of their underlying structure. In Chapter II.6, we turn to the analysis of 'false-questions', or QAP, in LSF. We show that they present different properties from their ASL, NGT and LIS counterparts. Along with an extensive review of the myths which continue to spread within the sign language literature on the topic, these results will lead us to propose a grammaticalization path leading from questions/answers to referential free-relatives. Finally, in Chapter II.7, we carefully investigate about fifty sentential complements in LSF. To determine how they are related to their main predicates, we conduct a systematic empirical work aiming at unearthing their syntactic properties. Along our path, we discover the use of a complementizer 'WHAT$_{comp}$' which is obligatory used to introduce commentative predicates, and optionally present in other cases.

We start this dissertation by providing a glimpse at the necessary background needed to better understand the complexity of the Deaf community, the variations within the signing communities, and the LSF's specific socio-linguistic context. We also present the linguistic specificities induced by the visual modality of signed languages. We then introduce the needed bases of LSF's grammar before describing the methods we used throughout our researches.

1.2 Visualizing sign languages

1.2.1 Sociocultural background

In this thesis, we are investigating French Sign Language, the language of the French Deaf people. However, what does it mean to be Deaf with a capital D (Woodward 1972)?

1.2.1.1 d/Deaf

This concept arose in reaction to the medical perspective onto deafness, on which Deaf individuals are primarily seen through the notions of impairment and deficiency. Within this perspective, Deaf people are considered mainly through a lack, which feeds stereotypes within the society about Deafs abilities and impact greatly their life (see Benvenuto (2004), Myrdal 1944, Monaghan et al. 2003, Krentz 2004 or Skutnabb-Kangas 2003 for in-depth analysis of these phenomenons). A rather different narrative has nevertheless emerged in the past fifty years with the concept of 'Deafnicity' (Lane, Paul-Grosjean, and Butel 1979) and being 'Deaf'. Through this word, Woodward (1972) aims at distinguishing the cultural construction (=Deaf) from the medical

circumstance (=deaf). In this respect, Deaf individuals form a community (or even an *ethnos*, following Eckert 2010), which revolves mainly around its shared sign language and life experiences.
Life experiences vary significantly across countries and contexts. For example, living in a village versus living in an urbanized area might influence the degree of integration of the Deaf people within society. Similarly, having centralized education policies or, on the contrary, decentralized, are other factors of variations that have a definite impact on Deaf lives. Nevertheless, Monaghan et al. (2003) identify many common patterns, universal throughout Deaf history. Among these patterns, Monaghan et al. (2003) say that there is not a time T in History which can be taken as being the precise origin of a Deaf community; they arise as soon as multiple Deaf individuals are together. Often this opportunity surfaces through schools and institutions. In France, more and more works are investigating the History of LSF and the Deaf community (see, for example, Cantin 2016 or Mottez 1977).

1.2.1.2 The Deaf community

The sign language of the Deaf communities (ASL for the American Deaf community, LSF for French Deafs) is at the heart of their culture and ethnos. Eckert (2010) highlights the various distinctions within the 'Signing community', which includes all d/Deaf and non-d/Deaf individuals signing. The members of the signing community vary greatly in terms of their hearing status, their SL fluency, their age and mean of acquisition, and their contribution to the Deaf community. While being Deaf entails being part of the signing community, the reverse is not true, as illustrated in Figure (1). To describe the signing community Eckert (2010) says:

> "Although SL fluency is preferred, it is not required [...] Anyone with interest in sign languages can be a member [of the signing community] for the duration of their interest." (*Eckert, 2010: 325*)

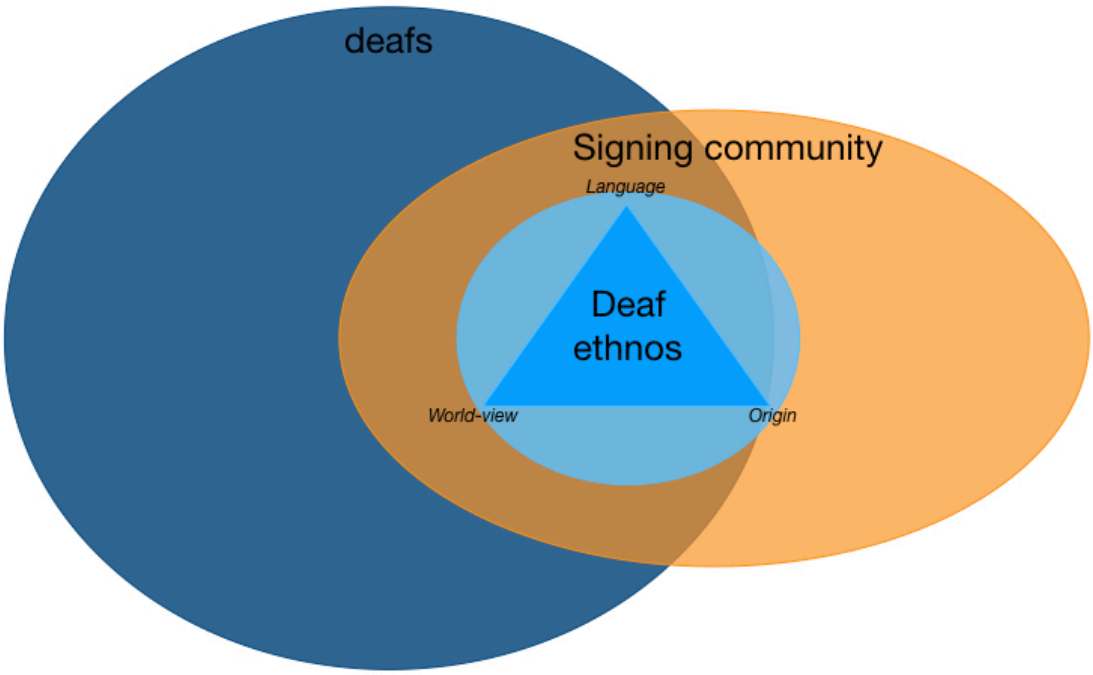


Figure 1. Illustration of Deaf ethnos and its position with respect to the Deaf and Signing community, elaborated on the basis of Eckert (2010).

Figure 2. Brentari's model of SL lexicon.

1.2.1.3 Towards language recognition

As language is at the very heart of the Deaf culture, it is very relevant to document every SL. In this respect, the seminal work of Stokoe Jr (1960/2005), acknowledging the language status of sign languages, has paved the way for their linguistic investigation and formalization. In France, 'Le réveil Sourd' (translated: The Deaf awakening) refers to the re-appropriation of their culture by Deafs in the 1970's[1]. Within this movement was Christian Cuxac (1983), who significantly contributed to the recognition of the LSF as being a fully-fledged language, different from French, until its legal recognition in 2005. While Cuxac (1983)'s work has made it possible to identify the specificities of visual languages through a system designed explicitly for their study, a lot more work remains about the descriptive, formal, and comparative dimensions, especially for LSF. This is precisely what we aim at doing in this dissertation, at least in the domain of subordination.

1.2.2 Accessing language through the visual modality

Sign languages are realized both through the hands and through non-manual markers. Regarding manual signs, three types of signs co-exist in the native lexicon of sign languages: core signs, classifiers (Brentari and C.A 2009), and compounds (Santoro 2018). While we will not go in the details of this classification, we repeat the figure proposed in Santoro (2018) in Figure (2). Classifiers are generic morphemes, expressed through particular handshapes that iconically map a salient characteristic of the entity referred to (Zwitserlood 2012).

Since sign languages use the visual modality, any visual cue may have an impact on the interpretation of the sentence. The 'NMMs' are pieces of information conveyed through other means than the hands; they can include movement of the body or the eyebrows, eye-gaze direction, and any other facial expression. They can, for example, express declarative vs. interrogative force of a sentence, or negation, among other things (Baker and Padden 1978), but they also play a role in determining the structure of relative clauses and other subordinate clauses (see for example Cecchetto, Geraci, and Zucchi 2006). As specified in the glossing conventions of this dissertation, we indicate the extension (or spreading) of NMMs over manual signs by using a line above the glosses. Each NMM has a label describing its meaning or its phonological features. In the example in (1), the topicalized constituent is co-articulated with a topic NMMs, which is indicated by the line above the signs 'NEXT' and 'WEEK'.

(1) $\overset{\text{top}}{\overline{\text{NEXT WEEK}}}$ FUTURE SEE B-I-L-L *[ASL]*
'Next week, I'll see Bill.'

(Leeson & Saeed, 2012: 251)

1.2.3 Use of space

Space is used for several linguistic functions across sign languages; this includes references of time or nominals as well as, for example, agreement. Here we present an overview of how time can be mapped in space across SL.

[1] Several works show that there was a strong Deaf community, signing in old LSF well before the Deaf awakening, see Pélissier (1856) or Cantin (2016)

1.2.3.1 Time

In Sinte (2015)'s book 'Le temps en langue des signes' (*'Time in signed languages'*), the author offers a review of how time is expressed across sign languages. Along the line of previous cross-linguistic studies Pfau, Steinbach, and Woll (2012), the author remarks that temporality is mainly expressed through lexical items, spatial timelines, and NMMs. In fact, all these components interact to express fine grained degrees of temporal relations.

Regarding the spatial timelines, many authors (Brennan 1983 for BSL, Engberg-Pedersen 1993 for NGT, Sallandre 2007 for LSF, Pizzuto et al. 1995 for LIS or Johnston 1991 for AUSLAN) argue that these are visual representation of time in the signing space. Sinte (2015) lists a total of six different timelines described in the literature. Based on the author's description of each line, we produced the Figure in (3).

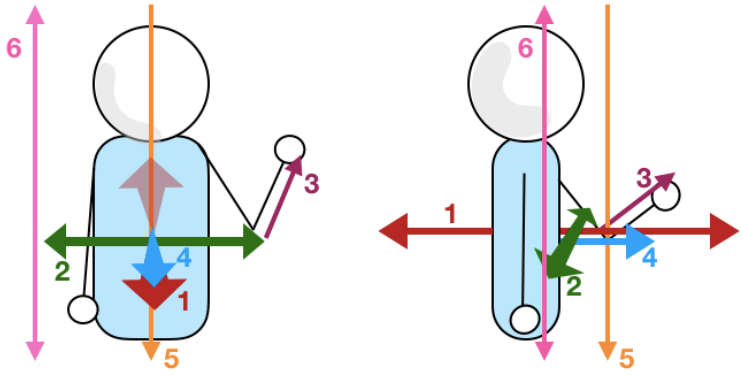


Figure 3. Timelines in space, elaborated on the basis of Sinte (2015).

More specifically, line number 1 (in red in Figure 3) is called the 'deictic line'. It takes the signer's body as the present reference and the space in front/behind him as the future/past. Line 2 (in green, from left to right on the horizontal plane) is the 'duration/continuity line'. The line number 3, (in purple from the elbow to the fingers of the non-dominant arm) is used for calendar events and anaphora in BSL while the line 4 (in blue, on the horizontal plane in front of the signer) is the 'mixed line' used for all three precedent functions. Additionally, the latter can express succession between specific events. The 5^{th} line (in orange, on a vertical plane in front of the signer) refers to the succession of events organized as in an agenda in BSL. [2] Finally, line 6 (in pink, on the vertical ipsilateral plane) is called the 'ontological line' and refers to the life-time related event of individuals.

Out of these six lines, only the line number 1, which is visualized in Figure (3) as a horizontal line going from behind the signer to ahead of him, is consistently described cross-linguistically.

Reference to these lines can appear through movement and localization of the signs, or through body lean. The latter is the main non-manual cue used to express temporal information: leaning the body back expresses the past tense while leaning it forward expresses the future. This use of virtual lines goes beyond time reference; spatial realization is an essential aspect of sign languages that is visible at all levels of the linguistic input.

[2] Under closer inspection, line 5 might not be linked with time itself but rather with the concept of ordering and prioritizing. Data from LSF support this claim since the same vertical line is used to refer to the ranking of categories, competitors or even the succession of floors in a building.

1.2.3.2 Nominals, reference, and agreement

A peculiar use of space which is typical of sign languages is when nominals are associated with a point in space, named locus. Nominals can be signed in a specific location of the signing space and be referred back by pointing toward this localization, as in example (2) (Liddell 1980, Pfau and Steinbach 2015, Wilbur 1996 a. o.).

(2) Here is Mary$_i$. She$_i$ received a gift.

We illustrate this process in Figure (4) and will explain it in more details while describing the LSF grammar.

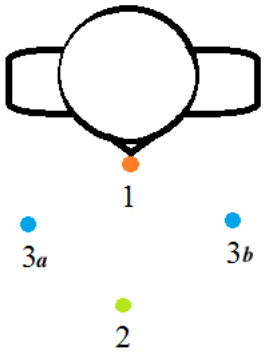
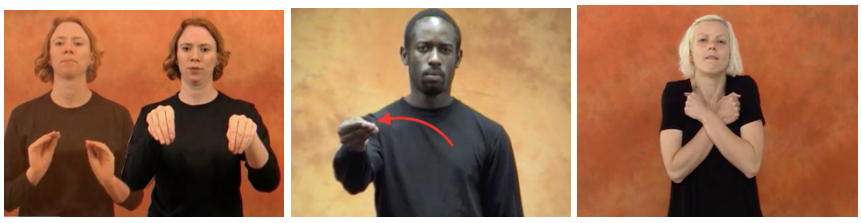


Figure 4. Illustration of loci in space with respect to the signer's body.

The loci can also be visible in the realization of some verbs and functions like agreement markers. Across SL, three main types of verbs have been identified by Padden (1990): spatial (cf. Fig. 5a), agreeing (Fig. 5b) and non-agreeing verbs (Fig. 5c). For the last two types, we prefer the terms 'directional' and 'plain', which are more neutral on whether some kind of agreement is present or not.
Directional verbs are described by Padden (1990) as verbs that contain agreement affixes for person and number for both the subject and the object. The two arguments are expressed through movement, with, in general, the onset of the verb movement being the subject locus and the object locus, the offset (see Figure 5). Backward verbs, a subcategory of directional verbs, also use movement from one locus to the other but in the opposite direction, with the onset of the movement being the object of the verb. Plain verbs are realized on the body or neutral space and do not express agreement through movement. Spatial verbs, finally, contain locative affixes in their morphology.



(a) Spatial verb: PUT **(b)** Agreeing verb: GIVE **(c)** Non-agreeing verb: LOVE

Figure 5. Illustration of the three types of verbs: spatial, agreeing and plain, in ASL.

1.3 Investigating the grammar of French Sign Language

In this section, we provide pieces of information about the grammar of LSF that will be needed to interpret the results of our thesis fully. This includes a description of the language's main grammatical properties, coming from the literature, whenever possible, or out of our work, whenever needed.

1.3.1 Word order in LSF

In LSF, the possibility to position nominals in space has led proponents of what Millet in Millet and Verlaine (2017) calls the 'divergent approach' (among many others Cuxac 1999, Cuxac 1983, Sallandre 2007 or Sallandre 2003), to postulate this as mandatory. According to this view, the syntax is virtually absent from LSF which is said to be structured on pragmatic and semantic grounds, the use of space being at the heart of sentence realization. In this account, word order is described as follows: time of the event > location of the event > patient > beneficiary > agent > action. This is illustrated in example (3).

(3) YESTERDAY, SCHOOL, BOOK, MARY$_i$, JOHN$_j$ $_j$GAVE$_i$.
'Yesterday, at school, the book, to Mary, John gave (it).'

This view has been partially challenged by Millet in Millet and Verlaine (2017), who analyses this order as a tendency contingent on a specific type of setting, the narrative one. The word order proposed should not be, in her proposal, considered a real feature of the grammar since the narrative setting is different from the normal dialog one. The two modalities are distinguished by the presence of role-shift (i.e., the character playing), which is obligatory in the narrative setting. In such case, the signer acts as a character of the sentence. According to Janzen, O'DEA, and Shaffer (2001), this phenomenon has to go from agent to agent, except in the case of passive voice. In Quer et al. (2017b), Pfau and Steinbach (2015), Schlenker (2017a), Schlenker (2017b) or Quer et al. (2017a), role-shift is characterized as involving body orientation as well as the use of classifiers to embody the character, with an optional shift in deictics. This setting usually affects the word order in requiring to posit elements of the 'play' with which the character will interact, as in example (4).

(4) CAMPAGNE, ÉTENDUE VALLONNÉE, VERT(ESQUISSE), HERBE VERTE, ÉTENDUE, CHEVAL GALOPER CONTENT.
rural, bumpy valley, green, grass green, surface, horse run happy. 'In the rural land, in a valley with reliefs, there is green grass, in the field there is an horse who's happily running.' *from Braffort et al. (2001): crdo-FSL-CUCO23 00:07 to 00:13*

In Millet and Verlaine (2017), role-shift in LSF is described as a process involving the synchronized movement of the head, torso, and shoulders in which the signer signs very close from his body and face in order to show the act of impersonating. The face is also 'acting', meaning that the NMMs acquire an expressive meaning. Importantly, eye-gaze follows the perspective of the impersonated character, meaning that the signer stops looking at his addressee as long as the role-shift is happening. The narrative setting is often accompanied by the presence of classifiers identifying the character impersonated that are kept while the perspective is maintained (see Figure 6). A lot more work is needed to fully grasp the syntactic implications of role-shift, which goes beyond the purpose of the present thesis.



Figure 6. Role-shift in LSF where the signer impersonates a cow.
He uses both hands to sign the classifiers for 'LEG' and maintains this classifier with his left hand while signing 'WHAT' then 'TOUCHED' with his right hand.
Sentence and pictures are from Braffort et al. (2001)

Outside of the narrative setting, Millet proposes a semi-divergent view in which the signer's space is horizontally and vertically subdivided into meaningful areas, what she calls the 'pre-semanticized model' (see Figure 7). Then, the syntax of LSF surfaces mainly through movement between these areas and 'iconic' handshapes (what she calls the 'dynamic iconic model').

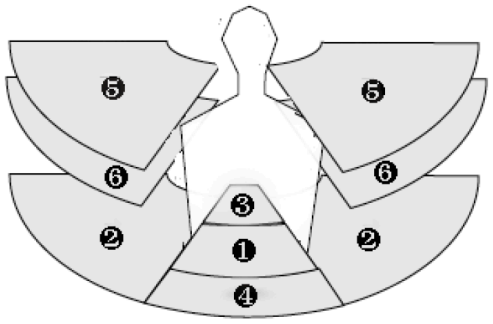


Figure 7. The pre-semanticized space model. *From Millet and Verlaine (2017)*

While we do not agree with this semi-divergent approach, there are descriptive aspects of Millet's work that are worth discussing in detail. She acknowledges that the word order of LSF is in the majority SOV or SVO. This is consistent with what we find in our researches and what has been previously described by Bouvet (1996) (who reports SVO as the main word order) and De Langhe et al. (2004) (who reports SOV as the basic one).

Millet and Verlaine (2017), also specify the word order within the nominal group. They show that the noun is, in general, signed first with respect to possessives, demonstratives, predicative adjectives (as is the case in ASL Sandler and Lillo-Martin 2006) and numerals (see examples in 5).

(5) Word order within the nominal group

a. [PIERRE] [CHAT] [À LUI] // [SAUVAGE]
Pierre cat his savage
'Pierre's cat is savage.' *From Millet and Verlaine (2017): 327*

b. [CAHIER] [ÇA] [DONNER]eps1
notebook this give ix-1
'Give me this notebook.' *From Millet and Verlaine (2017): 292*

c. BABY CUTE
'A cute baby.'

d. GIRL TWO
'Two girls'

However, she notes that the reverse is also possible despite being less frequent. In the methodological part, we present additional evidence in favor of analyzing LSF as flexibly presenting both SOV and SVO word orders.

1.3.1.1 Active versus passive voice

The difference between active and passive voice has been unequally addressed across sign languages. Some authors (see among others Gee and Goodhart 1988 or Mallery 2001) deny the existence of a productive role of passivization in SL. On the other hand, Janzen, O'DEA, and Shaffer (2001) and Leeson and Saeed (2003), Leeson and Saeed (2012) have argued the opposite for ASL and Irish SL, respectively. According to these authors, the passive voice can be identified through either word order change or role-shift. In detail, Leeson and Saeed (2012) argue that in Irish SL, the passive voice forces the patient to be produced first with the agent appearing after or being left out. In ASL, Janzen, O'DEA, and Shaffer (2001) argue that role-shift always goes from agent to agent except in the case of passive voice where it is the patient that is impersonated. Therefore the presence of passive shifts the target of role-shift. This is illustrated in example (6).

(6) a. CAT MOUSE CL_{cat} CATCH *active*
'The cat catch the mouse.'

b. MOUSE CAT CL_{mouse} CATCH *passive*
'The mouse is caught by the cat.' *Adapted from Guitteny (2005): 305*

These two features are also found in Guitteny (2006) in LSF. The author proposes that the word order for the active voice is generally SVO or SOV with 'S' being the agent while in the passive voice, it has to be the patient. Interestingly, Guitteny (2006) argues that this change in word order only appears with directional verbs; plain verbs have to introduce the agent after the verb through a 'by-phrase' headed by signs such as RESPONSIBLE or BECAUSE.

1.3.2 Syntactic categories in LSF

Millet, in Millet and Verlaine (2017), provides interesting descriptions about the realization and distinction of some syntactic categories in LSF. As we shall see, they are mainly defined on their distribution rather than by their morphological distinctions.

1.3.2.1 Nouns

The distinction between nouns and verbs is often problematic in sign languages (and not only) since some lexical items can function as both. For example the sentence in (7) could be interpreted as being either a noun-phrase (7a) or a verbal-phrase (7b).

(7) PAINT/PAINTBRUSH WHERE? *LSF*

a. 'Where is the paintbrush?'

b. 'Where do you paint?'

However, Millet correctly shows that the category 'noun' is necessary to describe LSF for several reasons. First proper names, as well as the vast majority of nouns referring to beings, animals, objects, or places, can only be nouns.
In general, she proposes that signs which a) refer to an entity and b) do not display a morphology based on the movement needed to use the object, have to be nouns. To illustrate this last point compare the morpho-phonological properties of 'PAINTBRUSH/PAINT' in Figure (8), to 'PENCIL' and 'WRITE' in Figure (9). Morphologically, 'PAINTBRUSH' is realized with a movement reproducing the action of painting. 'PEN' does not, leaving no ambiguity in its interpretation as a nominal.

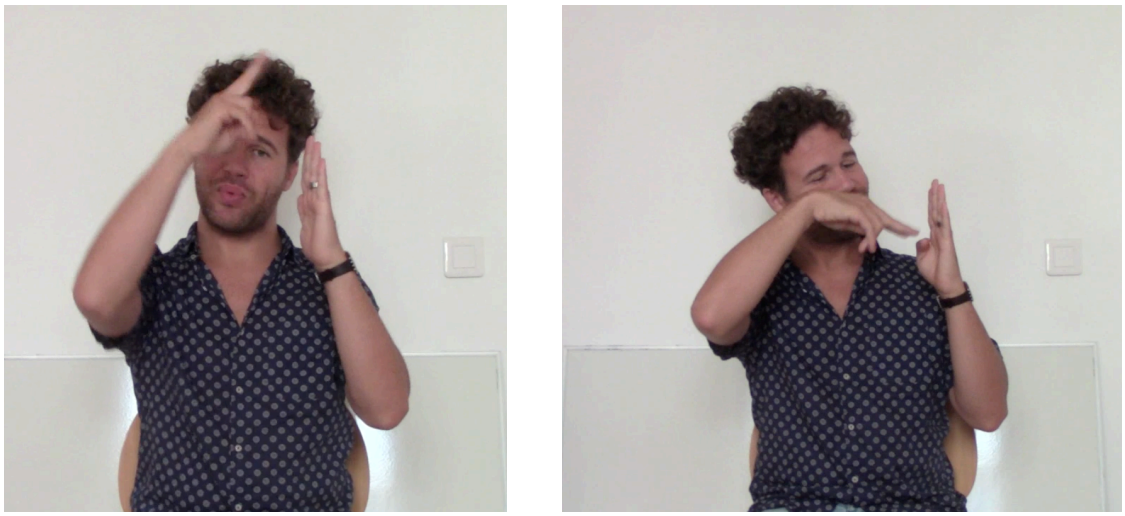


Figure 8. PAINTBRUSH/PAINT = one sign can be interpreted as referring either to an object or a verb



Figure 9. PENCIL/WRITE = need two separate signs to express either the object or the verb

1.3.2.2 Verbs

Verbs are, of course, also ambiguous with nouns. However, this is not systematically the case. Verbs are unambiguously identified through their distribution: i.e., their ability to combine with nouns and other markers. In particular, combination with negation is a clear marker of verbness, with'NOT' combining with verbs only and the negative marker 'NONE' (illustrated in Figure 10) appearing with nouns (see 8).

(8) [TRAVAIL/LER] [Y'A PAS]
(to) work none
'There is no work.'
From Millet and Verlaine (2017): 224

Finally, combination with aspectual markers such as 'DONE' or 'NOT-YET' is also a clear feature teasing apart verbs from nouns.

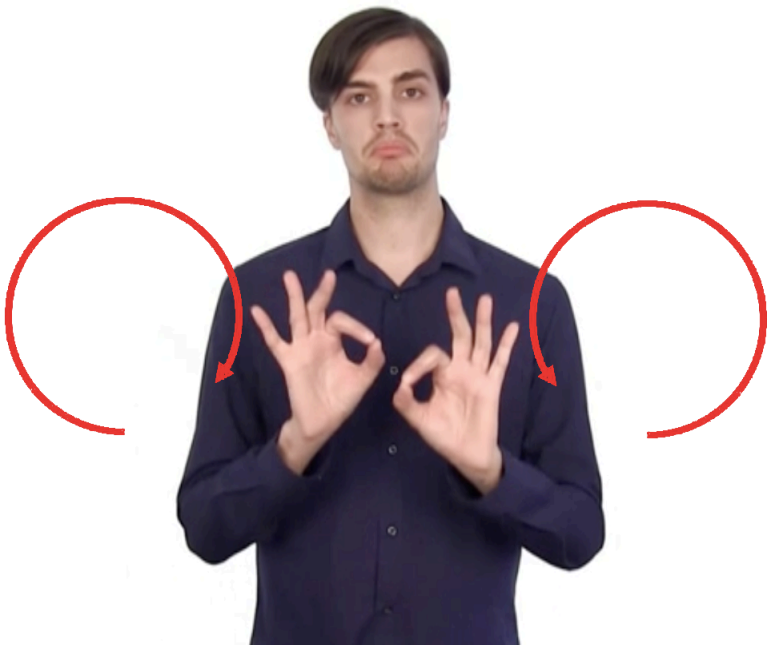


Figure 10. Negative marker NONE in LSF

1.3.2.3 Adjectives and adverbials

It is not always easy to distinguish adjectives and adverbials in many languages. Here again, the difference is mainly distributional: an adjective typically combines with a noun, an adverbial with a verb.

Interestingly, Millet and Verlaine (2017) found also instances of adjective/adverbial NMMs like in (9).

(9) MAN $\overline{\text{WALK}}^{\text{sad}}$
'The man sadly walks'.

In (9), the emotion displayed non-manually has the function of modifying the verb.

Other adverbials, manually realized, are found in LSF, among which the temporal adverbs 'YESTERDAY' and 'TODAY' which will be very useful for our investigations; these adverbs mark either the beginning or the end of the clause, as shown in (10).

(10) a. YESTERDAY DOG SCRATCH CAT
b. DOG SCRATCH CAT YESTERDAY
'A dog scratched a cat yesterday.'

The position of temporal adverbs will be used here as a reliable cue to determine the edges of a clause cross-linguistically (see among others Neidle et al. 2000 and Cecchetto, Geraci, and Zucchi 2006).

1.3.2.4 Pointing signs

Millet and Verlaine (2017) groups under the term 'pointage'[3] all linguistic elements directed towards a locus, whether manual or non-manual. This includes pointing realized through torso orientation ('shoulders' in her terminology), eye gaze, or through manual signs. In the latter subcategory, she differentiates between indexicals (realized with the index finger) and the manual configurations associated with a verb realization.

Finally, she identifies four different demonstratives glossed as CE$_{pichenette}$, CE$_{mainplate}$, CELUI-LÀ for animates and CELUI-LÀ for inanimates, of which we reproduced the illustrations provided by the author. Note that CE$_{pichenette}$ is the sign which we gloss as 'PI' that plays an important role in relativization..

In formal literature, pointing are analyzed as pronominals (Pfau, Steinbach, and Woll 2012, Quer et al. 2017b or Pfau and Steinbach 2015, among many others), the locus in which they are realized is shared with the nominal they refer to.

1.3.2.5 Linkers

As for complex sentences, Millet and Verlaine (2017) use a generic term 'linker'[4] to refer to functional elements such as conjunctions and prepositions. They only distinguish between 'paratactic' and 'hypotactic' types of relationship and acknowledge that more work is needed on this behalf. This is precisely what we offer to do in this dissertation.

Among the linkers identified by Millet in Millet and Verlaine (2017), we find topicalization markers ('THEME' and 'AFFAIR' cf. 11) and the causative linker 'RESPONSIBLE' (cf. 12) that are analyzed as having undergone a grammaticalization process from their nominal form to their grammatical function.

(11) [AVANT] [**AFFAIRE**] [AMÉRIQUE] [OPPOSÉ] [PRÉSIDENT] [BUSH] [PTÉ3] [OPPOSÉ] [IRAK]
before affair America opposed president Bush IX-3 opposed Irak
'Before, as for America, President Bush was opposed to Iraq.'

(12) [TRAIN] [RETARD] [**RESPONSABLE**] [INONDATION]
train late responsible inondation
'The train is late because of the inondations.'

Other linkers are coordinators such as OR, BUT, SO or the sign 'EVEN-MORE/STILL'.

1.3.3 Questions

To the best of our knowledge, very little research has focalized on interrogative clauses in LSF. Millet and Verlaine (2017) observe that the wh-word tends to appear at the end of the sentence, but they provide no actual test to support this claim. In Geraci (In Prep.), on the other hand, the

[3] 'pointers' in English.
[4] 'Joncteurs' in French.

author found that the preferred strategy for asking wh-questions in LSF is to leave the wh-sign in situ (Geraci In Prep.). The examples show this in (13a)-(13b).

(13) LSF

a. DOG SCRATCH **WHO**
'Who did the dog scratch?'

b. **WHO** SCRATCH CAT
'Who scratched the cat?'

Another type of question, which will receive extensive attention in this dissertation are so-called 'false questions' or 'rhetorical questions'. While resembling questions in the lexical words used, they receive an assertive interpretation. Their first description in LSF dates from 1983 with Moody, Hof, and Dufour (1983). However, to the best of our knowledge, their description remains very superficial. In Chapter II.6, we will apply syntactic and semantic tests to unearth their formalization.

1.4 Methodology

This dissertation applies fieldwork methods following three main steps: baseline elicitation, syntactic/semantic surveys, and data assessment through the playback method (Schlenker 2010). All three steps are carried out with native informants of LSF who regularly collaborate with our lab but who crucially have no precise knowledge of our working hypotheses[5]. Additionally, we conduct psycholinguistic studies on a larger and broader population, whose methodology will be detailed in Chapter II.4. Here we present the methodology used to collect the data discussed in Chapters (3), (5), (6) and (7).

1.4.1 Word order

Following Comrie (1989), many tests are allowing to determine the dominant word-order of a language:

- Asking native informants
- Comparing frequency within a corpus.
- Defining which word order is the less marked (morpho-phonologically or syntactically)
- Defining which word order is prevalent in pragmatically neutral contexts (i.e., outside of topicalization, focalization, interrogation)
- Analyzing the correlations between heads and complements within the language.

As for the first test, our informants present alternative preferences; while Laurène, Thomas and Yohan repeatedly preferred SVO (as shown in 14a), Valérie showed a clear preference for SOV word orders.
Looking at corpus studies, Millet and Verlaine (2017) found more frequently SOV than SVO, while still finding the latter. There is, however, no numbers provided.
Within the literature, OSV is also frequently attested (see De Langhe et al. 2004), but it requires at least the raising of the eyebrows over the object, which makes it more marked than its SOV or SVO alternatives and is probably a signal of topicalization, hence movement (see (14b)).

[5] More precisely, Thomas Lévèque (28 yo), Laurène Loctin (28 yo), Yohan Marcelino (29 yo) were recruited by the Sign Language Group of the Institut Jean Nicod and Valérie Benjoubi (38 yo) by the Laboratoire de Linguistique Formelle of the Université de Paris. We deeply thank them all for their precious help throughout all these years.

(14) a. MAN PET DOG
'The man is petting the dog.'
b. $\overset{\text{top}}{\overline{\text{DOG}}}$ MAN PET
'As for the dog, the man is petting it.'

Additionally, we follow Millet and Verlaine (2017) in considering that the word order described in Cuxac (1983) and subsequent works, corresponds to a specific pragmatical setting: narration. Therefore, it is less neutral than, say, dialog.

Finally, if we turn to correlations between the ordering of heads with respect to their complements, we see the same ambivalence as expected by the two main SOV and SVO word orders. The NPs, for example, can either precede or follow DPs (see 15) just like they can either precede or follow possessives (see 16).

(15) a. THREE GIRL *Head > Complement*
'Three girls.'
b. GIRL THREE *Complement > Head*
'Three girls.'

(16) a. MARIE$_i$ HOUSE POSS-3$_i$ *Head > Complement*
'Marie's house.'
b. MARIE$_i$ POSS-3$_i$ HOUSE *Complement > Head*
'Marie's house.'

All these considerations amount to the conclusion that LSF present a flexible word order between SVO and SOV, and between heads and complements in general. This means that in the description of relative clauses (Chapter I.3), temporal clauses (Chapter II.5), sentential complements (Chapter II.7) and Question-Answer Pairs (Chapter II.6), LSF examples may be used with either order. Unless differently specified, we assume the two alternatives to be always possible. The difference is to be further qualified either in terms of sociolinguistic variation or in terms of individual preferences.

1.4.2 Baseline elicitation

Depending on the topic we investigate, the elicitation of the baselines is realized through picture-based tasks (for relative-clauses and temporal clauses) or by showing extracts from corpora targeting the relevant structures (for question-answer pairs and sentential complements).

To investigate relativization strategies, since we had no prior knowledge of whether there existed such constructions in LSF, we had to create a protocol favorizing their production. These structures being particularly complex, different methods have been adopted by Sign Languages researchers. In their study about LIS, Cecchetto, Geraci, and Zucchi (2006) asked their informants to translate written Italian. In 2013, LI (2013) used the help of signed contexts given by an interpreter to elicit the sentences of her HKSL corpus.

In our study, we chose to avoid any interaction between written French and LSF. For this reason, we chose to use an elicitation task *à la* Hamburger and Crain (1982), based on pictures that we illustrate here. We started our elicitation with three kinds of pictures depending on what we wanted to elicit: subject relatives, object relatives, or adjunct relatives. Each of these was further split into three kinds of arguments: animate human, inanimate and animate non-human. We, therefore, started with nine situations to elicit. Finally, we tested the possibility for relative

clauses to appear as the subject of the main clause, adding nine new situations to our procedure (see the full list in Appendix A).

We illustrate our method with the subject relative clause corresponding to the English equivalent of (17) for which we used pictures like the one in Figure 11.

(17) I prefer the **little girl** who pets the dog.

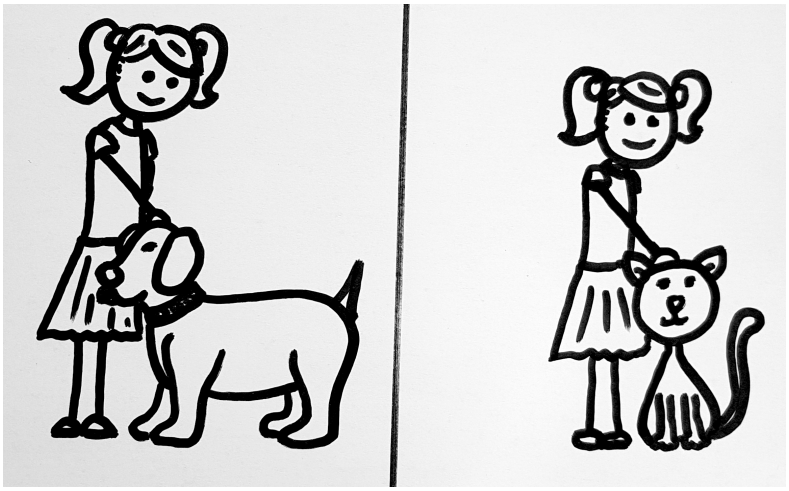


Figure 11. Image used to elicit subject relative clauses

The first thing we asked our informants was to describe the content of each picture. From the description, we extracted simple sentences. We illustrate this point in examples (18).

(18) a. GIRL PET CAT
'A girl pets a cat.'

b. GIRL PET DOG
'A girl pets a dog.'

Then we asked our informants which girl they preferred the most. We instructed the informant to start their answer by signing "I prefer" in order to favorize the production of a relativization strategy. Among the answers we obtained is the relative clause in (19):

(19) IX-1 PREFER LITTLE GIRL PI PET DOG.
'I prefer the little girl who pets the dog.'

This elicitation strategy is an adaptation of the elicitation technique customarily used to elicit relative clauses in the language acquisition studies (Hodgson 2019). This has been proven extremely useful in our study.

We used a similar method to investigate temporal constructions by asking for the description of paired pictures. We asked the signers to produce a sentence for each picture, and, only after, to sign a sentence organizing the two events in time. The target sentences obtained using the pictures in Figure (12) are shown in example (20). All the pictures used are presented in Appendix (B).

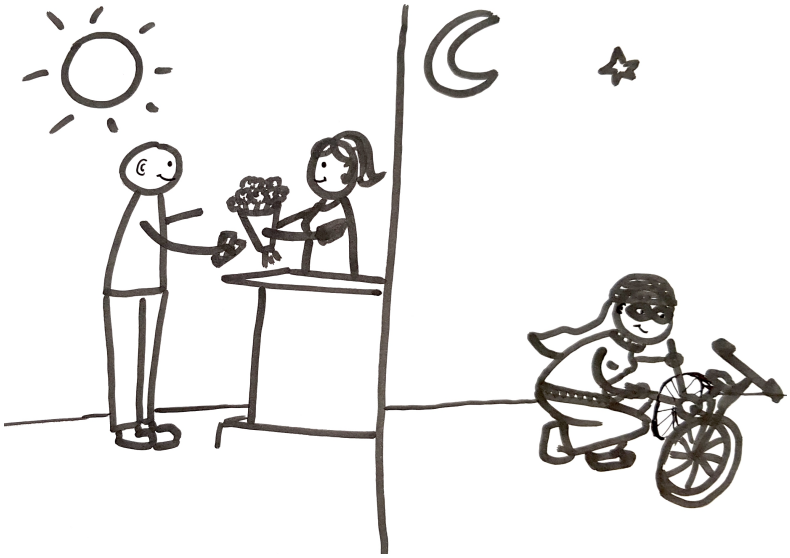


Figure 12. Example of elicitation picture for the target sentences in (20).

(20) a. JEAN BUY FLOWER
Jean bought flowers.

b. MARIE STEAL BIKE
Marie stole a bike.

c. $[_{left}$JEAN BUY FLOWER$]$ $\overset{\text{re}}{\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}}$ $[_{right}$ MARIE STEAL BIKE$]$
‘ Jean bought flowers and before / at the same time / after Marie stole a bike.’

For both chapters on QAP and sentential complements, we proceeded differently since, here, we already knew precisely the structures we were interested in. Therefore, we started by finding examples of both in corpora[6] and showed them to our informants. We then asked them to propose examples of their own, using the same structure or alternative sentence types. This allowed us to obtain minimally distinct sentences such as the pattern in (21).

(21) a. QAP
BOY OFFER FLOWER WHO GIRLFRIEND

b. Simple sentence
BOY OFFER FLOWER GIRLFRIEND

c. True question
BOY OFFER FLOWER WHO?

Independently from the elicitation method chosen, we video-recorded all the baselines produced by our informants and processed next to their syntactic and semantic investigations.

1.4.3 Syntactic and semantic survey

This step aims at obtaining both positive and, more importantly, negative evidence about the structures we are interested in. Indeed, while using pictures or corpus-data was a necessary first

[6] We mainly used the LS-COLLINS corpus

step, it does not allow us to distinguish between the performance (i.e., what is signed) and the competence of a signer (what could, or not, be signed). For these reasons, this step consists in asking our informants what is possible or not in LSF, regarding the sentence they recorded. For every topic of interest, we started by determining what the possible alternatives to the baseline recorded in the previous step regarding word order are. Beyond this point, the survey differs for each structure, based on relevant typological milestones found in the literature. The aim is to determine the inherent properties of the structure at stake and, therefore, which analysis they should receive. Every answer was video-recorded so that we could ensure the robustness of our findings through cross-validation between our informants. The detail of our investigation is given along with the literature survey in each relevant chapter.

1.4.4 The playback method

The 'playback method' elaborated in Schlenker (2010) consists of playing back every filmed utterance obtained in the two previous steps (from the baseline elicitation and syntactic/semantic survey) and ask all informants to rate them. It takes place in a different session, and, for each sentence, informants have to give a judgment on a seven-point scale regarding two different aspects: acceptability and felicity. The first criterion checks if the sentence is well-formed, the second criterion checks whether the sentence matches the target picture or context. Through this procedure, we make sure that the data obtained can be generalized.

What comes out from this method is a set of data equally judged as good by our informants which we will consider as being grammatical in LSF, a set of data considered as very bad by our informants which we will consider as being agrammatical for LSF and a set of degraded data, on which more interpretations are allowed.

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Chapter 2

Relativization strategies across languages and theories

In this first chapter, we present the state of the art of the literature on relative clauses. While the topic has been extensively addressed over the years (see among many others De Vries 2001, Bianchi 2002b, Kayne 1994, Sauerland 2001, Cinque 2014, Branchini 2014, Carlson 1977), we enrich the framework by integrating a review of what is known about relativization strategies in sign languages. More precisely, the chapter is organized as follows: Section I.2.1 presents a review of the typology of relative clauses. It addresses the relevant parameters of variation, as well as the different types of Relative Clause (RC), found both in spoken and signed languages. The review of relativization strategies across signed languages is provided in Section I.2.2. Finally, Section I.2.3 is dedicated to the formal frameworks used to account for the typological variations among RC.

2.1 Typological variations

Relative clauses are subordinate clauses modifying a nominal element (the head). They typically contains a gap identical to the head when they are head-external. An example is given in (22).

(22) She married the **man** [who $____{gap}$ lived next door.]

In (22), the noun 'man' is both the object of the main clause (She married the *man*) and the subject of the relative clause (the *man* lived next door). We represent this second role visually by adding a gap in the position in which the argument is missing. The relative clause itself, identified by square brackets, cannot stand on its own, so it is dependent on the main clause. The externally headed relative clause presented in (22) is only one out of many relativization strategies that appear cross-linguistically and take a large variety of syntactic and semantic forms. To help to understand what unifies them, Branchini (2014) proposes that their defining properties should be recognized as:

> "... dependent clauses connected to the matrix clause by a syntactically **and** semantically shared pivotal element, [...] overtly realized in either one of the two clauses, in both of them or neither one of them."
>
> (Branchini, 2014:58)

In this definition, Branchini uses both semantic and syntactic properties, highlighting the need to consider both criteria when analyzing relativization strategies. In what follows, we will use the terms relativization strategy or relative construction to refer to all structures sharing

these properties; 'relative clauses' is a subset of them. We will describe them along three fundamental axes: i) the type of projection they modify (a NP or a CP), ii) the position of the RC with respect to the head (internal or external, postnominal or prenominal) and iii) the semantic operation linking the head and the subordinate clause (restrictive, appositive, maximalizing or kind). All these properties will be addressed in our analysis of LSF relative clauses in Chapter I.3.

2.1.1 Relative markers

A first step to identify relativization strategies is to find whether they are signaled through the use of specific markers, as is the case in many languages. Depending on the syntactic properties the relative marker can be either a Complementizer (Comp.), a Relative Pronoun (RelP), a Resumptive pronoun (ResP) or a Relative markers (RelM).

The complementizer (cf. example 23) is an element which is base-generated in C position.

(23) The boy (**that**) you saw is nice. *Comp.*

This means that it has a fixed position and presents no relation to the gap inside the RC. It usually carries no case, does not display agreement either[1], and can be optional depending on languages (Figure 13).

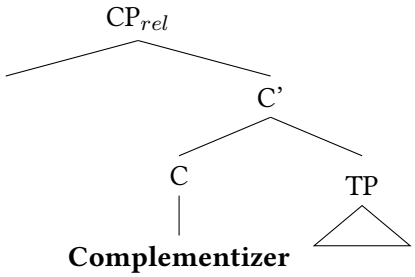


Figure 13. Structure of a Complementizer

In relative clauses, the complementizer is usually not sensitive to the status of the head (argument or adjunct). This is an essential distinction between complementizers and relative pronouns that will help us in determining the nature of the relative elements we will study.

Crosslinguistically, two major types of relative pronouns are attested: those that derive from wh-words and those that derive from d-like pronouns (either a demonstrative or a noun), an example of each are presented in (24) (De Vries 2001).

(24) a. The girl **who** came yesterday is nice.

b. Ik heb één van de voetballers **die** bij Ajax spelen/speelt, gisteren ontmoet.
I have one of the football.players who with Ajax play PL /play SG yesterday met
'Yesterday I met one of the football players who plays with Ajax.'

Dutch, from (De Vries, 2002: 187)

While these RelP differ in their morphology, they share their syntax. Indeed, they have to occupy an internal position from which they are raised (or copied depending on the frameworks) to the specifier of the CP, as shown in Figure (14) (Bianchi 2002b, Hulsey and Sauerland 2004 and De Vries 2002).

[1]This is challenged by data from French with the opposition qui/que or from Irish where the complementizer is sensitive to the case of the elements passing through. Interestingly, in relative clauses, complementizers can constitute exceptions to the 'that'-trace effect.

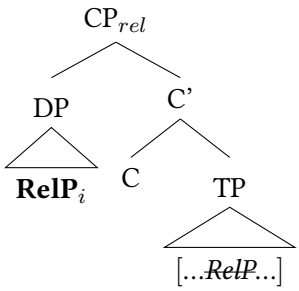


Figure 14. Structure of a Relative Pronoun

The RelP abstractly agrees with the head noun in gender and number but crucially not in case as it bears its own (see examples 25a and 25b). Unlike the complementizer, it receives a theta-role and can marginally be pronounced in the position of the gap. Lehmann (1986) and Sauerland (2001) refer to this property as the 'gap function'.

(25) a. The women [**whom** you talked about _] are in the house.
b. The man [**whose** name is written on the door _] is there.

The ResP plays the same semantic and syntactic role as RelP, but it remains in-situ (in the position of the gap, cf. example 26).

(26) ha-isha **she-** Yoav ohev ot-a … *ResP*
the-woman REL- Yoav loves ACC -her
'the woman that Yoav loves …'

Israeli Hebrew, from De Vries (2001: 233)

De Vries (2002) analyzes the resumptive pronouns as being the mirror image of the RelP in that they share their base position, but the latter rises to a higher position in the structure while the ResP does not raise[2], as illustrated in Figure (15).

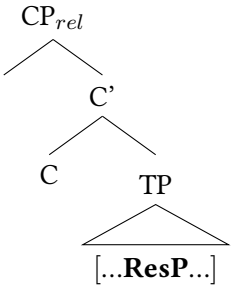


Figure 15. Surface structure of a Resumptive pronoun

Since RelP and ResP are supposedly base-generated in the same position, we should never find both of them at the same time in a relative clause. However, it is expected that each of them can co-occur with a complementizer. Indeed, the relative operator which moves overtly (RelP) or covertly (ResP) targets the specifier of the CP while the complementizer sits in C. They are

[2] In De Vries (2001), the author proposes that a covert movement, carried by a relative operator, happen in the resumptive case

not in competition (unless other restrictions are at play, as the so-called doubly filled COMP filter, see footnote 1). For, example, Akan, a Kwa language of the Niger-Congo family (Abrefa 2016), allows both Comp. and ResP as shown in example (27).

(27) àbɔ̀frá$_i$ (nʊ́) [â ɔ̀$_i$- bʊ́-ʊ̀ kɔ̀fí nʊ́] a- da
child (DEF) **Comp**. *ResP-3sg-sub* beat-PST Kofi det PERF sleep
'The child who beat Kofi is asleep'

Akan, from Abrefa 2016: 3

Some languages mark relative constructions through a number of affixes or markers which act as relativizers. The Korean example illustrates this in (28). Depending on their morpho-syntactical operations, De Vries (2001) divides them further into nine various categories that we will not repeat here.

(28) John-un [totwuk-i tomagka-n-un **kes**-ul] cap-ess-ta.
John-TOP thief-NOM run.away-IMPF-ADN NMLZ-ACC catch-PST-DEC
'John caught the thief that was running away.'

Korean, from Kim (2009)

What distinguishes relative markers from relative pronouns is that they never occupy the base position (i.e., the internal position where the relative operator is generated) but, contrary to complementizers, they often display agreement with the head of the relative.

Languages can also present no relative markers at all. In this case, the identification of relativization strategies has to be done solely through the recognition of their syntactic and semantic properties.

2.1.2 Syntactic types of relativization strategies

Following most accounts (see a.o. Lehmann 1986, Dryer 2005, De Vries 2001, Bhatt 2002 or Branchini and Donati 2009), there exists six types of relativization strategies illustrated in (29)[3].

(29) Typological categorization of relativization strategies
   a. IHRC[4] (as in Japanese, Shimoyama 1999, or in Mesa Grande Diegueño, Couro and Langdon 1975)
   b. Pre-nominal EHRC (as in Chinese Gibson 2000, Korean Kwon et al. 2013 or Alamblak, Bruce 1984)
   c. Post-nominal EHRC (as in English or French, Kayne (1994))

[3]Following the majority of accounts (see for example Caponigro 2000,Bianchi 2002a, Ross 1967), we leave the free-relatives as part of the relativization strategies. We will discuss this classification in Chapter I.3 as, according to other authors, this type should be considered on its own (Den Dikken 2001, Grosu and Landman 1998, Declerck 1994, De Vries 2001). On the other hand, Dryer (2005) and Cinque (2014) argue in favor of 7 types of relative clauses, adding adjoined relative clauses to the typology presented here. Dryer (2005) distinguishes correlatives from adjoined relative clauses (as in Diyari Austin 1981, Dryer 2005) based on the position of the NP modified by the clause. If it is in the dependent clause it is a correlative, if it is inside the main clause, it is an adjoined relative clause here. We will follow more traditional accounts which regroup the two types as correlatives (Culy 1990, Lehmann 1986, Keenan and Comrie 1977).

[4]They are also called 'circumnominal relatives' by Lehmann (1986), Culy (1990) and De Vries (2001) among others.

d. Double-headed relative clauses (found in Kombaï, Dryer 2005, in Hewa, Givón 1984, and Diegueño, Culy 1990)
e. Correlatives (as in Bambara, Bird 1968)
f. Free-relatives (or headless relatives)

The classification presented in (29) varies along different criteria such as a) the nature of the embedding relation between the main clause and the relative clause (modifying a NP or a CP) b) the presence of none (free relatives), one, or multiple heads (double-headed), c) the position of the head with respect to the RC itself (internal, external, linearly ordered before or after the relative) and d) the presence of a co-referring pronoun in the main clause or in the relative clause. These criteria are not mutually exclusive; a relativization strategy may be placed in several categories depending on the axis studied.

2.1.2.1 Modifying a NP or a CP

Their level of embedding can distinguish relativization strategies. The first category is referred to as relative clause and groups together relatives that are nominally embedded (i.e., under a DP/NP of the main clause) as in Figure (16).

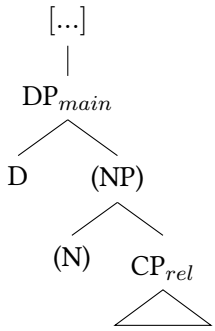


Figure 16. Structure of relative clauses.
The presence and position of the NP projection depends on the position of the head with respect to the RC.

A prototypical example is given by the English post-nominal relative clause in (30).

(30) $[_{CP main}$ $[_{DP}$ The $[_{NP}$ student $[_{CP rel}$ who $_{_gap}$ writes her thesis]]] might sleep someday.]

As relative clauses are embedded under DPs, the construction is nominal in nature and its distribution is typically nominal (Den Dikken, Meinunger, and Wilder 2000, Kayne 1994, Keenan and Comrie 1977 or Lehmann 1986). It can show nominal inflection, as in Japanese, where the accusative case marks the internally headed relative clause in (31).

(31) Yoko-wa [Taro-ga sara-no ue-ni **keeki**-o oita-no]-*o* tabeta
Yoko-Top [Taro-Nom plate-Gen on-Loc cake-Acc put-NM]-*Acc* ate.
'Yoko ate the piece of cake which Taro put on a plate.'

(Japanese, from Shimoyama 1999: 147)

In this category, we find IHRC, pre- and post-nominal EHRC (as in the English in 30), double-headed relative clause and free-relatives.

Some relativization strategies are modifying a CP instead of a DP. These structures are called correlative constructions[5]. In this respect, they are clausal and are directly adjoined to the main clause, as in Figure (17)[6].

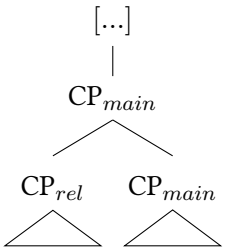


Figure 17. Structure of correlatives.

An example of a correlative clause is given in (32) with Bambara[7].

(32) [n ye **ty**ɛ̀ mìn ye,] *ò* be finì fère.
[I COMPL man REL saw] *D3* IMPF cloth:DEF sell
'The man I saw (, *he*) sells the cloth.'

(Bambara, from Bird 1968: 43)

Correlatives can be separated from the main clause and, crucially, do not form a constituent with it. The presence of a co-referring pronoun (overt or covert, in italic in the gloss of 32) allows maintaining a semantic link between the head and the main clause.

2.1.2.2 Presence of a head

Relative clauses can have a single head, two heads, or none in which case they are called headless or free-relatives. An example of an Italian free-relative is given in (73).

(33) [Chi svela il segreto] sarà punito
Who reveals the secret be.fut. punish.pst
"Who reveals the secret will be punished."

(Italian, from Branchini 2014: 73)

In a double-headed relative clause, as in (34), the head is either repeated or is a larger generic noun.

[5]This includes adjoined relative clauses if considered as a separate type from correlative.

[6]Note that, if we adopt a double-headed analysis *à la* Cinque (2003), this distinction disappears as every relative clause type is base-generated in a pre-nominal position. The distinctions between all types then come from different syntactic derivations.

[7]For adjoined relative clauses, see Diyari:

(1) ŋani **wila-ni** yata-la ŋana-yi [yiinda-nani]
1SG.SUBJ woman-LOC speak-FUT AUX-PRES
'I'll talk to the woman who is crying.'

(Diyari, from Austin 1981: 210)

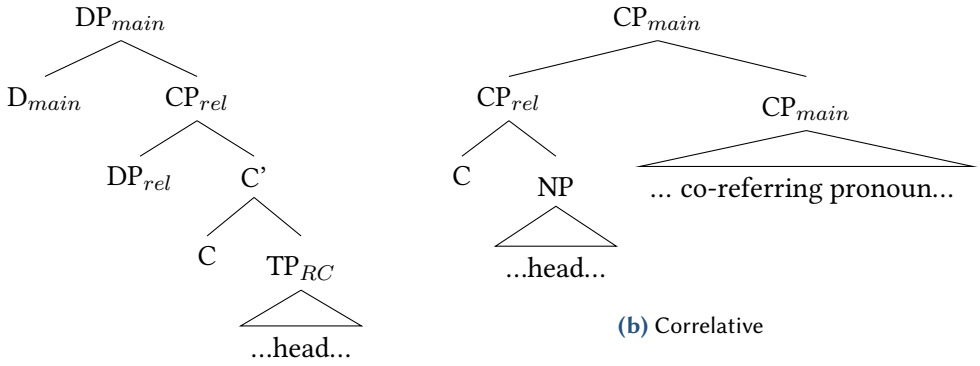
(34) [**doü** adiyano-no] **doü** deyalukhe[8]
sago give.3PL.NONFUT-CONN sago finished.ADJ
"The sago that they gave is finished."

(Kombaï, from De Vries 1993)

In single head relative clauses, relativization strategies vary typologically concerning the position of the head: whether it is internal to the RC or external to it. In the latter case, we also have to describe whether the head appears before or after the relativized clause.

2.1.2.3 Head position

The head can be internal to the clause, as in Japanese IHRC (31) and Bambara correlatives in (32). Figure (18) illustrates internally headed relativization strategies whether nominally embedded or adjoined.



(a) IHRC

(b) Correlative

Figure 18. Structure of Nominally-embedded (Figure 18a) and adjoined (Figure 18b) internally headed relativization strategies.

The head can also be external in which case we find either pre- or post-nominal RC[9]. The two types present a different linear order. Pre-nominal EHRC display the RC first and then the head, as in the Turkish example in (35).

(35) [Orhan-in _ gör-düg-u] **adam** cik-ti
[Orhan-GEN gap see-NR-POSS.3] man leave-PAST
" The man that Orhan saw left."

(Turkish, from Andrews 1975:152)

Post-nominal EHRC, on the other hand, present the reverse order with the head preceding the relative clause. This is illustrated in Maybrat in (36).

(36) **aof** [ro ana m-fat _]
sago [rel 3pl 3obj-fell gap]

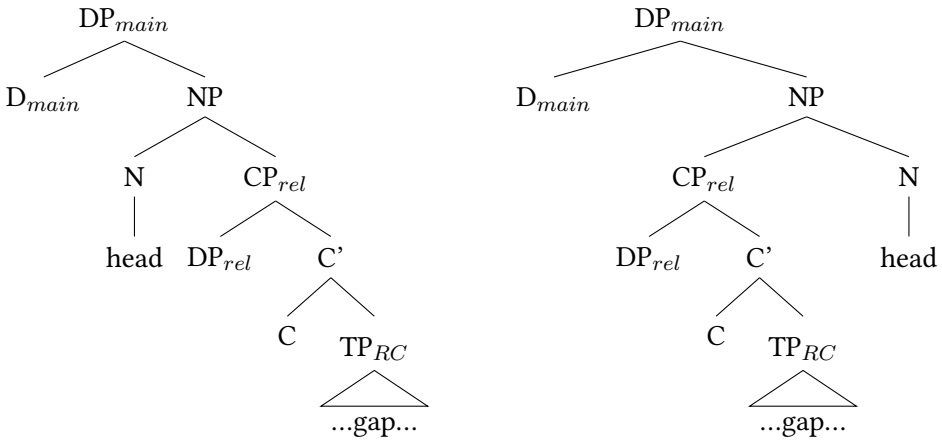
[8]Note that very few work exists on double headed relative clauses, however, De Vries (2001), Culy (1990), Dryer (2005) and Cinque (2014) remark that the second head is either the same as the internal one or a more general one such as "thing".

[9]As well as adjoined RC if they are considered as a separate type from correlatives.

"The sago tree that they felled."

(Maybrat, from Dol 1999: 137)

From a structural point of view, however, the two types are very similar since the head is generated in its base position and then raised outside the relative clause tp pre- or post-nominal position, respectively (see Figure 19).



(a) Post-nominal EHRC **(b)** Pre-nominal EHRC

Figure 19. Structure of post-nominal (Figure 19a) and pre-nominal (Figure 19b) relative clauses.

To summarize the different axes of typological variations we have seen so far, we provide the Table in (1).

Relativization strategy	Nominal	Clausal	Number of heads	Head internal	Head external	Head < RC	RC < Head
IHRC	✓	X	1	✓	X	NR[10]	NR
Pre-nominal EHRC	✓	X	1	X	✓	X	✓
Post-nominal EHRC	✓	X	1	X	✓	✓	X
Double-headed RC	✓	X	2	✓	✓	X	✓
Free-relatives	✓	X	0	NR			
Correlatives	X	✓	1	✓	X(✓[11])	NR	

Table 1. Summary of typological variations across relativization strategies.

[10] NR = Not relevant.
[11] In which case they can be called adjoined relative clauses.

2.1.3 Accessibility hierarchy

Keenan and Comrie (1977) note that it is not equally easy to relativize all syntactic positions. This is visible through several parameters. First, we find a higher proportion of languages having SRC than languages with ORC, which in turn is larger than the number of languages allowing genitive RC. Additionally, languages displaying ORC are also displaying SRC while the reverse is not true. This shows that language internally, some positions can be available to relativization while others are not. These observations led them to propose a typological scale ranging positions from the easiest to relativize to the hardest. Lehmann (1986) further enriched this hierarchy with intermediate positions; the result is presented in the following Figure.

Keenan and Comrie's Accessibility hierarchy (enriched):

Subject/absolutive > Direct Object/ergative > Indirect Object > Genitive Complement > Temporal Complement > Adjuncts

Along this scale, Keenan and Comrie (1977) argue in favor of three principles, referred to as "Primary Relativization Constraints". These constraints entail that a) every language should present at least subject relative clauses, that b) if relativization over a lower step of the accessibility scale is allowed then it is also available to all higher positions and that c) such strategy can cut off at any point of the scale. In other words, if a relative clause is attested in one position of the scale, then all other positions to its left in the scale should also be found as heads of relatives. Notice that this implication only goes in this direction[12].

A concrete example of the scale is shown by Swiss German. In this language, we find ORC (cf. 37) and, as predicted, their left position on the scale, SRC (38).

(37) Ich hilf$_{dat}$ em Bueb, won i (***en**) geschter gsee$_{acc}$ han. *Obj.*
I help.1SG the.DAT boy C (him) yesterday seen have.1SG
'I help the boy who I saw yesterday.'

(38) Ich suech$_{acc}$ de Bueb, wo (***er**) immer z spaat chunt$_{nom}$ *Subj.*
I search.1SG the.ACC boy C (he) always too late come.3SG
'I'm looking for the boy who is always late.'

However, for each position on the right of direct object, another strategy using a resumptive pronoun has to be used. This is illustrated with indirect object in (39).

(39) Ich suech$_{acc}$ de Bueb, wo mer ***(** em **)** es Buech ggee$_{dat}$ hand
I search.SG the.ACC boy C he.DAT a book given have.1PL *Ind. Obj.*
'I am looking for the boy who we gave a book to.'

(Swiss German, example taken from De Vries 2002)

In English, all positions of the scale can be heads of post-nominal externally headed relative clauses, hence with a gap (example 40).

(40) a. The girl [who _ came to your place] is nice. *Subj.*
b. The girl [that you recommended _] is nice. *Obj.*
c. The girl [with whom you danced _] is nice. *Adj.*

[12] The uni-directionality of the scale is the defining character of typological universals Greenberg (1963).

Data in acquisition and processing also support the accessibility hierarchy. We will present a detailed review of the literature on this topic in Chapter I.4 where we discuss the processing of relative clauses in LSF. As a preview of that discussion, the majority of acquisition studies (Costa, Lobo, and Silva 2011, Guasti et al. 2012, Adani et al. 2010, Friedmann, Aram, and Novogrodsky 2011 and Belletti and Contemori 2009 among many others) indicates that object relative clauses are understood and produced later than subject relative clauses, showing that they are more complex as predicted by the accessibility hierarchy scale. In psycholinguistic studies, the linguistic complexity of sentences is correlated to their processing burden, whether it means longer time needed to understand or read them, more eye-movements, or any additional cognitive operation. The complexity of ORC compared toSRC has been captured cross-linguistically through a large variety of experimental protocols (Gibson 2000, Traxler et al. 2005 or Yun et al. 2015). All in all, Keenan and Comrie (1977)'s scale functions as a tool on which we will base our predictions in Chapter I.4.

2.1.4 The semantics of relative clauses

The semantics of relative clauses varies concerning the position in which the reference is (or is not) constructed. Three[13] big classes have been identified (Grosu and Landman 1998) (41) depending on their defining macroscopic semantic properties. Each is exemplified in (41).

(41) Relative clauses: semantic types
   a. restrictives (Partee 1973, Grosu 2002, Bianchi 2002b, Browning 1987 or Abusch 1997)
   b. non-restrictives, or appositives (Smits 1988, Grosu 2002)
   c. amount or maximalizing (Carlson 1977, Loccioni 2018, Cinque 2019, Grosu and Landman 1998, Heim 1987)

The difference in the semantic contribution of the material internal (the relative clause) or external (the head) to the RC is illustrated by Grosu and Landman (1998) in Table (2). To better understand what is captured by Table (2), look at appositives for which the reference is described as deriving solely from external material (the head). Often described as parenthetic, the appositive clause does not create any additional semantic operation (narrowing or maximalizing) to the reference provided by the head, which is, therefore, the only semantic contributor to the reference.

sortal-external			sortal-internal	
(Simple XPs)	Appositives	Restrictives	Maximalizers	(Simple CPs)

Table 2. Scale of reference construction *from Grosu and Landmann (1998)*

In what follows, we will present each semantic type of relativization process and make explicit its semantic contribution to the construction of the reference. We will also present how these semantic types interact with the syntactic types we presented in the previous section.

[13]Prince (1997), Beninca (2003), Beninca and Cinque (2014) and Cinque (2015) propose to identify a fourth type of semantic relation: the kind identifying relatives. While this type is considered on a par with amount reading by Carlson (1977) and Grosu (2014), the fore mentioned authors single them out based on their semantic peculiarity. Contra to other semantic types of relatives, kind defining relative clauses cannot construct by themselves a reference, they have to modify a nominal predicate. They are distinguished by their irrealis mood and the fact that they only provide the features of the class to which the head noun belongs (Beninca and Cinque 2014). In (1), we see that the reference of the relative clause is given by the subject of the predicate, Paul.

(1) Paul is a man (that) you can count on.

2.1.4.1 Restrictive relative clauses

An example of a restrictive relative clause is provided in (42).

(42) The **boys** that are standing are tall.

In (42), the head '**boys**' refers to a set of individuals sharing the property of being a boy, the subordinate clause 'that are standing' designates individuals who share the property of standing. The intersection of both sets results in a *restriction* of the individuals initially referred to by the head. The head **and** the relative clause are necessary to understand who is the subject of the predicate 'are tall'.

More generally, restrictive RCs need to have a set they can intersect with. Therefore they cannot have an already maximally defined head, such as proper names or a pronominal head. This is exemplified in (43).

(43) a. *Mary who came yesterday is my neighbour.
b. *We who have met Mary are privileged people.

Besides this semantic restriction, restrictive RCs can have all categories of heads; quantified, definite, or non-specific head (see example 44).

(44) I prefer looking for a/the/some job which fulfills my dreams.

Restrictive RC form a constituent with their head and display reconstruction phenomena (cf. 45). This is only possible if the restrictive clause is embedded under the external DP and if the relative's head occupies the gap position at some point in the derivation. Indeed, without this, the anaphora 'himself' in (45) could not be bound by the DP 'John' and would be ungrammatical[14].

(45) The pictures of himself$_i$ which John$_i$ liked $_gap$ are now in the garage.

Restrictive relatives are transparent for binding and allow extraposition across temporal adverbs, at least in some languages, as illustrated by example (46). What we see here is that the semantic operation of restricting the meaning still occurs whenever and adverb intervenes between the external head and the relative clause.

(46) I went to the house, yesterday, that is painted in pink.

They additionally present downward entailing environments, allowing Negative Polarity Items (NPI) licensing (cf. 47) and indefiniteness effects, as shown by the availability expletives as in the relative clause in (48).

(47) The nurses who requested any help from the surgeon received blame.

(48) The nurse took the needles that there were on the table before the surgeon arrived.

Finally, restrictive relatives can stack (i.e., when a first RC restricts the set of individuals that the head refers to, and another RC further restricts the result), as illustrated by example (49).

(49) I like the cat$_i$ [$_{Rel1}$ that $_gapi$ came to my house] [$_{Rel2}$ that the dog bite $_gapi$.]

Multiple, recursive relative clauses, embedded in each other, are also possible as displayed in (50).

(50) The man stabbed the dog$_i$ [$_{Rel1}$ that $_gapi$ was chasing the cat$_j$ [$_{Rel2}$ that $_gapj$ caught the bird.]]

[14] Following Principle A of pronouns binding in generative grammar (Chomsky 1998).

2.1.4.2 Non-restrictive / Appositive relative

As briefly mentioned before, in appositives (cf. 51), the reference is constructed solely through the head. The relative clause itself does not have an impact (restricting or maximalizing) on the set of individuals selected by the head. It merely adds more information on the same set.

(51) **The boys**, who happen to be standing, are tall.

In example (51), the head refers to a set of individuals who share the property of being a boy as it was the case in (42). However, in this case, the appositive relative could be removed without affecting the set of individuals selected by the nominal head 'boy' (example 52).

(52) The boys are tall.

Differently from restrictive relatives, appositives can have pronouns and proper names as heads, as in (53).

(53) a. We, who are students, have less trouble finding an apartment.
b. Mary, whom you met at the party three weeks ago, is coming tomorrow.

Because of this property, appositive relative clauses have been analyzed following two major approaches. Either, they are similar to parenthetical constructions and are therefore only linked to the main clause at discourse level (Espinal 1991, Peterson, Butt, and King 2004, Grosu and Krifka 2007). Or, they are generated in the grammar as coordinated structures (De Vries 2001) or as a special type of relative clause under a nominal projection containing also the head (Huot 1978, Cornilescu 1981, Demirdache 1991, Kayne 1994, Bianchi 2000)[15].

Independently from the approach chosen, appositives are defined regarding a number of properties which we review here. According to both Branchini (2014) and De Vries (2001), appositives accept indefinite and definite heads (cf. 54), but they have to be specific in some way, via the use of adverbs like 'certain'. The contrast in (55) shows this. Notice that in (55b), the meaning derived is restrictive.

(54) I saw the lion, which was lying in the sun, during my safari.

(55) a. Lions, which are lying in the sun, have a great life.
b. * I saw a lion, which was lying in the sun.
c. I saw a certain lion, which was lying in the sun.

Nevertheless, like restrictive relatives, appositives can have all types of heads, whether DP, CPs (cf. 56), or QPs (57).

(56) I knew that to live a long life, which can be desirable, would not be compatible with living exciting adventures.

(57) I saw some friends, which were all from my homeland, at the conference venue.

However, appositive relatives do not present reconstruction effects; this is shown by the ungrammaticality of (58), which displays an anaphora not bound by its referent. This property shows that appositives are not in the c-command domain of the main clause.

[15] Cinque (2008) provides a third analysis which attempts at capturing both hypotheses who proposes that there exists in fact two kinds of non-restrictive relative clauses. The integrated ones, generated by the grammar, and the non-integrated ones, linked to the head at the discourse level. While English only presents the non-integrated appositives, Italian *che/cui* versus *il quale* relative clauses would instantiate the two. The main argument comes from the fact that the two kind of appositives pattern symmetrically regarding a number of properties, but, crucially, differs along others.

(58) * The picture's of himself$_i$, that John$_i$ always liked, were lost in a fire.

Similarly, they do not license NPI (cf. 59), prevent binding transparency and show definiteness effects (contrarily to restrictive relatives) as illustrated by example 60.

(59) * The nurses, who requested any help from the surgeon, received blame.

(60) * The nurse took the needles, which there were on the table, before the surgeon arrived.

Finally, there is a debate in the literature about the possibility for appositive relatives to be stacked. According to De Vries (2002) and Grosu and Landman (1998), appositives can stack, but the sentences are more acceptable if different relative pronoun in each new relative is used, as in (61). However, Branchini (2014) notices that stacked appositive relatives cannot be embedded within each other, as shown by (62)

(61) I want to see Mary$_i$, who$_i$ still need to apologize for stealing my job$_k$, about whom$_i$ none of my friends is happy, before she leaves for Canada.

(62) ? I want to see Mary$_i$, who$_i$ must have forgotten my name$_j$ which$_j$ I had written on her notebook$_k$, which$_k$ was offered to her by my best friend, before she leaves for Canada.

2.1.4.3 Maximalizing / Amount / Degree relatives

Maximalizing relatives, first referred to as amount relatives by Carlson (1977), superficially display the structure of restrictive relatives while varying in the semantic relation between the head and the RC; they display maximalization (Grosu and Landman 1998, De Vries 2001, Branchini 2014). They can be headed by a DP referring to entities (= e-type relatives, Grosu and Landman 2017) or by degree-phrases (= d-type relatives). Two examples are provided in (63)-(64).

(63) I took the **books** that there were on your desk. *e-type RC*
⇝ I took **all** the books.

(64) We will need the rest of our lives to drink the amount of **wine** they spilled that evening. *d-type RC*

(adapted from Grosu and Landman 2017: 9)

In (63), both the head and the RC contribute to the derivation of the reference. However, the presence of the expletive 'there' forces all individuals being 'book on the desk' to be selected. Hence, while superficially looking like a restrictive relative clause, the relative itself does not restrict the reference but maximize it. In d-type relatives as (64), the same semantic operation happens, but this time, what is maximalized is the reference of the whole degree phrase (i.e., the amount of wine). For this reason, amount relatives of the d-type have been analyzed on a par with equatives and comparatives (Carlson 1977, Heim 1987).

Interestingly, e-type relatives can also receive a d-type interpretation without presenting a visible measure phrase. This is the case of (65), which receives the same interpretation as its overt counterpart in (64).

(65) We will need the rest of our lives to drink the **wine** they spilled that evening.
⇝ to drink the same **amount of wine**, and not **the specific wine** spilled that night.

In (65), the relative is headed by an entity, hence presenting a mismatch with the d-interpretation they receive Grosu (2002). We will come back to the implication of such a mismatch on a formal level in Chapter I.3.

Amount relatives come with a set of properties distinguishing them from other types. First, they do not allow indefinite heads (cf. 66).

(66) *I took a book that there was on your desk.

Secondly, amount relatives do not allow all types of quantifiers (Branchini 2014), universal quantifiers are acceptable while existential ones are forbidden, as illustrated in (67).

(67) I took every/*each book that there were on your desk.

Just like restrictive relative clauses, amount relatives need to be headed by non-maximalized heads like nouns and unlike proper names (68).

(68) *I called Mary that there was in the room.

According to Heim (1987), Carlson (1977) and Grosu and Landman (2017), this would also explain the impossibility for maximalizing relatives to stack, as shown by the ungrammaticality of (69).

(69) I suddenly noticed [the three books that there were on your desk that (*there) had earlier been on my desk]

(*from Grosu and Landman (2017)*)

All in all, Carlson (1977) proposes three distinctive properties to identify amount relatives: the impossibility to stack, the selection by a strong determiner, and the impossibility to be used with a wh-relative pronoun (they have to be introduced by 'that' in English).

2.1.4.4 Interaction between the syntactic and semantic types

In the definition of relativization strategies given by Branchini (2014) we have seen that semantic and syntax interplay in these structures. This is highlighted by the fact that not every syntactic type can present every semantic interpretation. This has been thoroughly addressed through the literature (see Lehmann 1986, De Vries 2001, De Vries 2002, Branchini 2014 or Cinque 2019 among many others), we sum the typological variations in Table (3).

We will consider syntax and semantic cues to be mutually informative in our investigation of LSF, following the Table (3). Indeed, as we will show now, the typological categories we presented so far have been successfully used to describe an ever-growing number of SL. We review the relativization strategies described for each of them in what follows.

2.2 Relative clauses in Sign Languages

While the syntactic investigation of sign languages is recent (the first works dates from the 1970s) compared to the history of linguistic, the complex topic of relativization strategies has

[15] Due to the small amount of researches on this syntactic type, we completed the table based on Berry and Berry (1999)'s work which states that double-headed relative clauses are limited to the non-restrictive semantic type.

[16] See Basilico (1996) and Cinque (2019) against this view.

[17] See Lüpke (2005)), Cinque (2014), Morshed (1986) against this view.

	Pre-nominal EHRC	Post-nominal EHRC	IHRC	Correlative	Double-head[16]	Free-relative
Restrictive	✓	✓	✓	X	X	X
Appositive	✓	X	X (✓[17])	X (✓[18])	✓	X
Maximalizing	✓	✓	✓	✓	X	✓

Adapted from De Vries (2001)

Table 3. Interaction between the semantic and syntactic types of relativization strategies.

been the flag holder of more and more researchers in the will to demonstrate sign language' syntactic complexity. This particular research line was historically motivated by several claims (Friedman 1991 or Thompson 1977 are well-known examples) arguing that sign languages were impoverished systems, lacking syntactic embedding or subordination. These claims have been proven wrong by the seminal work of Liddell (1980) on ASL has proven them wrong and are addressed by more and more researchers as sign linguistics grows around the world. We propose here a review of this literature which will include ASL, LIBRAS, HKSL, LIS, DGS, TÍD, JSL and LSC.

2.2.1 Relative markers

Across SL, a variety of relative markers have been identified. From a morphological standpoint, the majority of sign languages mark their relativization strategies through non-manual marking. An exception is JSL of which Penner, Yano, and Terasawa (2019) say that it is not marked in any way apart from occasional topic markers. As an example of non-manual marking, ASL's relative clauses are signaled through the use of a set of NMMs: backward head tilt, raised eyebrows and tensed upper lip (Wilbur 2017).

Some SL additionally presents a manual sign dedicated to relativization strategies. In HKSL it is a sign described as pointing towards the right and showing the palm by LI (2013). In DGS, the relative pronoun is the same sign as the pointing sign or to the 'PERSON-CL' sign. In LIS, the PE-sign[19] presents the manual configuration of a pointing sign but is realized with a wrist rotation rather than a directional movement (Branchini and Donati 2009), as illustrated in Figure (20). The syntactic analysis of these manual signs vary greatly across SLs.

[19] Glossed as 'PROREL' in Cecchetto, Geraci, and Zucchi (2006) and as 'PI' in Aristodemo and Geraci (2017).

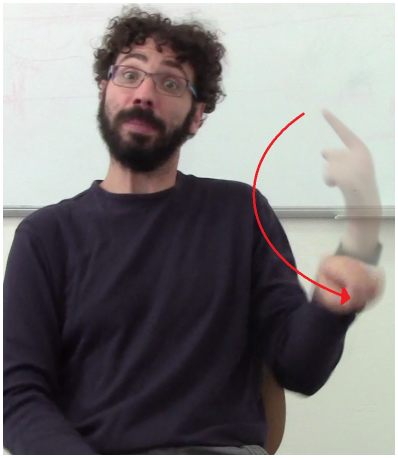


Figure 20. 'PE' in LIS.

Indeed, in ASL Liddell (1980) found the optional use of a complementizer glossed as 'THAT'. In TÍD, Kubus (2011) identifies an optional relative marker which can take different forms (flat, dual or plural) and is co-articulated with a set of NMMs such as raised eyebrows and optional "o"-shaped mouth. All relative clauses are identified in this language through raised cheeks, squinted eyes, tensed upper lip, and an optional head shake. Similarly, Mosella Sanz (2011) identifies an optional nominalizer in LSC, glossed as 'MATEIX', which can appear clause-final or clause-initial, while raised eyebrows, body lean and optionally squinted eyes mark all relative clauses.
In addition to the optional pronominal described before, which is analyzed by Tang and Lau (2012) as a demonstrative, HKSL' relative clauses are marked non-manually through an open mouth and direct eye-contact with the interlocutor (Tang and Lau 2012). The end of the RC is signaled through a blink and a head nod, which LI (2013) analyzes as a possible relative pronoun. Branchini (2014) analyzes the sign 'PE', present at the end of relative clauses in LIS, as being a determiner which signals the focalization of the relative clause. This goes against Cecchetto, Geraci, and Zucchi (2006)'s analysis of 'PE' as a relative pronoun. In LIBRAS, Nunes and Quadros (2005) describes no specific relative markers while in DGS, Pfau and Steinbach (2015) found two obligatory relative pronouns alternating depending on the nature of the head, whether it is human or not. Happ and Vorköper (2006) also found a different type of relative clause in DGS marked solely non-manually through pursed lips and a slight head nod.

In light of these facts, we see that sign languages instantiate all the different types of relative markers that were described in the precedent section[20].

2.2.2 Syntactic types of relativization strategies

All different syntactic types have been found across SL and will be presented here.

2.2.2.1 Modifying a NP or a CP

Relative clauses (i.e. relativization strategies modifiying a NP) have been found across all sign languages studied so far. For LIS (see 70), this structure has been argued in favor by Branchini and Donati (2009) or Branchini (2014) while Cecchetto, Geraci, and Zucchi (2006) argued in favor of a correlative analysis.

[20] Interestingly, for headed relative clauses, the SL studied so far presents d-like relative pronouns (i.e., derived from a determiner) and no wh-like relative pronouns. In LIS, Branchini (2014) found that free-relatives, on the other hand, are realized with a wh-like relative pronoun. In Chapter II.6, we show a similar finding in LSF.

(70) $\overline{\text{PIERO CONTRACT}_i \text{ SIGN DONE PE}_i}^{\text{rb}}$ GIANNI FORGET
'Gianni forgot the contract that Piero signed.'

LIS, (Cecchetto & Donati, 2014: 8)

However, only ASL additionally allows correlative constructions, modifying a CP (Galloway 2011), as seen in example (71). The author analyzes two other types of correlatives, one with the head within the main clause (adjoined relative) and another with two heads instead of a co-referring pronoun.

(71) $\overline{\text{DOG}_j \text{ BITE}_i}^{\text{rel}}$ WOMAN$_i$ $\overline{\text{THATPT}_j}^{\text{br}}$ COP SHOOT
'The cops shot the dog, that (one) bit the woman.'

2.2.2.2 Presence of a head

It has long been believed that SL cannot display free-relatives. Indeed, the most studied SL, ASL, does not present them (see among others, Liddell 1980, Wilbur 1996, Hoza et al. 1997). However, more recent studies on other sign languages have shown their presence in TİD (Kubus 2011), LIS (Branchini and Donati 2009,Branchini 2014) and JSL (Penner, Yano, and Terasawa 2019). An example of each is provided in (72)-(74)

(72) [ENGLISH KNOW] PRIZE WIN
'The one who knows English very well won the prize.'

TID, (Kubus, 2010

(73) $\overline{\text{IX-3 INVITE WHO}}^{\text{re}}$ IX-1 MEET DONE
'I met who s/he invited.'

LIS, from Branchini, 2014:279

(74) $\overline{\text{[BEFORE MEET] NEG LOOK.FOR; FRIEND NOT-EXIST, LOOK-FOR CL-FISH-SWIM-AWAY}}^{\text{fe}}$
'(Those) met before not being (there), he looked for (them); (his) friends not being (there), he swam away to look for (them).'

JSL, from Penner, Yano & Terasawa 2019: 10

The double-head correlative strategy found by Galloway (2011) could be counted as an occurrence of a double-headed relative, though not being nominal. Further researches are needed in order to assess their precise properties.

For all other sign languages, the single head strategy is dominantly present.

2.2.2.3 Head position

In HKSL (cf. 75), LSC (cf. 76), and LIS (cf. 76), IHRC is the sole strategy allowed. As for LSC, the relative is obligatorily extraposed.

(75) IX-3$_i$ FEMALE [$_{RC}$ LOOK_FOR GRANDFATHER IX$_1$] LISA INTIMIDATE
'Lisa intimidated the female who was looking for the grandfather.' *HKSL, from Li, 2013: 24*

(76) $\overline{\text{YESTERDAY MAN COME MATEIX}}^{\text{rel}}$ POSS$_1$ FRIEND
* JOAN [BOOK YESTERDAY BUY (MATEIX)] BRING NOT
'The man who came yesterday is my friend.'

LSC, from Mosella Sanz (2011)

$\overline{\text{PIERO } \textbf{CONTRACT}_i \text{ SIGN DONE PE}_i}^{\text{rb}}$ GIANNI FORGET
'Gianni forgot the contract that Piero signed.'

LIS, from Cecchetto & Donati, 2014: 8

IHRC are the preferred strategies in TÍD (Kubus, 2011) and ASL (Tang and Lau 2012) and one of the available options in JSL (Ichida 2010, Penner, Yano, and Terasawa 2019). An example of each is provided in (77)-(77). All of these languages also allow externally headed relative clauses.

(77) $\overline{\text{RECENTLY } \textbf{DOG} \text{ CHASE CAT}}^{\text{rel}}$ COME HOME
'The dog which recently chased the cat came home.'

ASL, from Tang & Lau, 2012: 358)

$[\overline{\text{HOUSE SOME } \textbf{PAPER WALL}_i \text{ EXIST}}^{\text{rel}}]$ REL$_i$ FOR REMOVE
'The wall papers which some houses have should be removed.'

TID, from Kubus, 2011

Turning to EHRC, we have seen in the previous section that they could be either pre- or postnominal. Among the SL studied so far, JSL is the only one displaying pre-nominal EHRC, as illustrated in (78). This is the preferred strategy of this language.

(78) $\overline{[\text{ YOU-ALL KNOW }] \textbf{ MOVIE}}^{\text{top}}$, 10-LAWS SAY MOVIE, $\overline{\text{HEAR KNOW. SEE}}^{\text{yn}}$
'The movie that you all know, the movie called 10 Laws—you heard of it? Seen it? '

JSL, from Penner, Yano & Terasawa 2019: 7

JSL also displays post-nominal EHRC as shown in example (79) by Penner, Yano, and Terasawa (2019) and Ichida (2010).

(79) **COMPANY YOUNG** [CL-PEOPLE-LINED-UP(M)-FACING-1 EXIST] IX-1 $_1$EXPLAIN$_{mp}$
'I'll explain (things) to the young people of the company, [who are there lined up in front of me].'

JSL, from Penner, Yano & Terasawa 2019: 9

Among the other SL presenting post-nominal EHRC, it is the sole strategy available in both LIBRAS (Nunes and Quadros 2005) and DGS (Pfau and Steinbach 2015), as illustrated in (80)-(80).

(80) INDEX$_1$ [**BOOK** [RPRO-NH$_3$ TABLE LIE-ON]$_{cp}$]$_{dp}$ KNOW
'I know the book which is lying on the table.'

DGS, (Pfau & Steinbach, 2005: 515)

GIRL [BICYCLE FALL] IS HOSPITAL
'The girl that fell off the bicycle is in the hospital.'

LIBRAS, from (Nunes and Quandros 2004: 180)

Finally, post-nominal EHRC are also found in ASL and TÍD, as shown in (81)-(81).

(81) $_1$ASK$_3$ GIVE$_1$ **DOG** $[_{cp}[_{tp}\ \overset{\text{rel}}{\overline{\text{URSULA KICK}}}]$ THAT$_c$ $]$
'I asked him to give me the dog that Ursula kicked.'

ASL, (Tang & Lau, 2012: 358)

CANSU MESSAGE SEND. **SAMET** CALL $[\overset{\text{rel}}{\overline{\text{MESSAGE SEE NOT}}}]$ CALL
'Cansu has sent a message. Samet, who did not see the message, called.'

TID, from Kubus 2010

A summary of the syntactic typological variations attested in sign languages is provided in Table (4).

SL		IHRC	Pre-nominal EHRC	Post-nominal EHRC	Correlative	Free-relative
European SL	LIS	✓	X	X	X	✓
	LSC	✓	X	X	X	NA[21]
	DGS	X	X	✓	X	X
	TÌD	✓	X	✓	X	✓
Asian SL	HKSL	X	X	✓	X	NA
	JSL	✓	✓	✓	X	✓
SL in the Americas	ASL	✓	X	✓	✓	X
	LIBRAS	X	X	✓	X	NA

Table 4. Summary of typological variation accross Sign Languages.

From the previous table, it emerges that SLs offer a similar level of complexity as spoken languages. Also, while in some cases one can argue for some influence of the dominant spoken language (e.g., the postnominal position of RC in JSL) in several other cases the grammar of the individual SL is different from the grammar (e.g., LIS-Italian, LSC-Catalan/Spanish, and so on).

[21] NA = Not Addressed.

2.2.3 Accessibility hierarchy

To the best of our knowledge, LIS is the only sign language to have been thoroughly described along the accessibility hierarchy[22]. In her book, Branchini (2014) shows that LIS allows subject, object, and adjunct relatives as any argument or adjuncts of the main clause. An example of each is provided in example (82). Notice that, as described before, the relative clause is always extraposed to the left.

(82) a. *SRC in subject position*

$\overline{\text{TODAY MAN}_i \text{ PIE BRING PE}_i}^{\text{rel}}$ YESTERDAY (IX$_i$) DANCE

'The man that brought the pie today danced yesterday.'

b. *SRC in object position*

$\overline{\text{DOG}_i \text{ IX}_i \text{ EAT A-LOT PE}_i}^{\text{rel}}$ DOCTOR (IXI) VET BRING

'I took to the vet the dog that eats a lot.'

c. *ORC in subject position*

$\overline{\text{DOCTOR VET IX}_i \text{ DOG}_i \text{ BRING PE}_i}^{\text{rel}}$ (IX$_i$) EAT A-LOT

'The dog that I took to the vet eats a lot.'

d. *ORC in subject position*

$\overline{\text{YESTERDAY DOG}_i \text{ FIND PE}_i \text{ PAOLO}_k \text{ IX}_k}^{\text{rel}}$ (IX$_i$) WASH

'Paolo washed the dog that I found yesterday.'

e. Adjunct Relative Clause (ARC) in an argumental position

GIRLI IX$_{dual}$ STUDY WITH $\overline{\text{PE}_i}^{\text{rel}}$ GIANNI LIKE (IXI)

'Gianni likes the girl I study with.'

f. ARC in an adjunct position

$\overline{\text{SON POSS-1 PLAY NEAR TABLE}_i \text{ PE}_i}^{\text{rel}}$ (IXI) IX KEY FORGOT

'I forgot the key near the table where my son plays.'

(From Branchini, 2014:191-192)

2.2.4 The semantics of relativization strategies

Semantic properties of relative clauses have not been systematically analyzed in SL; therefore, we cannot present the results of each of them in this respect.

In ASL, Galloway (2011) shows the maximalizing nature of correlatives by showing that, contrary to both IHRC and EHRC, they cannot be combined with atelic verbs. In DGS, Pfau and Steinbach (2015) indicates that EHRC are compatible solely with a restrictive reading while the relative clauses identified by Happ and Vorköper (2006) in the same language can only be understood as non-restrictive.

In TÍD, the IHRC are only restrictives while the EHRC can be both non-restrictive and restrictive. As for free-relatives in this language, Kubuş (2011) analyze them as being maximalizing. This is also what Branchini (2014) proposes for free-relatives in LIS. In LSC, the IHRC are analyzed as being restrictive only while they are restrictive in LIS.

Finally, Branchini (2014) identifies a strategy which is head external, lacks the 'PE' sign and the IHRC set of NMMs as well. This strategy has an appositive reading.

[22] In fact LI (2013) describes both subject and object relative clauses in HKSL.

All in all, SLs display all three different semantic types, showing as many variations as spoken languages do.

Through these studies, we can see that relativization strategies are as diverse in SL as they are in spoken languages. This comforts us in using the same typological tools across both spoken and signed modalities. We now turn to the formal frameworks proposed to account for the syntactic and semantic variations we have described so far.

2.3 Formal Frameworks

In the minimalist tradition, two[23] widespread analyses of relative clauses are currently available, namely the Head Raising (HR) analysis (Bianchi 2002b, De Vries 2001, Kayne 1994 among others) and the Head Matching (HM) analysis (Carlson 1977, Sauerland 2000, among others).

Both can account for both IHRC and EHRC; hereafter, we describe in detail their developments and implications. We will finish this section by presenting the double-head analysis, mainly proposed by Cinque (2003) or Cinque (2015). This last framework tries to capture all syntactic and semantic typological types while unifying the two preceding theories within a single underlying structure.

2.3.1 Head-raising based theories

The core ingredients of the head-raising analysis (also called 'promotion theory', Culy (1990)) are the following: the RC is the complement of a nominal projection, the head of the relative is generated within the relative clause, in its base position, and then raised to its surface position. Out of these (voluntarily) simple elements, shared by all versions of the raising analyses, debates have mainly concerned the nature of the nominal projection (DP? XP?) and the position of the external head (Spec CP_{rel}? External to the CP_{rel}?).

It is through Kayne (1994)'s seminal work on antisymmetry that the head-raising analysis of relative clauses became relevant in the linguistic literature. Seeding on Brame (1968) or Vergnaud (1974)'s work, the author proposes that the head of the relative clause is generated in its base position, but, as he notices that relative clauses are not theta-marked, he offers that they have to depend on a functional head. Given their nominal nature, RC are analyzed by Kayne as complements of a determiner, an external D head. The relative pronoun is argued to be the first determiner of the head, both of them rising to the left periphery of the relative clause. The head is then further raised to the specifier of DP, in order to be in the C-command domain of the external D head. The derivation is presented in Figure (21).

[23] We do not discuss here previous accounts in favor of an Head external-only / adjunct RC analysis (Quine 1960, Chomsky 1977, Jackendoff 1977) since, to the best of our knowledge, no defender of this theory has been able to account for reconstruction effects, idiom pattern and all other pieces of evidence indicating that the head of the relative has to be internal at some point of the derivation.

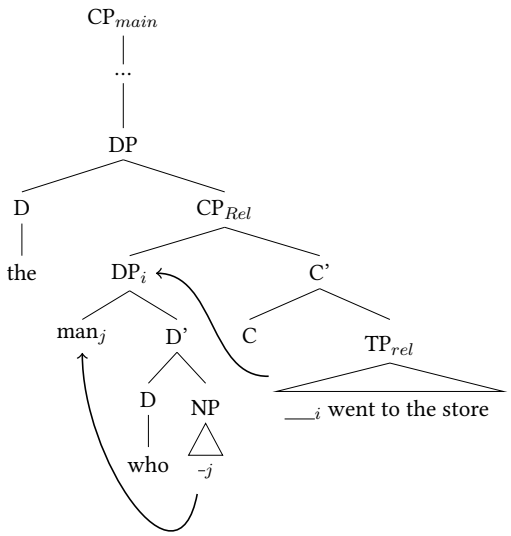


Figure 21. Derivation of relative clauses *à la Kayne*.

While adopted by authors such as Bianchi (2002b) and De Vries (2002), who extend this analysis to all types of relatives (with complementizers, without any relative pronoun, etc.), Bhatt (2005) notices that this analysis does not account for the sentence presented in (83).

(83) The woman [whom I loved] and [whom I always cherished] was here, in front of me.

Indeed, in (83), the head does not form a constituent with the relative since it does not need to be present in the second conjunct. This pattern leads Bhatt to propose that the head is further moved out of the relative clause CP, to land in an external position. Figure (22) illustrates his proposal.

While interesting, this proposal goes against Chomsky (1998)'s principle, which states that the label of the projection (here, NP) cannot be given by the moving element (the head) but has to be provided by the target itself. As an answer, Bhatt (2005) proposes to change this ban in the case of relative clauses. Another way out of this debate is to adopt Cecchetto and Donati (2014)'s proposal to refine the way elements can label projections. In their theory, movement becomes the motivation of labeling, and they also extend the number of labels available by proposing a mixed label, made of both the probe and target labels.

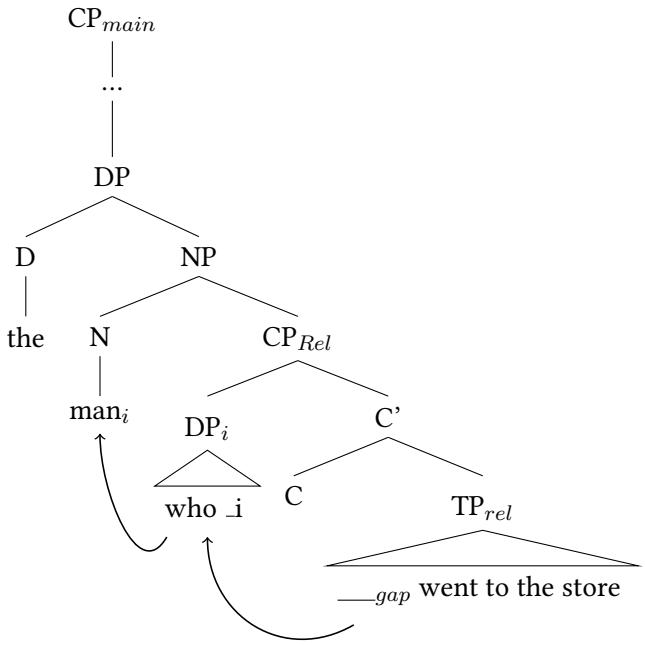


Figure 22. Derivation of relative clauses *à la Bhatt*

Another proposal comes from Bianchi (2002b) who proposes to add an intervening functional projection between the external DP and the relative CP[24]. We present the resulting structure in Figure (23).

As can be seen by comparing the three types of structures displayed so far, the variations across theories are fine-grained. In what follows, we will use the structure presented in Figure (22) since, similarly to Bianchi's proposal, it accounts for the constituency of the head with respect to the RC while providing a clear label in the landing projection.

[24] Originally, Bianchi (2002b) proposed that the intervening projection should be within the relative CP, however, Bhatt (2005) shows that adopting such structure derives the wrong word order. He proposes to have the functional projection outside of the relative CP. This is what we present here.

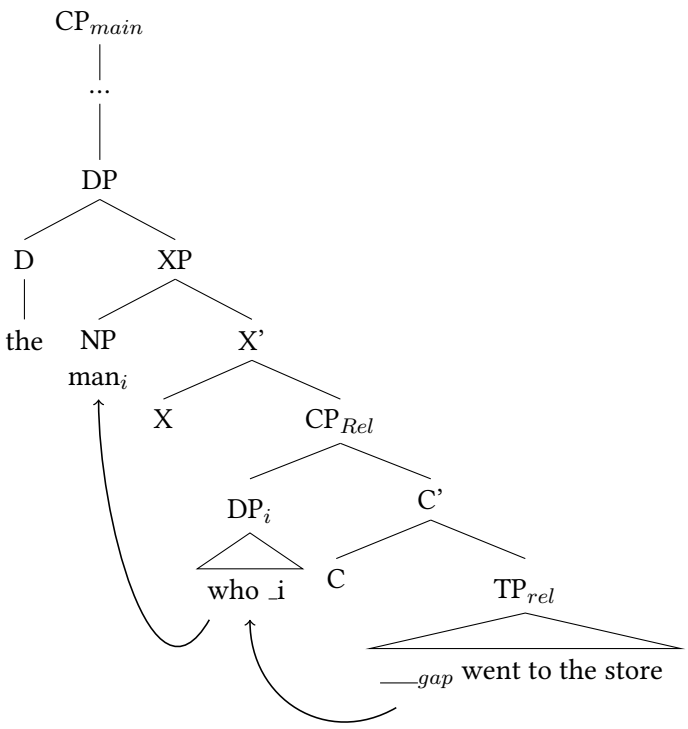


Figure 23. Derivation of relative clauses *à la Bianchi (& Bhatt)*

Independently from the analysis chosen, a raising analysis is needed to account for several properties linked to reconstruction effects. A prototypical example comes with anaphor binding. Indeed, without postulating an internal position for the head, we cannot explain the acceptability of (84).

(84) The pictures of himself$_i$ which Mario$_i$ likes are on the table.

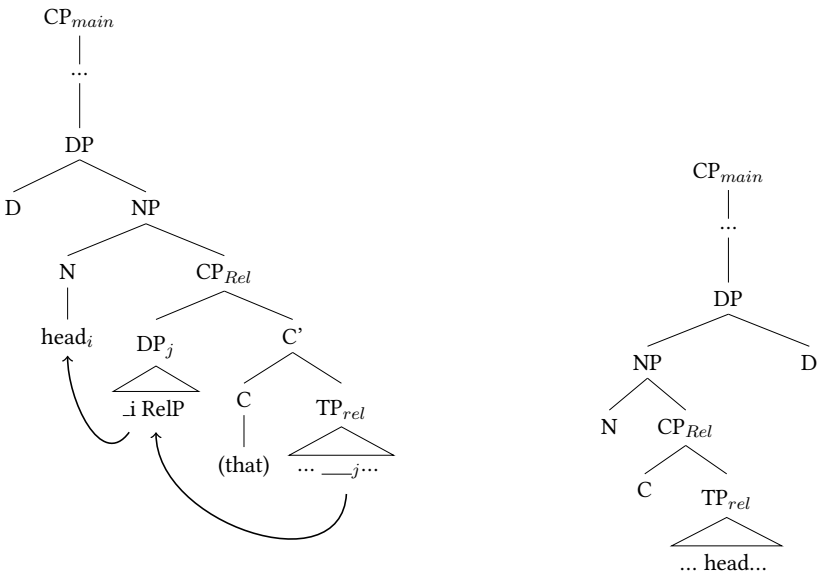
As briefly mentioned when presenting properties of restrictive relative clauses, anaphoras need to be bound by their referent in their local domain, at some point in their derivation (following Principle A of the binding theory Chomsky (1973)). Another example of reconstruction effects comes from idioms. As shown by Bianchi (2002a) and De Vries (2002), relative clauses allow their head to present chunk of idioms as in (85).

(85) L'herbe qu'elle lui a coupé sous le pied n'est pas prête de repousser.
Lit. 'The grass which she cut under his feet is unlikely to grow again.'
'The opportunity she stole from him is not likely to happen again.'

Similarly to anaphor binding, idioms have to be interpreted as forming a constituent, which is not possible if the two chunks are generated separately (Marantz 1984).

Finally, the raising analysis allows us to account for both IHRC and EHRC since the difference between the two is just a matter of movement of the head either in the surface syntax or at Logical Form (LF). The alternation between the two is presented in Figure (24).

While the need for a rising analysis is hardly contested, a growing number of researchers have pinpoint facts that cannot be accounted for through this analysis alone.



(a) EHRC **(b)** IHRC[25]

Figure 24. Derivation of both IHRC and EHRC with raising derivation.

2.3.2 Head-matching based theories

The matching analysis (Lees 1960, Sauerland and Chomsky 1998, Citko 2011 or Bhatt and Pancheva 2017) seeds on the idea that there is an external head merged to the main clause, which coexists with the internal base-generated one. The two heads are coreferential, and one of them has to be deleted at Phonological Form (PF). Moreover, the internal head is raised to the SpecCP of the relative clause. This process is illustrated in Figure (25).

Two variations of the head matching analysis have been proposed. The strong matching analysis (Bhatt 2015,Schachter 1973 or Salzmann 2006) and the weak matching analysis.

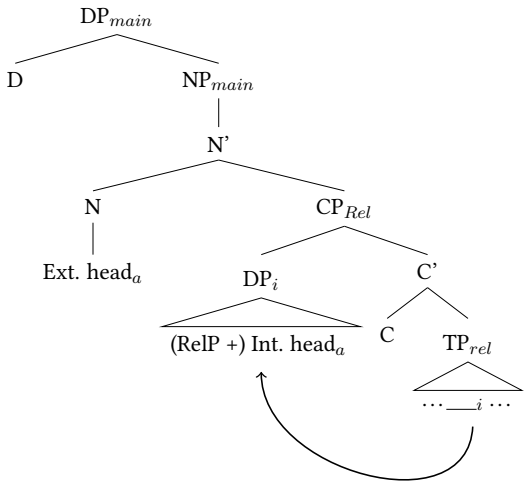


Figure 25. Head matching derivation.

[25] This structure is based on De Vries (2002)'s analysis of IHRC.

The strong matching analysis allows a mismatch between the phonological form of the two heads but requires them to have the same semantics, as illustrated in (86).

(86) The flowers$_a$ [[which flowers$_a$]$_j$ Charlotte wants ___$_j$]
$\rightsquigarrow$ the flower λx. Charlotte want λy. (x=y and flower(y))

In (86), both heads are semantically similar, as shown by the equality between x and y.

The weak matching analysis requires no identity between the two heads as long as they co-refer such that the meaning is derived through one or the other. For this reason, the weak matching analysis can postulate the presence of a null operator, bearing the coreference solely with the full NP head. This operator can be either of the two heads. An example of the semantic derived is provided in (87).

(87) The flowers$_a$ [[which Op$_a$]$_j$ Charlotte wants ___$_j$]
$\rightsquigarrow$ the flowers λx. Charlotte want x.

An advantage of head matching theories is that it cuts out with the theoretical debate regarding labeling and projection since the (external) head is merged and not moved. Apart from this point, the head matching theory is needed to account for some cases in which reconstruction effects are blocked, showing that the derivation is not raised. Extraposition, for example, prevents both anaphor and idiom chunks from appearing as the head of the relative, as shown in (88). Notice that, out of reconstruction effects, extraposed relatives are perfectly acceptable (see 89).

(88) a. * They took the pictures of himself$_i$, yesterday, which Mario left on the table.
b. * Il ne pourra jamais faire repousser l'herbe, hier, qu'elle lui a coupé sous le pied.
Int. 'He will never be able to grow the grass again, yesterday, she cut under his feet.

(89) They took the pictures, yesterday, which Mario left on the table.

Another piece of evidence in favor of the head matching analysis is the absence of violation of Principle C in sentences such as (90). Notice that, if the proper noun had been bound at any point of the derivation, it would have yielded an ungrammaticality similar to (91)

(90) The video of Justine$_a$ which she$_a$ has shown to Charlotte has a very high quality.

(91) *Which video of Justine$_{ia}$ that she$_a$ has shown ___$_i$ to Charlotte has a very high quality?

Finally, HM is the only hypothesis able to account for e-type relative clauses receiving a d-interpretation, aka amount relatives as in (92).

(92) I drink in two years the milk that he swallows in a day.

In (92), through HR, we have to postulate a hidden degree phrase being raised, while HM can allow one of the two heads to be different from the other.

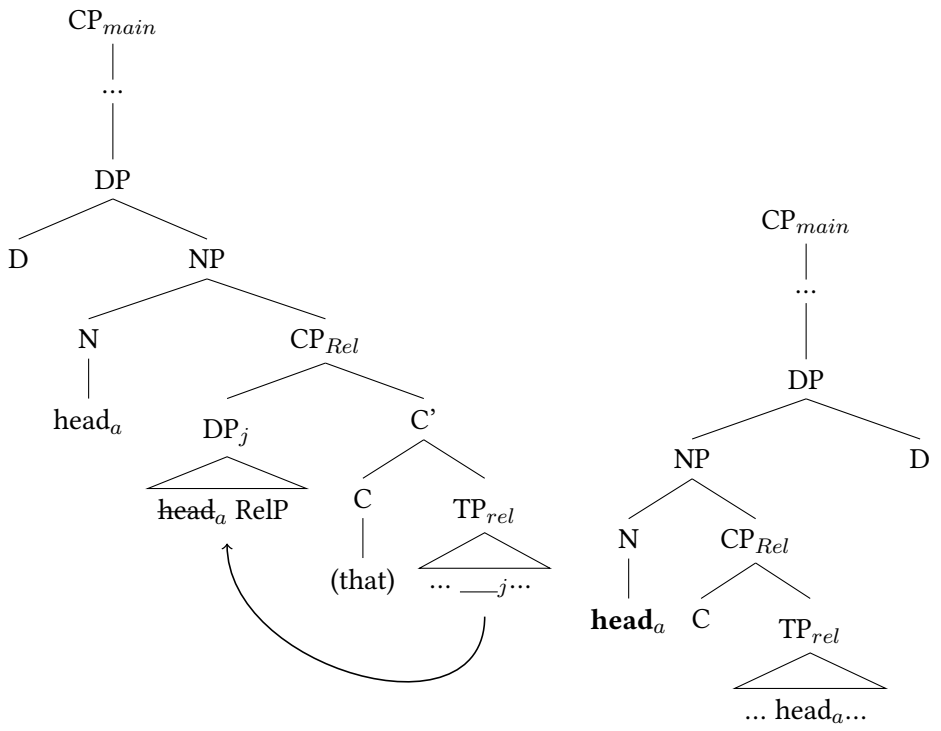
Finally, notice that just like the raising analysis, the HM allows deriving both IHRC and EHRC as shown in Figure (26)[26].

The majority of the proponents of the HM are in favor of having both analyses available within a linguistic system in order to derive the whole set of properties exhibited by relative clauses, (Cinque 2019, Sauerland 2002). On the one hand, Head Matching is required to derive the grammaticality of some cases of Principle C violation (see Cecchetto and Donati 2015 for

[26] In the weak alternative the internally headed relative analysis is not so straight forward as the internal element is a phonologically silent Op (see Sauerland 2002).

a possible case of overgeneration) and to account for extraposition/late merge of the relative clause (Lebeaux 1990). On the other hand, Head Raising is needed to account for kind readings (Sauerland 2000) and Principle B violations (Carlson 1977, Grosu and Landman 1998).

Now we turn to a recent analysis, proposed by Cinque (2003), which aims at accounting for all the variations we have seen so far.



(a) EHRC, the internal head is deleted at PF. **(b)** IHRC, the internal head is deleted at PF.

Figure 26. Derivation of both IHRC and EHRC with matching derivation.

2.3.3 The double-head hypothesis

In an attempt to unify all the possible syntactic and semantic derivations with a proposal framed in an antisymmetric framework (Kayne 1994), Cinque proposes a single, double-headed, prenominal structure integrated within a functional projection domain. This structure activates, moves, or deletes different elements, depending on the properties displayed by each relative type. The 'naked' structure is provided in Figure (27). To simplify, we removed intermediate projections (such as X') whenever possible.

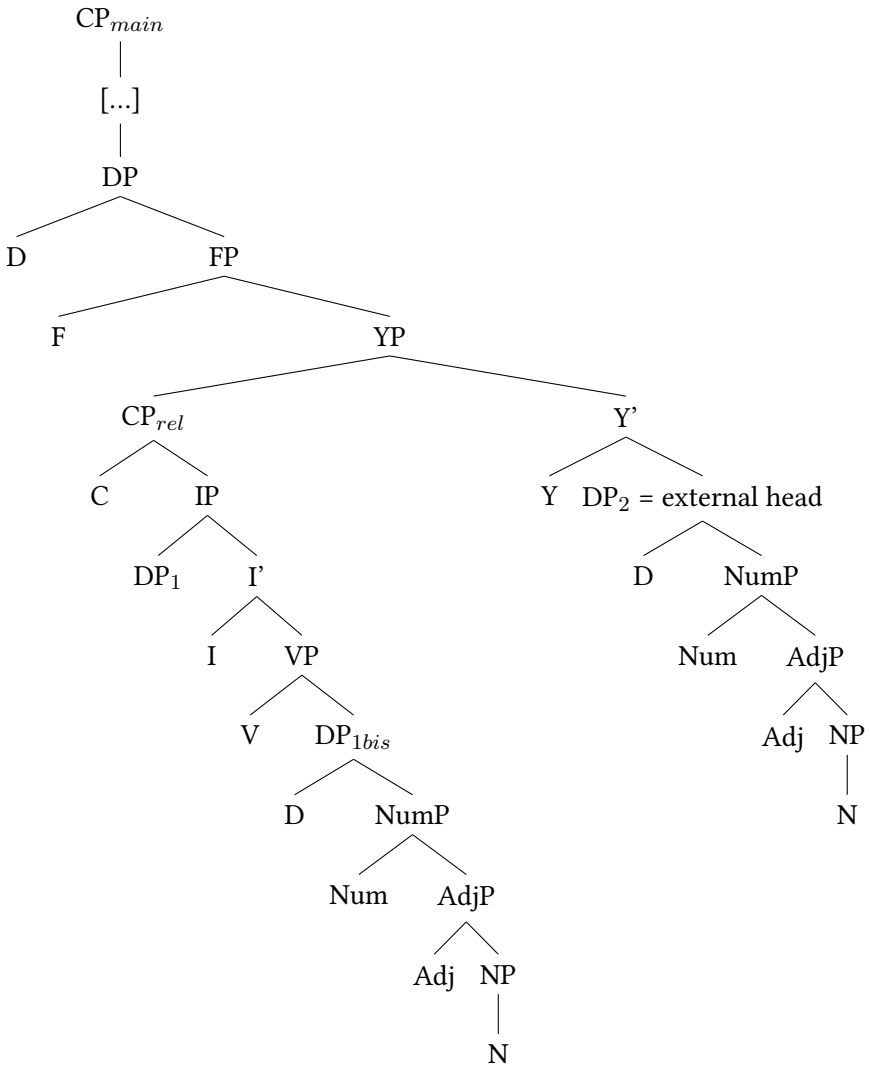


Figure 27. Full structure from Cinque (2019).

Following Cinque (2003)'s proposal, two heads are present within every relative clause, one external (after the relative clause) and one internal, base-generated in its argumental position. Following the matching analysis principle, the external head is directly merged to its external position (the complement of FP_2 in Figure 27) and co-refers with the internal head.

Then the relative clause itself is merged as the specifier of the functional projection FP_2, in a prenominal position.

Through this initial word order, Cinque (2019) attempts at unifying the order between all heads and their complements. This proposal roots on the observation that, across languages, complements (such as NP, AdjP...) have a fixed order when they are on the left periphery of the head they modify. When on the right side, however, their order varies greatly crosslinguistically. This is shown with the examples taken from Greenberg (1963) in (93)-(94).

(93) Attested[27] order of complements on the left of the head noun (in bold)

[27] This generalization is known as the *Universal 20* and has been revised and implemented several times since 1963. The current version is the one proposed by Hawkins (1989). Although typological research has shown that more options are attested, the basic facts referred to by Cinque have always been confirmed (Cinque 2015).

a. Demonstrative > Numeral > Adjective > **Noun**

b. * Adjective > Numeral > Demonstrative > **Noun**

(94) Attested order of complements on the right of the head noun (in bold)

a. **Noun** > Demonstrative > Numeral > Adjective

b. **Noun** > Demonstrative > Numeral > Adjective

In (93), the order between all complements is fixed. According to Greenberg (1963) we do not find languages presenting an alternative order. On the other hand, for complements on the right of the head noun, we find a variety of strategies acceptable.

To account for these facts, Cinque (2019) proposes that the true base-generated word-order has to be Complement > Head, all other surfacing word orders being derived by successive movements of the head to the left of the complement. Along the same line, he proposes to adopt the Linear Correspondance Axiom (LCA) (from Kayne 1994) but to inverse its order, thus stating SOV as the basic word order from which all the others derives (instead of the original SVO derived by the LCA).

With this theory in mind, the only merge position for a RC is prenominal. All other properties of relativization strategies (modifying a NP, a CP, being restrictive or maximalizing...) are obtained through different derivations. For example, to account for reconstructions effects Cinque (2015) proposes to raise the internal head (DP_{1bis} in Figure 28) to the specifier of the relative CP which now c-commands the external head (DP_2) which, in turn, is deleted under identity.

Now, with the relative pronoun, the whole DP_{1bis} would have been raised, and the external DP would have been erased (in a post-nominal EHRC strategy). To account for the blocking of reconstruction, Cinque proposes that it is the external head (DP_2 in Figure 28), which would have moved to the specifier of the functional projection FP. The internal head would still occupy the same position but would be the one erased under identity, just like in traditional HM proposals.

While very interesting, this model faces at least one founded criticism, already addressed to Kayne (1994)'s original LCA. Indeed, while both proposals present a seemingly highly constrained framework in terms of word order, lateralization of the complements and so on, such models are, however, very permissive regarding movement. Indeed, no intrinsic motivation is required for movement to occur, leaving the possibility to move any projection (in the limits of syntactic constraints on the number of nodes crossed, for example) in order to account for the surfacing word order. In that respect, this model is too permissive and becomes more descriptive than predictive. It fails to capture the differences in relative types.

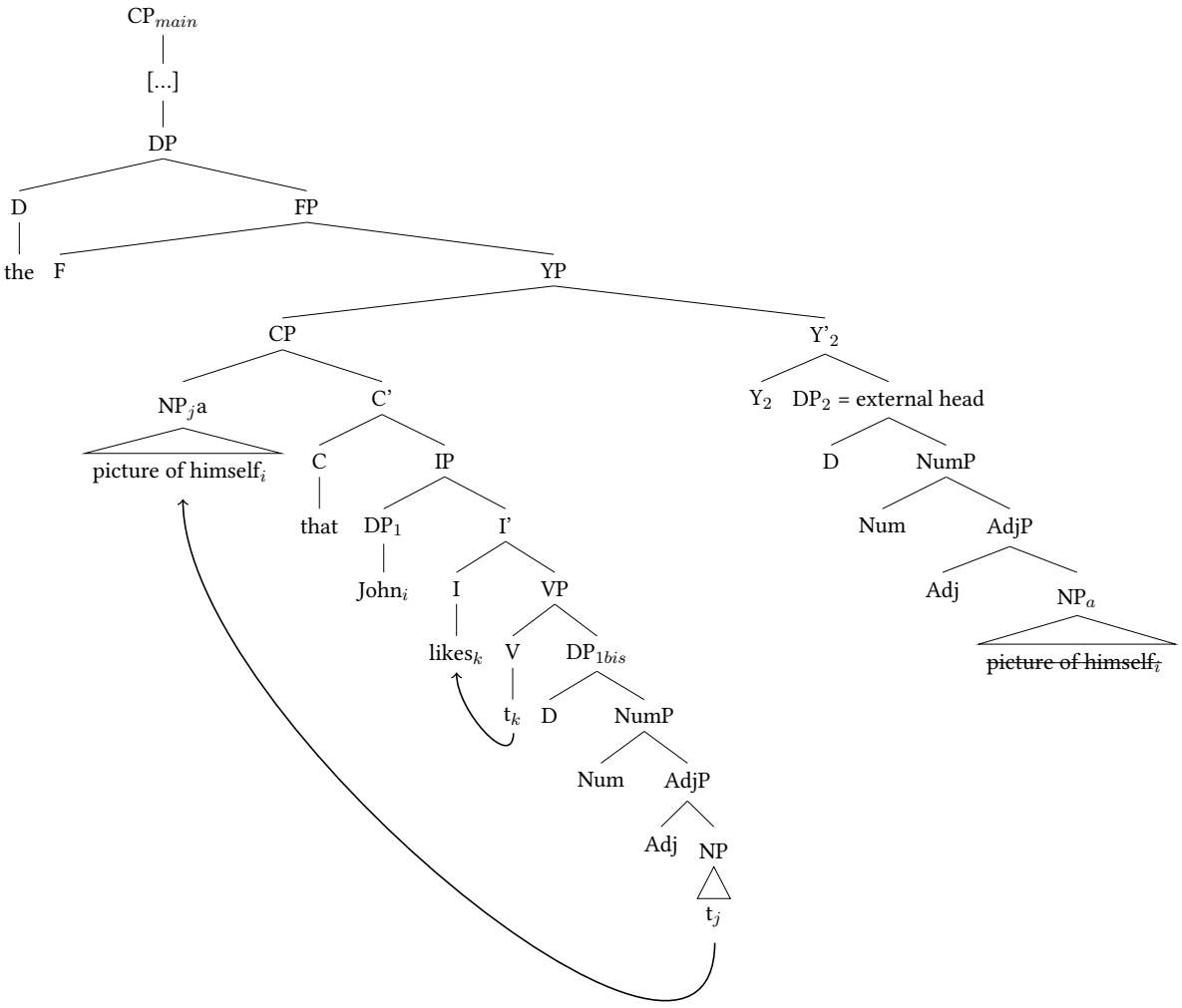


Figure 28. Derivation of 'The pictures of himself that John likes' through Cinque's model.

2.3.4 Appositive relative clauses

So far, we have presented the analyses competing to account for restrictive relative clauses. Regarding their appositive counterparts, a large number of hypotheses have also emerged throughout the literature. An overview is proposed in De Vries (2002) through the Table reproduced in (5).

constituency	↗	**complement of D** plus NP-internal extraposition of ARC	Smith (1964)
	→ **adjunction** to antecedent[28] ↗	"$\mathbf{S}_{\text{ubordinate}}\mathbf{C}_{\text{lause}}\mathbf{H}_{\text{ypothesis}}$"	Jackendoff (1977) Perzanowski (1980) Smits [type A] (1988) Toribio (1992)
	→ **adjunction** to antecedent[28] ↘	plus **LF-raising** to $\text{SpecCP}_{\text{main}}$	Demirdache (1991)
	→ **surrounding phrase** ↗	compl. of add. **empty N**; antecedent DP is in SpecNP	Platzack (1997)
	→ **surrounding phrase** ↘	**Small Clause compl.**	Lipták (1998)
	↘	**promotion** plus **LF remnant raising** of ARC to SpecDP	Kayne (1994) Bianchi [type i] (1999)
	↘ specifying **coordination** ↗ to antecedent	(bare ARC)	Sturm (1986) Koster (2000c)
	↘ specifying **coordination** ↘ to antecedent	ARC is **Free Relative**	De Vries (2000a)
orphanage	↗ **non-radical** →	"$\mathbf{M}_{\text{ain}}\mathbf{C}_{\text{lause}}\mathbf{H}_{\text{ypothesis}}$" coordination to matrix clause at D-structure	Ross (1967) Thompson (1971) Emonds (1979) Stuurman (1983)
	↗ **non-radical** →	**discontinuous constituent** plus attachment to matrix	McCawley (1982)
	↘ **non-radical** →	**base-gen. extraposition** [position unspecified]	Smits [type B] (1988) Bianchi [type ii] (1999)
	↘ **radical** ↗	(bare ARC) **LF'** / **'discourse'**	Safir (1986) Fabb (1990)
	↘ **radical** ↘	ARC is **Free Relative**	Canac-Marquis & Tremblay (1997)

Table 5. Syntactic analyses of appositive relative clauses, summarized by De Vries (2002)

In Table (5), the orphanage theories argue in favor of a link between the main clause and the appositive at a post-syntactic level only. An advantage of such accounts is that the binding and NPI effects described in the previous Section are easily explained. On the other hand, they have to explain why, while being an 'orphan', the appositive is restricted in the position in which it can appear (on the right of the head).

Constituency accounts argue in favor of appositives being linked to the main clause at the syntactic level. Hence, they have to explain the binding and NPI effects. On the other hand, these accounts present interesting insights on properties of appositives such as the fact that they form a constituent with the head (see 95 from De Vries 2002).

(95) Annie, die viool speelt, heeft een nieuwe strijkstok gekocht. *Dutch*
'Annie, whom violin plays, has a new bow bought.'

In Dutch, like in German, the verb has to be second in main clauses. The sentence in (95) shows that the appositive forms a constituent with the head noun 'Annie'; thus, the verb is

indeed in the second position. This property cannot be accounted if one adopts a parenthetical analysis of appositive relatives.

We will not detail all the arguments used by De Vries (2002) here. We instead sketch the outline of the author's analysis in order to use it later to account for LSF data.

Based on Marquis and Tremblay (1998) and Koster (2000)'s work, De Vries (2002) takes appositive relatives as being light-headed free-relatives (with a pronominal, generally null, as their head) which are coordinated to the seeming head within the main clause. In Dutch, it is possible to see every component of this analysis through the covert/overt alternation presented in (96).

(96) a. Annie, ∅ die onze directrice is
'Annie, who is our manager.'

b. Annie, oftewel **zij** die onze directrice is
'Annie, or she who is our manager.'

from De Vries (2002):219

In (96b), 'or' is the overt head of the conjunct projection proposed by De Vries (2002) and 'she' is the overt pronominal head modified by the appositive relative. The constituent made of the covert/overt pronominal and the light-headed free relative together is the conjunct of the *prima facie* head noun (Annie) within the main clause. The structure for (96a) is provided in Figure (29).

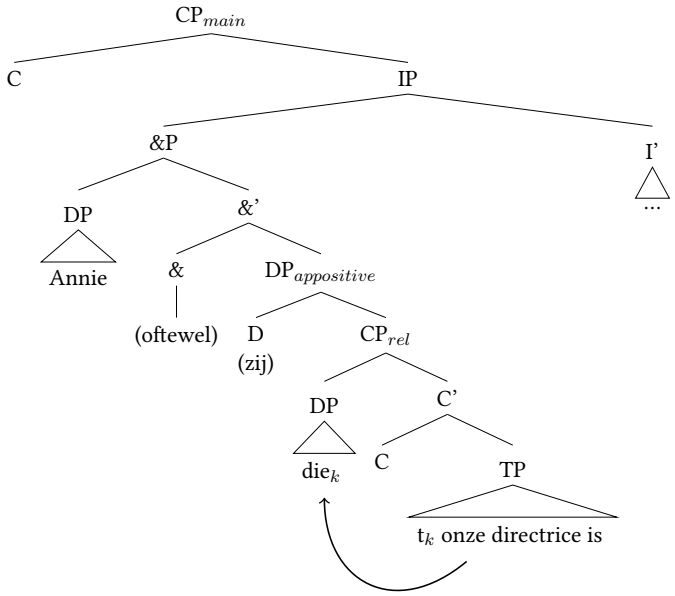


Figure 29. Appositive structure *à la De Vries, 2002.*

In the following Chapter, we present LSF data and will implement our results following the frameworks we presented here.

Chapter 3

Investigating LSF relativization strategies

In this chapter we present LSF relativization strategies. The data presented here have been elicited and assessed following the methodology explained in the introduction Chapter (1). We detail here the syntactic and semantic properties that we investigated in LSF. In Section I.3.1, we first locate LSF within the typology presented in the previous Chapter. We will adopt the structure we have followed throughout the previous Chapter, by presenting the manual and non-manual marking strategies available in LSF before introducing its syntactic types and its semantics. These findings will pave the way for our formal analysis in Section I.3.2.

3.1 Typological categorization of LSF

3.1.1 Relative markers

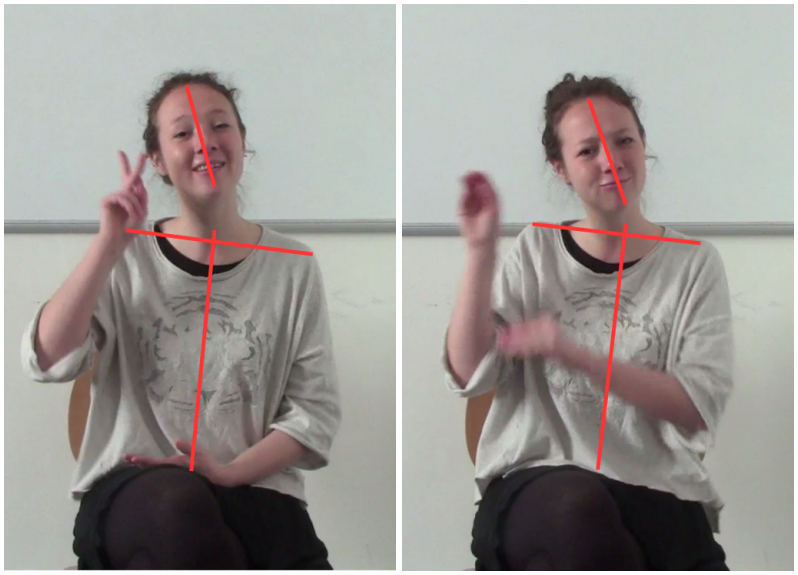
We identified three different relative markers in LSF. They all come with the same set of non-manuals markings, which spreads differently depending on the marker itself.

The first strategy is characterized by non-manual markings only (glossed hereafter as 'rel'), which minimally spread over the head of the relative, as shown in example (97). The key non-manual markers are: a) at least one part of the upper body —shoulders or torso— is oriented towards the locus where the head of the relative is located in the signing space b) eyebrows are raised, c) lips are tensed and d) upward or downward chin.

(97) IX-1 PREFER $\overset{\text{rel}}{\overline{\text{VET}}}$ CURE DOG
'I prefer the vet who cures the dog.'

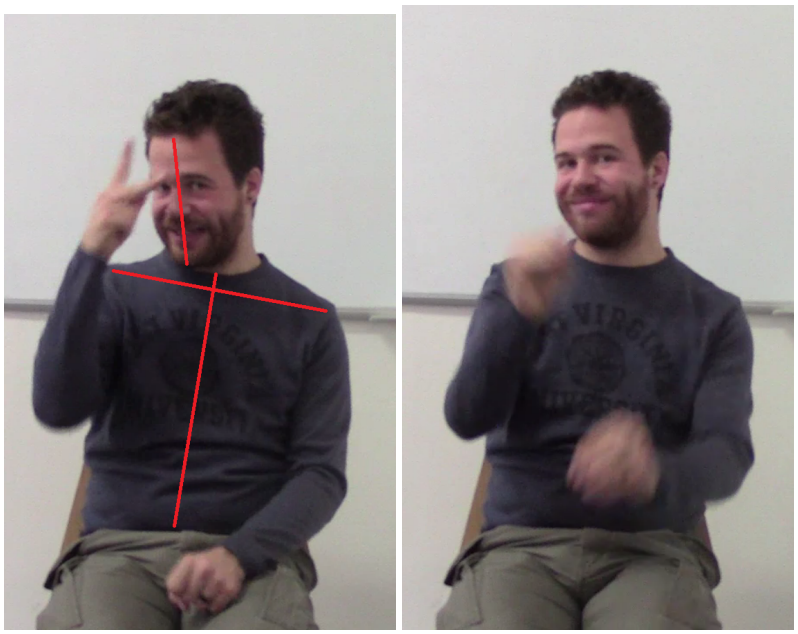
What seems to matter the most here is to contrast the head of the relative clause with the rest of the relative clause, as can be observed in Figure (30)[1].

[1] A similar, non-marked, strategy has been described by Millet and Verlaine (2017) for whom LSF's relative clauses are primarily identifiable by the fluency linking the main and dependent clauses. No mention of specific non-manuals is provided.



VET CURE

(a) Head of the relative realized with an up-chin, contrasting with the verb.



VET CURE

(b) Head of the relative realized with a lower chin, contrasting with the verb.

Figure 30. Signs for VET (the head) and CURE (the verb)

Interestingly we found two other relativization strategies marked with overt manual signs. The first manual marker in (98) is for human referents only (see the unacceptability of 99). It includes the classifier for 'person' in LSF (see Figure 31) and the same set of NMMs described above. The NMMs spread obligatorily on the relative marker (PERSON-CL) , as shown in (98), and optionally also over the head of the relative, as seen in example (100) and Figure (32).

(98) IX-1 PREFER LITTLE GIRL $\overset{\text{re}}{\overline{\text{PERSON-CL}}}$ PET DOG
'I prefer the little girl who pets the dog.'

(99) * IX-1 PREFER DOG PERSON-CL VET CURE ___*gap*



Figure 31. PERSON-CL relative marker

Intended: 'I prefer the dog which the vet is curing.'

(100) IX-1 PREFER LITTLE $\overset{\text{re}}{\overline{\text{GIRL PERSON-CL}}}$ PET DOG
'I prefer the little girl who pets the dog.'



IX-1 PREFER LITTLE GIRL **PERSON-CL** PET DOG

Figure 32. Non-manual marking of the sentence in (100)

The second manual relative marker is the demonstrative sign PI[2], glossed after the mouthing marking it[3], which can be used for any head, whether human, non-human or inanimate. Here again, the manual sign is coarticulated with an upper-body orientation towards the head of the RC, raised eyebrows which can optionally spread over the head of the RC and the mouthing component (cf. Figure 33 and example 101).

(101) IX-1 PREFER $\overset{\text{rel}}{\overline{\text{VET PI}}}$ CURE DOG
'I prefer the vet who cures the dog.'

[2]This corresponds to the sign glossed as 'CE-pichenette' in Millet and Verlaine (2017), who analyze it as a demonstrative but does not mention its use in relative clauses.

[3]This is not the only sign marked by the mouthing [pi] in LSF. Few others, such as the one expressing condition or the one expressing properties typical of a person or a group of individuals, share this mouthing. We do not analyze them in this dissertation and will thus unequivocally refer to the relative marker as 'PI'.

(102) IX-1 PREFER $\overset{\text{rel}}{\overline{\text{DOG PI}}}$ VET CURE ___*gap*
'I prefer the dog which the vet cures.'

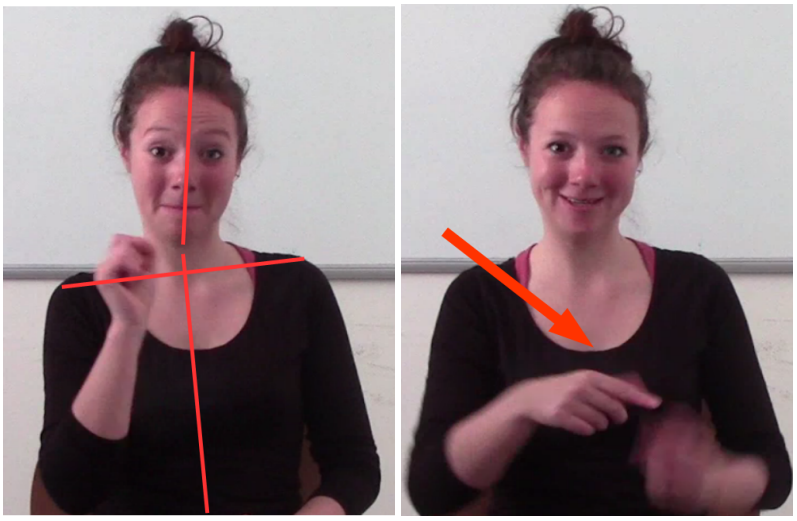


Figure 33. Non-manual marking of (101)

As we have seen in the previous Chapter, relative markers can be analyzed either as complementizers, as relative pronouns, or as relative markers/nominalizers. In the case of both PI and PERSON-CL, we will argue in favor of a relative pronoun analysis based on a) their agreement pattern, b) their optional appearance inside the relative clause.

Starting from agreement, PERSON-CL shows a plural inflection with a plural head, as in example (103) and Figure (34).

(103) IX-3 MEET-PL GIRL ALL **PERSON-CL-PL** PLAY-PL-CIRCLE HOPSCOTCH.
'She (Mary) met all the girls who were playing hopscotch.'

On the other hand, PI cannot be inflected for number. If the sign is repeated 'x' times, it will be interpreted as a demonstrative of 'x' entities. PI can still be used with plural heads, but the sentences are usually graded better by our informants if it is combined with a quantifier or another sign designing the group of entities as in example (104).

(104) IX-3 MEET-PL GIRLS ALL **PI** PLAY-PL HOPSCOTCH.
'She met all the girls who were playing hopscotch.'

Whenever possible, PI displays nevertheless spatial agreement with the location of the head of the relative[4], as can be observed in Figure (35) where the locus of the head 'TOOTHBRUSH'/'GIRL LITTLE' is used as the locus of 'PI'.

PERSON-CL is realized either on the left or the right side of the signer without apparent relation with the head noun's locus. What needs to be noted is that displaying agreement with the head is commonly associated with relative pronouns, but it is not a sufficient criterion to

[4]There is however a specific instance of PI (cf. example 1 below), where it is signed at the end of the relative clause and realized in the neutral space, with the body leaning back which could be interpreted as a relative marker, nominalizing the whole sentence just like the 'kes' particle in Korean (Kim 2009). We will address this case in (3.2.2.1).

(1) IX-1 PREFER [MAN PET DOG] **PI**
'I prefer situations in which a man is petting a dog (in general).'



Figure 34. Plural agreement on PERSON-CL.

evaluate the nature of these markers since some languages do present some form of agreement on complementizers.

For this reason, we elicited all possible word order with our informants (see Methodology in the Introduction) and found (105) and (106) to be acceptable options, although slightly degraded. In these examples, PI and PERSON-CL can both be found in a position internal to the relative clause.

(105) IX-1 PREFER [MAN **DOG** $\overset{\text{rel}}{\overline{\text{PI}}}$ PET]
'I prefer the dog which the man is petting.'

(106) [IX-1 PREFER [TODAY **VET** $\overset{\text{rel}}{\overline{\textbf{PERSON-CL}}}$ CURE DOG]]
'I prefer the vet who is curing the dog today.'

In (105), the head 'DOG' is the object of the relative clause and appears in its base position (in an SOV order). In (106), the temporal adverb 'TODAY' marks the edge of the relative clause, which entails that any lexical element on its left, such as the head 'VET', is therefore within the relative clause. More importantly, in both examples, the relative markers PI and PERSON-CL are found next to the head. In this respect, both relative markers behave like relative pronouns. Recall from Chapter I.2 that only relative pronouns are base generated in the gap position and might optionally appear here. The same test can exclude that they are clitic on some specific elements like the verb, for instance.

The fact that the two pronouns are normally dislocated to the left side of the relative clause is evidence that they are not resumptive pronouns (De Vries 2002).

(107) IX-1 PREFER PI_a [MAN PET DOG_a]
'I prefer the dog that the man pet.'

[4] i.e. rated 5 out of 7 by our informants

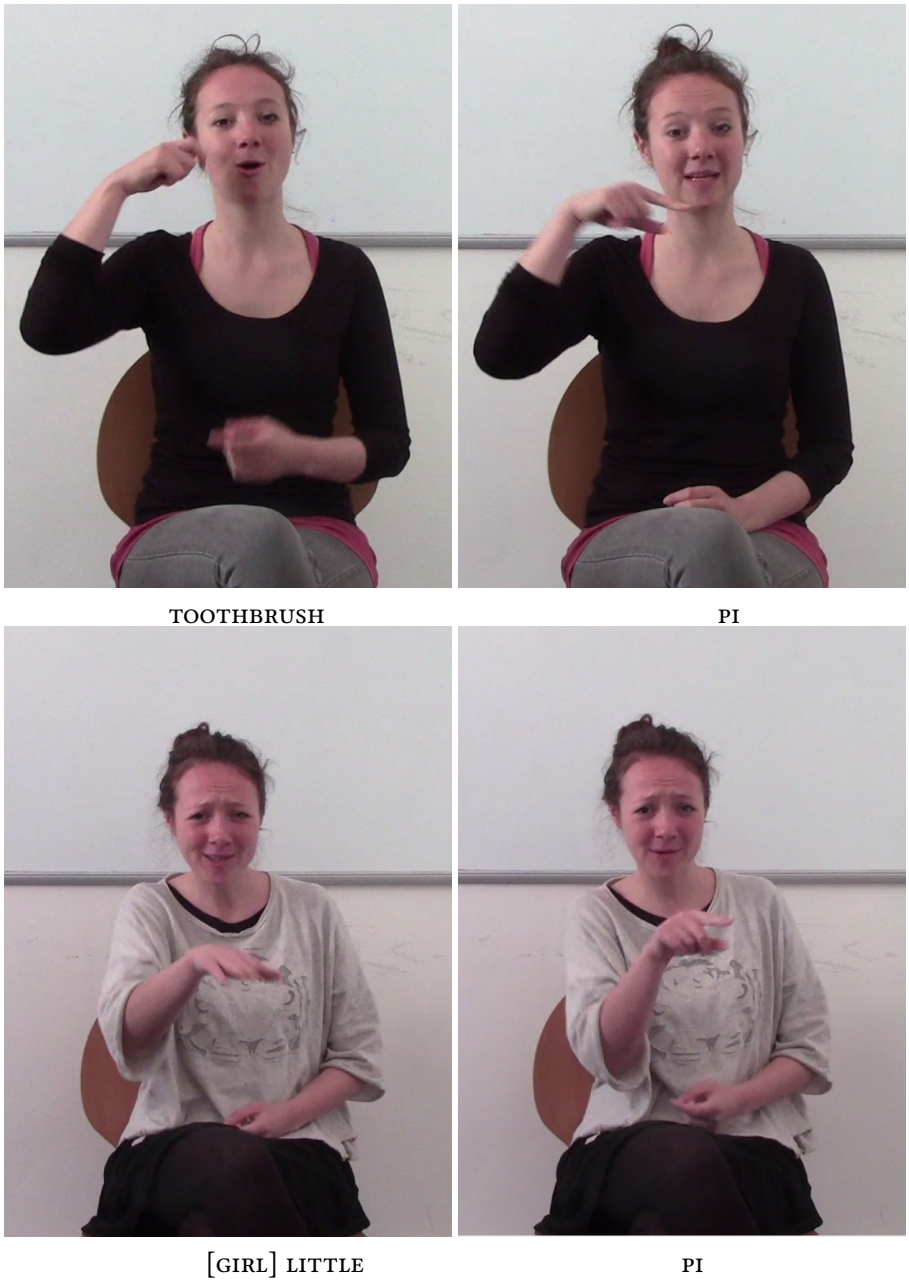


Figure 35. Spatial agreement between the head and PI.

Therefore, we analyze PERSON-CL and PI as two relative pronouns. None of them can be used as a wh-word in a question, while they both appear in combination with nouns in simple sentences such as (108) and (109).

(108) MOM POSS-1 NURSE PERSON-CL
‘ My mom is a nurse.’

(109) IX-1 USE PI MUG
‘ I used this mug.’

Furthermore, PERSON-CL can be used as an independent pronominal element, as shown in (110).

(110) a. PERSON-CL ENTER
'Someone entered (the room).'

For further semantic properties of PERSON-CL and PI outside of their relative use, see Kuhn and Aristodemo (2017) and Schlenker (2018), respectively.

3.1.2 Syntactic type of relativization strategy

3.1.2.1 Modifying a NP or a CP

In Chapter I.2, we have distinguished two main types of relativization strategies depending on the constituent they modify: correlative constructions modify CPs, and relative clauses modify NPs.

Regarding LSF, a first property to be considered is the (in)dependence of the relativized clause. To determine how LSF behaves in this respect, we presented our informants with the relative clause only. The resulting sentences are presented in (111) and (112).

(111) $\overset{\text{rel}}{\overline{(\text{PERSON-CL})}}$ CURE DOG
'(who) cures dog.'
' person who cures dog.'

(112) * $\overset{\text{rel}}{(\overline{\text{PI}})}$ CURE DOG
'(who) cures dog.'

When the relative pronoun used is 'PERSON-CL', as in (111), the isolated relative is judged acceptable although slightly degraded. 'PERSON-CL' is interpreted here as its pronominal alternative (which can be translated by 'someone'). However, for this interpretation to hold, the set of relative NMMs must be ignored. Such a repair-strategy is not available with 'PI', which cannot refer to an individual by itself. Therefore, the unacceptability of (112) shows that the relative clause depends on the main clause and cannot appear on its own, in an out-of-the-blue context.

This piece of datum argues in favor of a relative clause analysis since correlative constructions, being clausal, are more likely to be accepted in isolation[5].

Another argument in favor of identifying LSF strategies with RCs comes from their behavior concerning islandhood. Relative clauses are known to be strong islands as opposed to sentential complements (Ross 1967). This is illustrated in English. While you can ask a question from the main clause (see 113a-114a) and from a complement clause (113b), you cannot ask a question from a relative clause constituent (114b).

(113) Sentential complement: Mary said [that the man is petting the dog.]
a. **Who** _ said that the man is petting the dog? ✓ Main clause
b. **What** did Mary say that the man was petting _? ✓ Sub. clause

(114) Relative Clause: Mary prefers the man [who is petting the dog.]
a. **Who** _ prefers the man who is petting the dog? ✓ Main clause
b. ***What** does Mary prefer that the man who is petting _? *Sub. clause

[5]Notice that their independence would be from a syntactic point of view only. Recall that the definition of relativization strategies involve a notion of syntactic and/or semantic dependence. Correlatives depend semantically from their main clause.

The question pattern can also be used to reject other competing analyses, such as coordination or juxtaposition. With coordinated clauses, for example, they only allow symmetric extraction from both clauses at the same time (= 'across-the-board'), as illustrated with English in (115). In that respect, the pattern in (114)-(114a) is not compatible with a coordinated analysis.

(115) Coordinated clause: Mary eats bananas and Jean drinks beer.

a. *__Who__ _ eats bananas and Jean drinks beer? *First clause

b. *__Who__ Mary eats bananas and _ drinks beer? *Second clause

c. __Who__ _ eats bananas and _ drink beer? Both clauses

The same contrast is found in LSF, as can be seen by comparing sentential complements in (116) to relative clauses in (117)[6].

(116) Sentential complement:

a. MARIE SAY [WOMAN CUDDLE DOG] Baseline
'Marie said that the woman is cuddling the dog.'

b. **WHO** SAY [WOMAN CUDDLE DOG] ✓ Main clause
'Who said that the woman is cuddling the dog?'

c. MARIE SAY [WOMAN CUDDLE **WHO**] ✓ Sub. clause
'What did Marie say that the woman is cuddling?'

(117) Relative clause:

a. MARIE PREFER WOMAN [$\overline{\text{(PI)}}^{\text{rel}}$ CUDDLE DOG] Baseline
'Mary prefers the woman who is cuddling the dog.'

b. **WHO** PREFER WOMAN [$\overline{\text{(PI)}}^{\text{rel}}$ CUDDLE DOG] ✓ Main clause
'Who prefers the woman who is cuddling the dog.'

c. *IX-2 PREFER WOMAN [$\overline{\text{(PI)}}^{\text{rel}}$ CUDDLE **WHO**] *Sub. clause
Intended meaning: 'What is the animal such that you prefer the woman that is petting it?'

(116) shows that it is possible to ask a wh-question out of a complement clause. Crucially, when the wh-sign is inside the relative clause, as in (117), the sentence is unacceptable[7]. The contrast between (117b) and (117c) shows that the islandhood only concerns the subordinate clause, hence rejecting a coordinated analysis. We take the asymmetry between complement and relative strategy as evidence that the constructions at stake are genuine cases of subordination at the nominal level, hence relative clauses.

Up to this point, we saw examples of relative clauses sitting as the object of the main verb. It is also possible to have relative clauses as the subject of the main verb. We differentiate these cases from topicalized, fronted, relative clauses such as (118).

(118) $\overline{\text{LIGHTER}}^{\textit{topic}}$ JOHN STEAL
'The lighter, John stole (it).'

[6] We present here the results for PI and NMMs relatives. PERSON-CL relatives resulted in mixed results, varying across informants. This might be due to their semantic interpretation (see Section I.3.2) or to the ambivalent nature of PERSON-CL.

[7] LSF is an in-situ wh-language. It has been reported in the literature that wh-situ languages may not show the same types of islandhood as wh-movement languages. It is clear that LSF does not belong to these languages as one cannot ask wh-question with a wh-sign sitting inside the relative clause.

(119) a. DOG PI SLEEP IX-1 PREFER
(topic; PI: rel)

b. PI DOG SLEEP IX-1 PREFER
(topic; PI: rel)
'The dog who sleeps, I prefer (it).'

Just like any other DP, relative clauses can be fronted. When a sentence is fronted, it appears with clear markers of topicalization (raised eyebrows and chin up), as shown in (118). By contrast, no such marker appears in the sentence in (120). This indicates that this is the canonical word order for relative clauses, allowing us to conclude that the relative clauses are here in their base (subject) position.

(120) **DOG** [PI: rel TODAY PLAY WITH CAT] RUN FAST
'The dog who plays with the cat today runs fast.'

(121) VET PI: re CURE DOG EAT FRIES
'The vet who is curing the dog eats fries.'

The possibility for the relative clause to appear both in subject and object position is another evidence against a correlative analysis since these constructions have to be extraposed (see Chapter I.2).

In the light of these data, we analyze the relativization strategies instantiated in LSF as clear cases of relative clauses, i.e., clauses modifying a NP, the head.

3.1.2.2 Presence of a head

Throughout the examples provided so far, we have seen that LSF presents headed relative clauses. It is also possible to find headless alternatives, free-relatives. In this case the clause is introduced by a wh-element (see 122) and the NP is not referential, as seen by the contrast between (122) and (123).

(122) ix-2 can eat what prefer
(what: br)
'You can eat whatever (you) prefer.'

(123) *IX-1 KNOW WHAT IX-2 PREFER
Intended: 'I know what you prefer.'

We will consider free-relatives separately, which will be treated in Chapter II.6.

3.1.2.3 Position of the head

In most cases, LSF relative clauses are externally headed and post-nominal (see 124a) but we also found cases of internally headed relative clauses, as in (124b).

(124) a. IX-1 PREFER **VET PI** TODAY [___$_{gap}$ CURE DOG]
'Today, I prefer the vet who is curing the dog.' (…Yesterday I preferred the vet who was curing the cat.)

b. IX-1 PREFER [TODAY **VET PI** CURE DOG]
'I prefer the vet who is curing the dog today.' (…not the one that is curing the cat.)

We use the temporal marker 'TODAY' as an indication of the edge of the clause. In (124a), 'TODAY' modifies the main clause, which indicates that the relative clause has been extraposed to the right of the temporal adverb. This is only compatible with an externally headed analysis.

In (124b), the adverb scopes over the subordinate clause only, so it has to be part of the RC. This indicates that the head of the relative is also within the subordinate clause, hence internal. With object relatives, the evidence for the co-existence of both externally and internally headed relative clauses is even more explicit, as shown in (125).

(125) a. IX-1 PREFER **DOG PI** [MAN PET ___$_{gap}$]
'I prefer the dog which the man pets.'

b. IX-1 PREFER **PI**$_a$ [MAN PET **DOG**$_a$]
'I prefer the dog that the man pet.'

In these examples, the head of the RC is the object of the verb 'PET' and it can appear either externally (125a) or in-situ as in (125b).

3.1.3 Accessibility Hierarchy

Following Keenan and Comrie's accessibility hierarchy, repeated below, it was easier to elicit subject relative clauses than any other type, with adjunct relatives being the hardest to produce for our informants.

Keenan and Comrie's Accessibility hierarchy (enriched):

Subject/absolutive > Direct Object/ergative > Indirect Object > Genitive Complement > Temporal Complement > Adjuncts

In (126) we show examples of subject relative clauses (cf. 126a), object RCs (cf. 126b), and adjuncts RCs. It is possible to relativize an indirect object (cf. 126c), a temporal adjunct (cf. 126d) and other PP adjuncts (cf. 126e).

(126) a. IX-1 PREFER **LITTLE GIRL** PI PET DOG *SRC*
'I prefer the little girl who pets the dog.'

b. IX-1 PREFER **TOOTHBRUSH** PI BOY USE *ORC*
'I prefer the toothbrush that the boy use.'

c. TODAY MEETING MET **GIRL** PI YESTERDAY POSS-3 COLLEAGUE SAY BRAVO *Ind. Obj.*
'At the meeting today I met the girl to whom yesterday my colleague said bravo.'

d. **DATE** PI MEETING IX-1 NOT AVAILABLE SO MOVE *Temp. Adj.*
'I am not available on the date in which the meeting was fixed, let's move it.'

e. IX-1 PREFER **DOG** PI WITH WOMAN WALKS *Adjunct DP*
'I prefer the dog with whom the woman walks.'

Overall, relative clauses in LSF could be built virtually out of any constituent (subject, object, genitive, or adjunct), whether human, non-human or inanimate. This is illustrated in (127), (128) and (129).

(127) **Subject relatives:**

a. IX-1 PREFER **VET** PI CURE DOG *Human*
'I prefer the vet who cures the dog.'

b. IX-1 PREFER **DOG** PI SLEEP *Non-human*
'I prefer the dog who sleeps.'

c. IX-1 PREFER PI **NAPKIN** COVER LIGHTER *Inanimate*
'I prefer the napkin which covers the lighter.'

(128) **Object relatives:**

a. IX-1 PREFER **MAN** PI DOG LICK *Human*
'I prefer the man that the dog lick.'

b. IX-1 PREFER **DOG** PI MAN PET *Non-human*
'I prefer the dog that the man pet."

c. IX-1 PREFER **TOOTHBRUSH** PI BOY USE *Inanimate*
'I prefer the toothbrush that the boy use."

(129) **Adjunct relatives:**

a. IX-1 PREFER PI **WOMAN** DANCE WITH MAN *Human*
'I prefer the woman with whom the man dances.'

b. IX-1 PREFER **DOG** PI WITH WOMAN WALKS *Non-human*
'I prefer the dog with whom the woman walks.'

c. IX-1 PREFER **TOOTHBRUSH** PI LITTLE GIRL PAINT *Inanimate*
'I prefer the toothbrush that the little girl paint with.'

We also found cases in which the head corresponds to the entire event described by the relative clause, as illustrated in example (130a). Notice that this strategy is not available with PERSON-CL and appears solely when the relative marker PI occurs at the end of the sentence, after the temporal adverb which marks the right edge of the relative clause. The meaning of example (130a) is the same as the one in (130b), with an overt head. [8]

(130) a. IX-1 PREFER [VET CURE DOG TODAY] PI_{center}

b. IX-1 PREFER SITUATION PI [VET CURE DOG TODAY]
'I prefer those situations in which a vet cures a dog today.'

We will give a full-fledged analysis of this structure in Section I.3.2.2.1. Let us anticipate that there are two lines of analysis compatible with the data presented here; either a) the clause-final PI is a nominalizer, like the 'kes-' particle in Korean (Kim 2009) or b) LSF displays an extra-step of the accessibility hierarchy by allowing the head of the relative clause to be the whole event.

3.1.4 Semantics of relative clauses in LSF

LSF instantiates all three semantic types described in Chapter I.2 across different constructions. We will see that relative clauses using the pronoun PI or with NMMs only are restrictive. 'PERSON-CL'-relative, on the other hand, are appositives. Finally, only 'PI' appears to allow for maximalizing interpretations.

[8] Notice also that this 'situation'-meaning is still present when the whole relative clause is fronted as in (1), confirming that the relative clause is topicalized and moved from its base position.

$$\frac{\overline{\text{DOG SLEEP PI}}^{\text{rel}}}{\text{IX-1 PREFER}}^{\text{top}}$$

(1) ' I prefer situations in which a dog sleeps.'

3.1.4.1 Restrictive relative clauses

PI-relatives display properties and meaning typical of restrictive relatives[9]. As is typical of restrictive RC, PI-relatives cannot modify a proper name[10], as shown by the unacceptability of (131).

(131) *IX-1 PREFER MARY PI PET DOG
'I prefer Mary, who pets the dog.'

Recall from Chapter I.2 that this restriction is due to the semantic operation, which requires that the relative clause modifies a set of individuals which it can restrict. With proper names, there is no restriction possible.

In addition, is it possible to stack PI-relatives as in sentence (132).

(132) MAN$_i$ FORK-FORM STING PI$_j$ **DOG**$_j$ [CHASE **CAT**$_k$ PI$_k$ [*_gap* BIRD CATCH]]
'The man stabbed the **dog** which was chasing the **cat** which caught the bird.'

In (132), the relative clauses are embedded within each other, with each PI referring to a nominal embedded in the RC. It is also possible to have a stacked relative clause that restricts the same head multiple times, as in (133).

(133) IX-1 CHOOSE **CAT**$_i$ PI$_i$ [$_{RC1}$ *_gap* PLAY WITH GIRL$_j$] $\overset{\text{foc}}{\overline{\text{PI}_i}}$ [$_{RC2}$ *_gap* CATCH BIRD$_k$]
'I choose the cat which is playing with the girl which caught the bird.'

The second PI is realized in the same locus as the head noun (CAT) and the first PI but is further marked through wide opened eyes and a small pause, which accentuate its coreference with the head.

However, PI-relatives cannot modify indefinite heads as shown in example (134)).

(134) SCHOOL IX-1 LOOK-FOR ALWAYS STUDENT $\overset{\text{rel}}{\overline{\text{PI}}}$ CAN 3-HELP-1.
'At school, I always look for the/*a student who can help me.'

In (134), the only available interpretation is definite. This might be due to the origin of PI as a demonstrative, which, by definition, selects an entity. A possible argument in favor of this conclusion comes from the singular versus plural pattern we described earlier; PI cannot be inflected for number. Interestingly, only the NMM-relative strategy allows an indefinite interpretation, as shown in (135).

(135) SCHOOL IX-1 LOOK-FOR ALWAYS STUDENT CAN 3-HELP-1.
'At school, I always look for a student who can help me.'

The overall pattern described here shows that restrictive relatives exist in this language.

[9] Unfortunately, we cannot test reconstruction effects in LSF at the moment as very little is known about nouns, pronouns, and anaphoras in this language.

[10] In our master thesis, we argued for the contrary. This conclusion was due to a wrong interpretation of this restriction. Indeed, we presented contexts with multiple individuals sharing the same name, obtaining, therefore, restrictive relative clauses that we misinterpreted as appositives based solely on the nature of the head (proper name). We correct this mistake here.

3.1.4.2 Non-restrictive/Appositive relative clauses

PERSON-CL-relatives, on the other hand, have an appositive interpretation. They present the opposite pattern of PI-relatives. Starting with NP modification, PERSON-CL can modify proper names as in sentence (136). Note that this is also possible for NMMs-relatives.

(136) IX-1 PREFER MARY (PERSON-CL) PET THE DOG
'I prefer Mary, who pets the dog.'

Additionally, PERSON-CL- and NMMs-relatives cannot stack. This is shown by the unacceptability of (137) and (138).

(137) * IX-1 CHOOSE **GIRL**$_i$ (PERSON-CL$_i$) [$_{RC1}$ $_gap$ PLAY WITH CAT$_j$] (PERSON-CL$_i$) [$_{RC2}$ $_gap$ EAT ICE-CREAM]
Intended: 'I choose the girl, who is playing with the cat, who eats an ice-cream.'

(138) * MAN$_i$ FORK-FORM STING **GIRL**$_j$ (PERSON-CL$_j$) [CHASE **BOY**$_k$ (PERSON-CL$_k$) [$_gap$ BIRD CATCH]]
Intended 'The man stabbed the girl who was chasing the boy who caught the bird.'

The last property of PERSON-CL-relatives is shared with PI-relatives; they require some specificity in the head they modify, as shown in (139).

(139) SCHOOL IX-1 LOOK-FOR ALWAYS STUDENT $\overline{\text{PERSON-CL}}^{\text{rel}}$ CAN 3-HELP-1.
'At school, I always look for the/*a student who can help me.'

Here, however, we argue that this behavior is a further indication of the appositive nature of the PERSON-CL. We have seen that PERSON-CL can receive an indefinite interpretation in sentences such as (110a), repeated as (140).

(140) PERSON-CL ENTER ROOM
'Someone entered the room.'

Recall additionally that, contrarily to PI, PERSON-CL can be inflected for number. Therefore, the impossibility to obtain an indefinite interpretation in (139) cannot be due to the sign 'PERSON-CL' itself.

It seems then that 'PERSON-CL'-relatives and some NMMs-relatives are appositives.

3.1.4.3 Maximalizing relative clauses

Amount relatives can only be expressed through the use of PI.

In (141), the sentence is ambiguous between an amount (= d-type) and a restrictive (= e-type) reading. Recall from Chapter I.2 that this is analyzed by Grosu and Landman (2017) as a subtype of maximalizing relatives.

(141) $\overline{\text{CHAMPAGNE-CL PI YESTERDAY SPILL}}^{raised}$, IX-1 CANNOT DRINK
⇝ 'I couldn't drink the champagne you spilled yesterday.' (... because that champagne is spoiled)
⇝ 'I couldn't drink the amount of champagne you spilled yesterday.' (... because it's too much for me)

However, such ambiguity is not always present. Consider for instance the scenario in (142) and the two options in (142a) and (142b). In this case, the relative receives only the e-interpretation with no further marking. In order to receive an amount interpretation, an amount classifier must be overtly used (142b).

(142) **Scenario:** There is a huge bowl full of rice on the side of a table. Marie walks by and knocks the bowl. The rice falls on the floor.

a. IX-1 CANNOT EAT RICE PI FALL SPREAD
   ⇝ 'I cannot eat the rice that fell and spread on the floor.'
   # ⇝ 'I cannot eat the amount of rice that fell and spread on the floor.'

b. IX-1 CANNOT EAT RICE **SAS-CL** PI FALL SPREAD
   ⇝ 'I cannot eat the rice that fell and spread on the floor (even if you pile it up again).'
   ⇝ 'I cannot eat the amount of rice that fell and spread on the floor.'

An interesting question is now what accounts for the difference between 'CHAMPAGNE' and 'RICE'. Why is the amount reading directly available with CHAMPAGNE but not with RICE? If we follow our idea that PI is only compatible with specific heads (whether amount or entities), we can find what differentiates CHAMPAGNE from RICE. The latter is an initialized form (the handshape 'refers to the letter "R" of the LSF manual alphabet) and not a classifier (cf. Figure 36). While for 'CHAMPAGNE', the morphology of the sign includes a classifier used to refer to the (bottle of) champagne (cf. Figure 37).



Figure 36. 'RICE' in LSF

Summarizing, PI-clauses can be ambiguous between restrictive and amount readings (cf. 141). However, such ambiguity is only available if the head of the relative clause contains an overt classifier, whether incorporated or not in the nominal head.

Two interesting hypotheses derive from this finding and should be addressed in further sign language studies. The first one is that PI-relatives can be used as diagnostics for the presence of a classifier in signs. The second one being that, following Aristodemo and Geraci (2017) and Mantovan and Geraci (2017), some classifiers could be analyzed as containing a degree-phrase[11].

[11] Indeed, by comparing the overt amount expressed in (142b) and the covert amount expressed through the bottle-classifier used in 'CHAMPAGNE', we could argue that the two are of the same nature: they express degrees. The difference being that one is incorporated in a sign while the other is not.



(a) Beginning **(b)** End

Figure 37. 'CHAMPAGNE' in LSF

3.1.4.4 Summing up

LSF presents EHRC relative clauses but can also display internally headed relative clauses. They can either display no overt relative markers or a relative pronoun. Every constituent of the relative clause (and the relative clause itself) can be relativized. Relatives with the human-only relative pronoun, PERSON-CL, are appositive. Relatives with 'PI' can be both restrictive and maximalizing. The strategy without manual signs can, in principle, be used both in appositive and restrictive relative clauses. We can now implement LSF in the SL typology of relativization strategies in Table (6).

SL		IHRC	Pre-nominal EHRC	Post-nominal EHRC	Correlative	Free-relative
European SL	LSF	✓	X	✓	X	✓[12]
	LIS	✓	X	X	X	✓
	LSC	✓	X	X	X	NA[13]
	DGS	X	X	✓	X	X
	TÌD	✓	X	✓	X	✓
Asian SL	HKSL	X	X	✓	X	NA
	JSL	✓	✓	✓	X	✓
SL in the Americas	ASL	✓	X	✓	✓	X
	LIBRAS	X	X	✓	X	NA

Table 6. Summary of typological variation accross Sign Languages, LSF included.

3.2 LSF relative clauses: a formal approach

The data from LSF can be accounted for using any of the main analyses presented in Chapter I.2, namely head-raising, head-matching, and double-headed accounts. We will start by presenting the derivation of appositive relatives in LSF (with PERSON-CL as a relative pronoun) and will turn to the analysis of PI-relatives. The NMMs strategy will not be analyzed on its own since many parameters are still unknown to us.

3.2.1 PERSON-CL-relatives

We have seen in the previous Section that PERSON-CL-relatives are appositive in nature. In this respect they can be analyzed either at discourse level (the 'orphanage' analyses, Espinal 1991 or Grosu and Krifka 2007) or at a syntactic level (the 'constituency' analyses, De Vries 2002, Huot 1978 or Cornilescu 1981). We implement the latter hypothesis by following De Vries (2002) in proposing that they specify a coordinated light-headed relative.

In this respect, 'PERSON-CL' could potentially be analyzed in two ways; as the head of the coordinated relative or as the relative pronoun modifying it. We argue that it is the pronominal and that the relative itself is only marked through non-manual markers. This roots on the alternation we have seen in the subsection I.3.1.4.2, in which the same results were obtained with or without PERSON-CL overtly expressed. As a reminder, consider the appositive sentence in (136), repeated here as (143).

[11] Only free-choice free-relatives, see Chapter II.6.
[12] NA = Not Addressed.

(143) IX-1 PREFER MARY (PERSON-CL) PET THE DOG
'I prefer Mary, who pets the dog.'

With this in mind, we provide the derivation of the baseline sentence (100), repeated here as (144), in Figure (38).

(144) IX-1 PREFER LITTLE $\overset{\text{re}}{\overline{\text{GIRL PERSON-CL}}}$ PET DOG
'I prefer the little girl who pets the dog.'

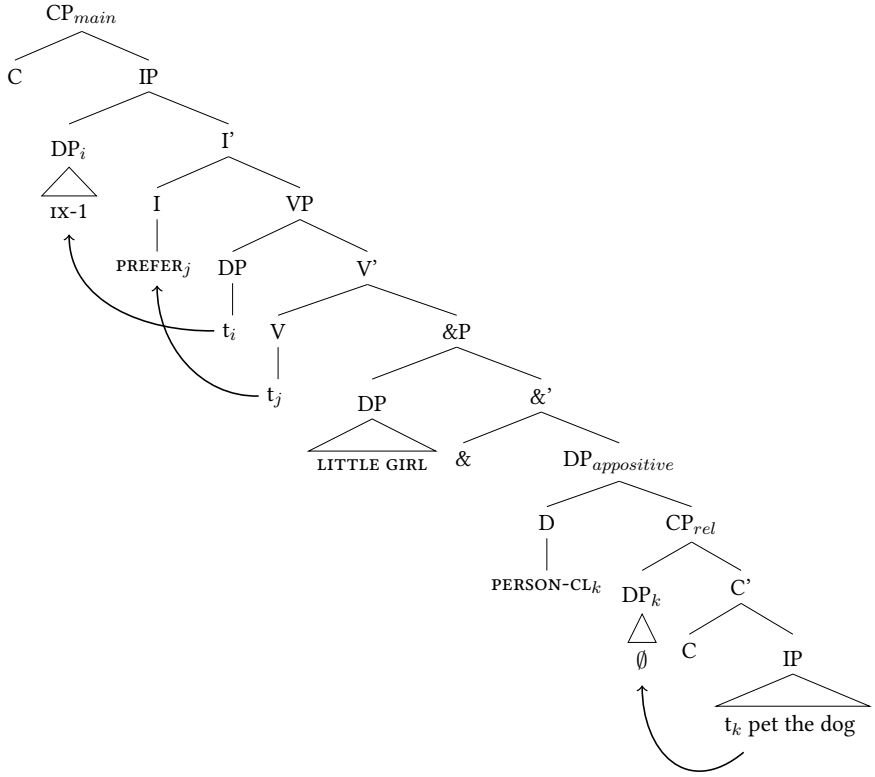


Figure 38. Derivation of appositive PERSON-CL relatives in LSF.

3.2.2 PI-relatives

3.2.2.1 PI at the end

As we have mentioned in the previous section, some PI-relatives can receive a 'situation' meaning. This only appears when PI is articulated in the neutral signing space and at the end of the relative. We repeat the relevant example in (145).

(145) IX-1 PREFER [MAN PET DOG] $\overset{\text{rel}}{\overline{\textbf{PI}}}$
'I prefer situations in which a man is petting a dog (in general).'

As we said, the data presented here points either towards an interpretation of the clause-final PI as a nominalizer or as a relative pronoun taking the whole event as its head.

If the 'PI'-final is a relativizer, in the terms of De Vries 2001's classification, it is different from the non-final 'PI' relative pronoun. Recall from the previous section that one of the main arguments in favor of analyzing 'PI' as a relative pronoun came from the possibility to find it in an internal position, as seen in (105), repeated here as (146).

(146) IX-1 PREFER [MAN **DOG** $\overset{\text{rel}}{\text{PI}}$ PET]
'I prefer the dog which the man is petting.'

These data are not compatible with a relativizer analysis since this kind of relative markers has to be at the edge of the relative clause (see Chapter I.2 again).

We think that PI-final is the same as PI non final, a relative pronoun. Since PI usually follows the head it modifies, 'PI-final' is simply taking the whole event as its head.

This analysis is supported by the pattern presented in (147).

(147) a. IX-1 PREFER [VET CURE DOG TODAY] PI_{center}
b. IX-1 PREFER SITUATION PI [VET CURE DOG TODAY]
'I prefer those situations in which a vet cures a dog today.'
c. * IX-1 PREFER SITUATION [VET CURE DOG TODAY] PI

When we introduce the overt noun 'SITUATION', as in (147b), PI is again found on the right of the head which it modifies. We see that the interpretation of (147b) and (147b) is the same. Meanwhile, if we try to have both the overt sign SITUATION and the PI-final, the sentence is unacceptable. This contrast shows that the head of the relative is the material to the left of PI. Therefore, when PI is final (see 147a-145), the head of the relative is the whole event. In order for the analysis to be coherent with the idea that the entire TP/CP is the head we must assume that the constituent is nominalized. Once nominalized it can move to the canonical position of heads in RC leaving PI to its right (see Figure 46 in the next subsection for the analysis).

An additional argument in favor of analyzing PI-final constructions as simple relative clauses in which the whole relative is the head comes from the agreeing and non-manual marking properties shared by both constructions.

Recall from the previous section that PI agrees in space with the head it modifies. Similarly, the non-manual markers include raised eyebrows, the mouthing '[pi]', and the body turned towards the place of realization of PI.

In PI-final constructions, the sign PI is realized in the neutral signing space, with raised eyebrows, the mouthing '[pi]' and the body leaned backward (Figure 39). This could be taken as a piece of evidence that it agrees with the whole event and not with a specific participant of the relative.

Summing up, we will analyze all instantiations of PI seen so far as being relative pronouns. PI-relatives are usually restrictive in nature, and we propose to analyze them with a classical analysis in the next subsection.

3.2.2.2 Analysis

3.2.2.2.1 Externally headed relative We choose to implement here a version of the head-raising analysis proposed by Cecchetto and Donati (2010) but recall that LSF data could fit any of the analyses as they behave like typical restrictive relatives. Our choice is justified by the fact that raising and relabeling operations will be useful throughout this thesis, especially to account for the grammaticalization path we describe in Chapter II.6.

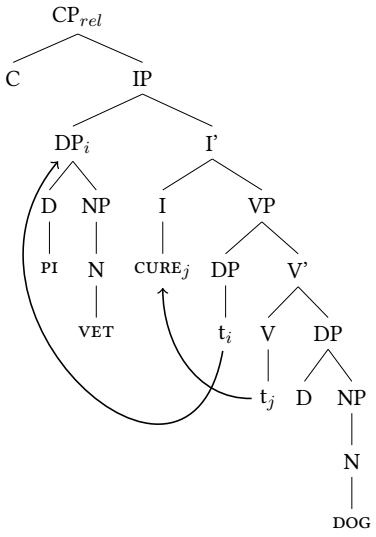
Under Cecchetto and Donati (2010)'s approach, just like other head-raising analyses, the head and the relative pronoun are generated inside the relative clause and then moved to its edge to create an operator-variable chain. The D dominating the relative clause is merged externally, as part of the main clause. The NP head raises from the relative CP to an external position next to the determiner. As a lexical item, the head labels the relative clause as a nominal projection, hence providing it with the nominal features that are necessary to meet the selectional requirements of the external D head.



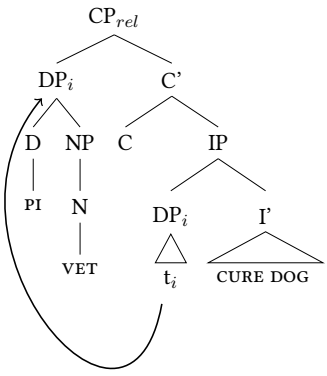
Figure 39. Realization of PI-final

Hence a sentence like the baseline (101), repeated hereafter as (148), is derived following the structure presented in Figure (40).

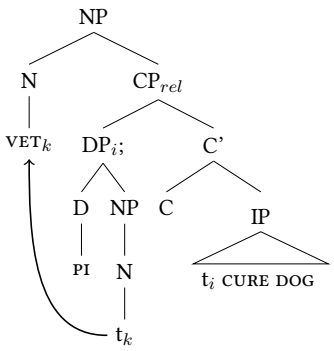
(148) IX-1 PREFER $\overline{\text{VET PI}}^{\text{rel}}$ CURE DOG
'I prefer the vet who cures the dog.'



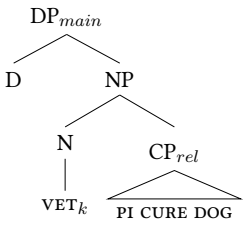
(a) Step 1: Derivation of the CP$_{rel}$.



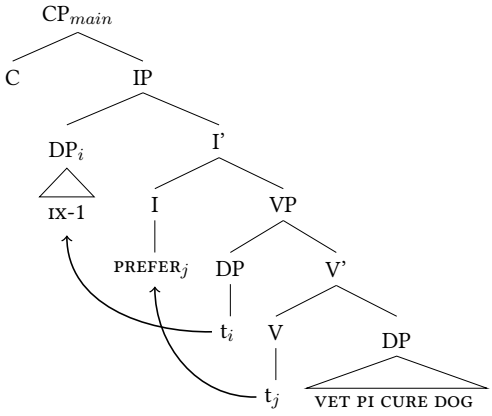
(b) Step 2: Raising of the relative DP (PI + N) in Spec CP.



(c) Step 3: Raising of the head in an external position, providing the relative CP with nominal features.



(d) Step 4: External merge of the DP$_{main}$.



(e) Step 5: Derivation of the main clause.

Figure 40. Step by step derivation of EHRC PI-relatives in LSF.

As a summary, we provide the final structure in Figure (41).

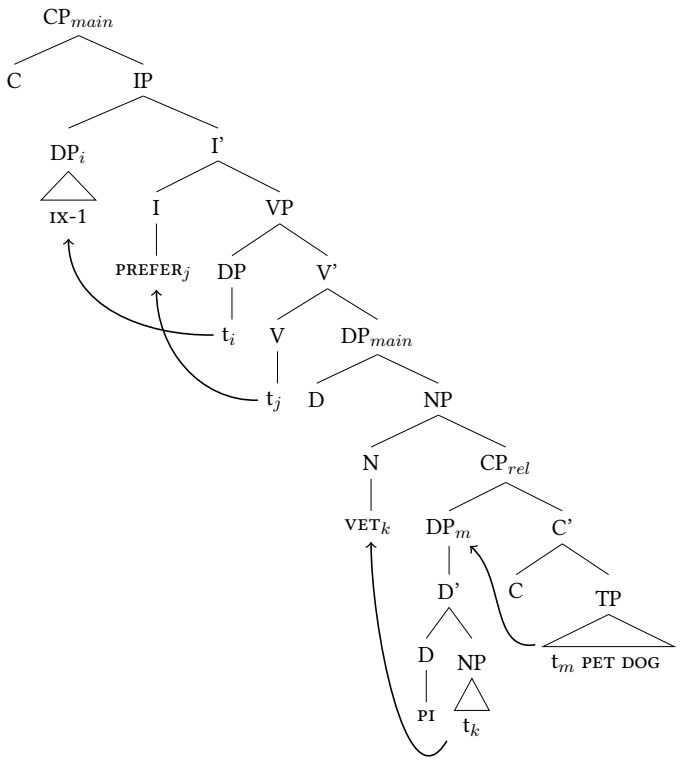


Figure 41. Structure of EHRC PI relatives in LSF.

With respect to word order, more work is needed to account for the alternation head > PI versus PI > head, presented in (149a)-(149b).

(149) a. IX-1 PREFER **VET** PI CURE DOG.

b. IX-1 PREFER PI **VET** CURE DOG.
'I prefer the vet who cures the dog.'

It is possible to argue that the order PI > head presents an externally merged PI. In this case, PI would be a simple demonstrative, base generated as the head of the external DP (see Figure 42).

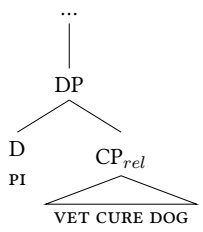


Figure 42. PI is an external determiner.

Another possibility is to consider that PI could raise as up as to be able to label the structure (see Figure 43). In that respect, it could raise as the external DP head. PI would then be considered as freely alternating between the two positions (SpecCP or above CP), depending on the preferred word order.

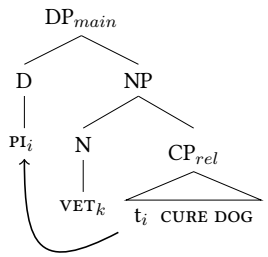


Figure 43. PI is raised higher, to label the structure.

The two proposals are tentative and require further investigation.

3.2.2.2.2 Internally headed relative The derivation of IHRC is similar to the externally headed alternative, to the exception that the head and the relative pronoun PI stay where they are generated, and only the wh-features (the operator) moves covertly to SpecCP (De Vries 2001).

Therefore the derivation of (105) repeated as (150) is presented in (44).

(150) IX-1 PREFER [MAN **DOG** $\overset{\text{rel}}{\text{PI}}$ PET]
'I prefer the dog which the man is petting.'

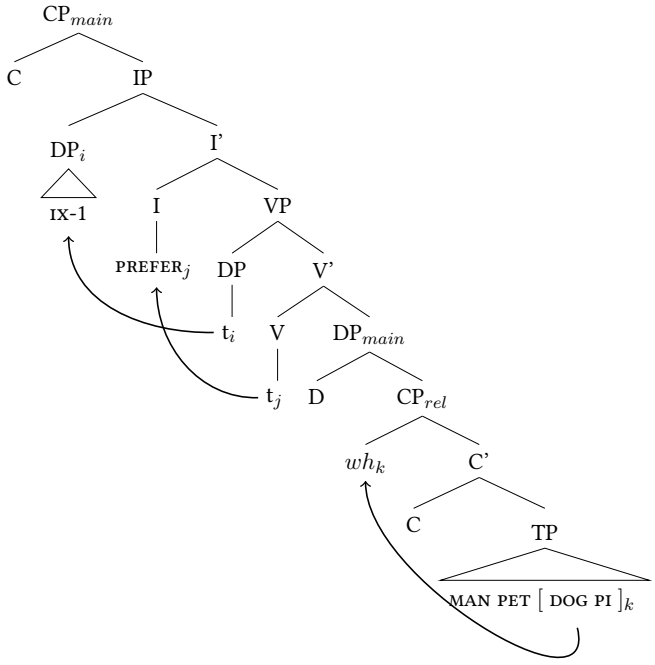


Figure 44. Structure of IHRC PI relatives in LSF

Similarly to EHRC, the possibility to find sentences such as (107), repeated here as (151), can be accounted for by either considering that PI is externally merged as a demonstrative or is raised in order to provide the structure with nominal features, leaving the head alone in its base position.

(151) IX-1 PREFER PI$_a$ [MAN PET DOG$_a$]
'I prefer the dog that the man pet.'

3.2.2.2.3 PI-final If PI were to be analyzed as a relativizer in De Vries 2001's typology, it could just be merged in an external D position on the right of the sentence, as in Figure (45). Indeed, recall from Chapter I.2 that relativizers never occupy an internal position and have to be located on the edge of the relative clause.

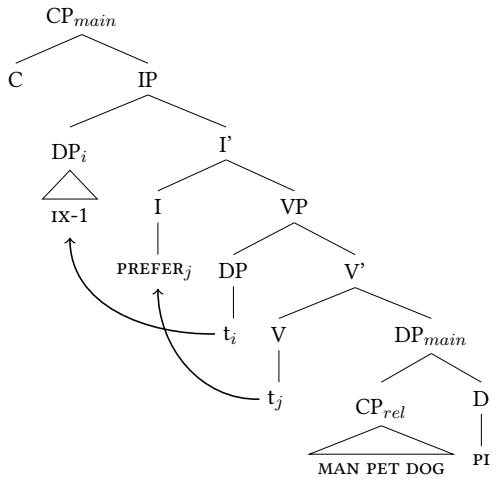


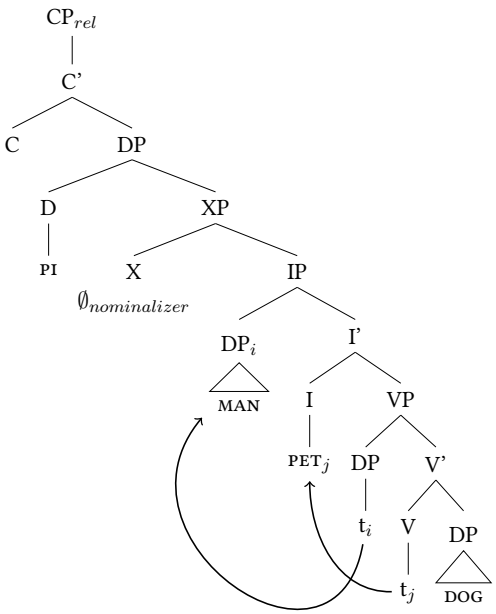
Figure 45. PI as a relativizer on the right of the relative clause

However, we chose to analyze PI-final as a regular case of the relative pronoun PI. In this respect, either PI should be analyzed as taking both DP and IP as complements, or the IP is nominalized before being combined with PI. The two assumptions will require fine-grained investigations to receive empirical back-up.

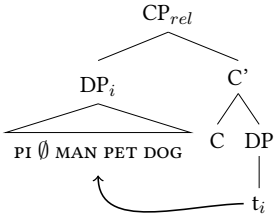
In the Introduction of this thesis, we mentioned that space plays a preponderant role within SL grammars. Based on the agreeing pattern of PI-final (in the neutral signing space) and its non-manual marking (the body is leaned backward), it can be argued that the clause itself is associated with a locus to which PI refers.

This would imply that all sentences can potentially be nominalized in LSF, by being signed in a specific space and thus being associated with a locus. Aristodemo and Geraci 2017 argued that something very similar holds for temporal clauses. If we adopt this analysis, PI does not require to be made compatible with IP and it can be analyzed as simply taking regular nominal as complements, hence no extra step is required in the derivation and the structure is similar to that of externally headed relatives (see Figure 46)[14]. The nominalized IP is the complement of the DP headed by PI. Then the DP moves to the specifier position of the relative CP, as in externally headed relatives. Finally, the head is moved further as the head of the relative clause, providing it with the nominal features required to be selected by the external DP.

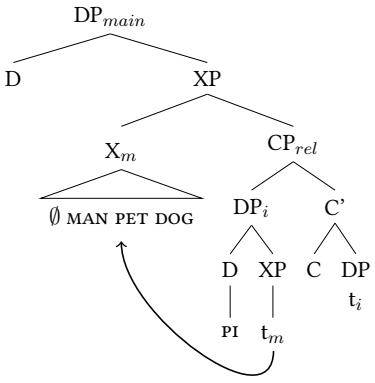
[14]Notice that if PI is simply compatible both with DP and IP, then the derivation is sensibly the same to the exception that we do not need a nominal projection anymore.



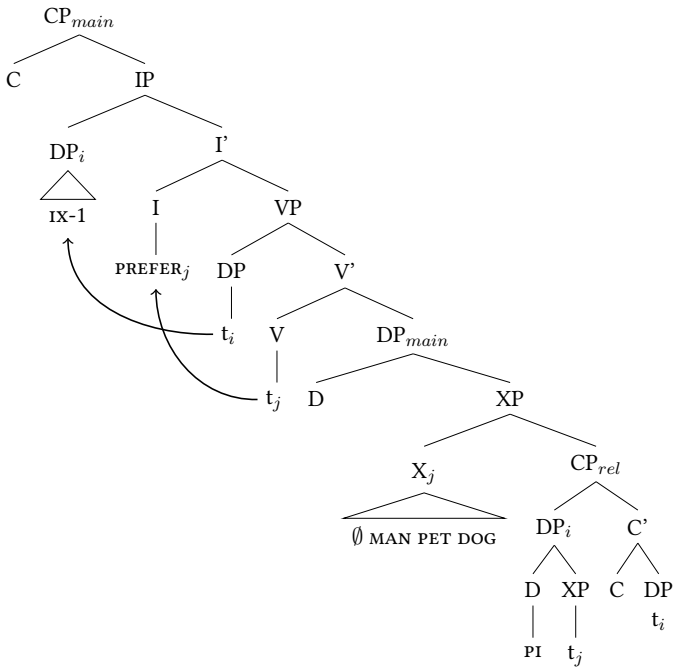
(a) Step 1: Derivation of the CP$_{rel}$



(b) Step 2: The head moves to the specifier of CP.



(c) Step 3: The head is raised as the specifier of the DP$_{main}$.



(d) Step 4: Derivation of the main clause.

Figure 46. PI-final = PI. Relative pronoun analysis

With the analysis proposed in Figure (46), we can also derive the overt 'SITUATION' alternative, as shown in Figure (47).

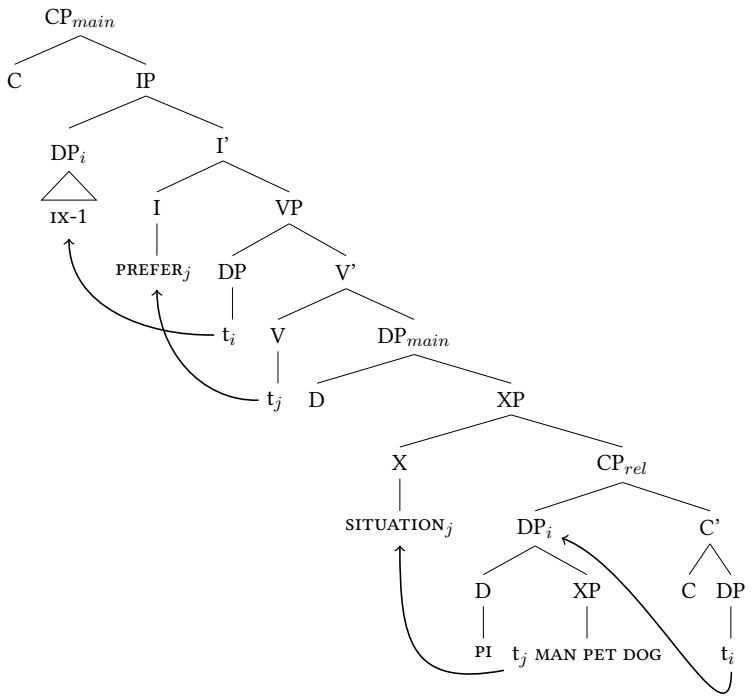


Figure 47. Derivation of the overt 'situation' alternative.

3.3 Summary

In this Chapter we found that LSF possesses several different relativization strategies. The main strategy is to use externally headed relative clauses, but internally headed relatives are also attested. LSF uses two types of relative pronoun: PERSON-CL for human heads and PI for all types of heads. PERSON-CL relatives have been shown to display non-restrictive interpretation. PI-relatives display either restrictive or maximalizing interpretation. However, the latter is severely constrained to heads bearing a classifier of size and shape.
Additionally, we have seen that LSF relatives can be virtually derived from every step of Comrie (1989)'s accessibility hierarchy and further. The whole relative clause can be taken as the head of the relative when raised to the left of PI. Finally, relative clauses can also be realized only non-manually, but this strategy is harder to control and analyze as many covert parameters could be at play here. It will need further researches to capture its complexity.

Based on this first description of relative clauses in LSF, we conducted deeper and broader analyses of their processing in LSF. This is what we turn to now.

Chapter 4

Psycholinguistic investigation

This chapter presents an experimental investigation of the distinction between subject and object relative clauses in LSF. The first question we wanted to answer was whether there exists an asymmetry in the processing of subject and object relative clauses. The reason why this is important is due to the fact that the syntax of LSF relative clauses is such that it allow us to make specific predictions about processing effects on these constructions. This is treated in Section I.4.3. We are also interested in investigating whether the processing of relative clauses is affected by the age of acquisition of LSF. This chapter is organized as follows; we will start by reviewing in greater details the literature on asymmetries in the processing of relative clauses, we will then present the advantages and limitations of the eye-tracking method to investigate this question. Section I.4.2 presents an innovative use of the visual world paradigm on an already studied population; French speakers. By showing that the results obtained with our visual-only protocols replicate those obtained with the original design, we confirm its viability for it to be used on a Deaf population. Consequently, Section I.4.3 presents our investigation of LSF relative clauses processing which resulted in the detection of a Subject Advantage.

4.1 Asymmetries in the processing of relative clauses

As we have discussed in the first chapter of this thesis, relative clauses accessibility varies greatly depending on their nature. Object relative clauses are found less frequently across languages than subject relative clauses, as illustrated by Keenan and Comrie (1977)'s accessibility hierarchy. This asymmetry is better known as the 'Subject Advantage'. The Subject Advantage is at the center of many controversies and debates revolving around a) the reasons explaining its presence and b) its universality.

4.1.1 Accounting for complexity: syntax

Many researchers have tried to capture what makes ORC more complex than SRC, but this topic entails at least two aspects that need to be defined: what does it mean to be more complex (i.e., from a descriptive point of view) and what explains and predicts such complexity?

As for the first question, the large variety of methodologies used to detect and rank complexity follows the motto that if something requires less (time to acquire, time to process, cognitive resources, etc.), then it has to be easier. Accordingly, if something is easier, then it should be produced more frequently across and within languages (Hawkins 2004).

Following this logic, Diessel (2004) study of English children's production, concludes that SRC are easier than ORC since the former are produced at an earlier age and in higher proportion than the latter. In their self-paced reading task, King (1991) observed that English adults read ORC significantly slower than SRC and obtained lower accuracy scores in comprehension questions. Similarly, for English speakers again, Traxler et al. (2005) 's eyetracking study captures a Subject Advantage in the form of longer fixations on ORC compared to SRC. Müller, King, and Kutas (1997) associate complexity to a higher electrical signal of the Left Anterior Negativity (LAN) in their Electroencephalogram (EEG) study, and an increased signal is associated to complexity in functional Magnetic Resonance Imagery (fMRI) studies (Constable et al. 2004) and Positron Emission Tomography (PET) studies (Stromswold et al. 1996), all confirming the Subject Advantage in English.

What we see here is that the SRC were consistently found to be easier than ORC, no matter the method of investigation. Nevertheless, why is it so? A large number of hypotheses have been proposed on the matter. The main ones are summarized in Yun et al. (2015)'s Table reproduced in Figure (48).

Broad Categories		General Proposals
Word Order	Bever (1970); MacDonald and Christiansen (2002)	The sequence of words in SRCs is closer to the canonical word order than that in ORCs.
Parallel Function	Sheldon (1974)	SRCs are easier to process than ORCs because their head nouns play the same role in both the main clause and the subordinate clauses.
Perspective Maintenance	MacWhinney (1977, 1982)	SRC structures maintain the human perspective and should be easier to process than those that shift it, e.g. ORCs.
Accessibility Hierarchy	Keenan and Comrie (1977)	Universal markedness hierarchy of grammatical relations ranks the relativization from subject higher.
Memory Burden	Linear Distance: Wanner and Maratsos (1978); Gibson (2000); Lewis and Vasishth (2005)	ORCs are harder because they impose a greater memory burden.
	Structural Distance: O'Grady (1997); Hawkins (2004)	
Structural Frequency	Tuning Hypothesis: Mitchell, Cuetos, Corley, and Brysbaert (1995); Jurafsky (1996)	SRCs occur more frequently than ORCs and therefore are more expected and easier to process.
	Surprisal: Hale (2001); Levy (2008)	ORCs are more difficult because they require a low-probability rule.
	Entropy Reduction: Hale (2006)	ORCs are harder because they force the comprehender through more confusing intermediate states.

Figure 48. Summary of hypotheses about the Subject Advantage- From Yun et al. (2015)

Two general tendencies can be highlighted: some hypotheses, based on Hale (2006)' surprisal theory, focus on inherent properties of relative clauses to explain asymmetries, while others focus on their frequency in the linguistic input[1]. In other words, they argue that ORC are harder to process due to the low probability to find them in the linguistic signal. This entails that, when

[1]The frequency of appearance is calculated through corpus studies

speakers hear an ORC they are surprised – or forced to revise their previous hypotheses on the outcome – which leads to greater calculation/time needed to understand the sentence. What is predictive of complexity in such theories is the frequency of representation across the linguistic signal. With these criteria in mind, we can interpret the accessibility hierarchy of Keenan and Comrie (1977) that we discussed in the previous Chapters as capturing this tendency. While an advantage of such theories comes from the possible generalization of the complexity metrics (i.e., what is less frequent is more complex), one problem lies in their circularity: they do not explain why ORC are less frequent than SRC in the first place. If they are not satisfactory on an explanatory standpoint, they do prove themselves useful for applied linguistics as they allow artificial networks to calculate the right probabilities for structures to appear.

On the other hand, a large variety of hypotheses try to find some inherent property of ORC, which could explain and predict their additional complexity when compared to SRC. The WORD ORDER hypothesis (Bever 1970) attributes the processing burden of ORC to its dissimilarity to canonical word order in a language. In that respect, it constitutes the premises of frequency-based theories.

The PARALLEL FUNCTION hypothesis (Sheldon 1974) relies on the idea that ORC are harder to process due to the competition when the object of the main clause, the head, also happens to be the object of the relative clause. If this theory held, we would expect the Subject Advantage to disappear when SRC are in the subject position as in (152). Results from Miyamoto (2003) show that this is not the case. ORC are read slower than SRC no matter their syntactic role withing the matrix clause and their case marking.

(152) The girl [who _ helped the robber] was arrested by a policeman. *SRC*
S_{nom} [Rel $_{-nom}$ V O_{acc}] V O_{obl}

In the PERSPECTIVE MAINTENANCE hypothesis (Macwhinney 1988), the burden of processing ORC is attributed to the need for the listener/reader to switch perspective twice. More precisely, they consider that a first change in perspective shifts from the subject of the main clause to the subject of the relative clause and that a second change shifts back from the subject of the RC to the subject of the main clause when the verb of the main clause is encountered. This is illustrated in example (153).

(153) The girl who _ helped the robber was arrested by a policeman. *SRC*
No shift, the subject of both clauses is the same.

(154) The girl that [$_{shift}$ the robber helped _ [$_{shift}$was arrested by a policeman. *ORC*
Shift from the subject of the main clause to the subject of the RC.
Shift back from the subject of the RC to the subject of the main clause.

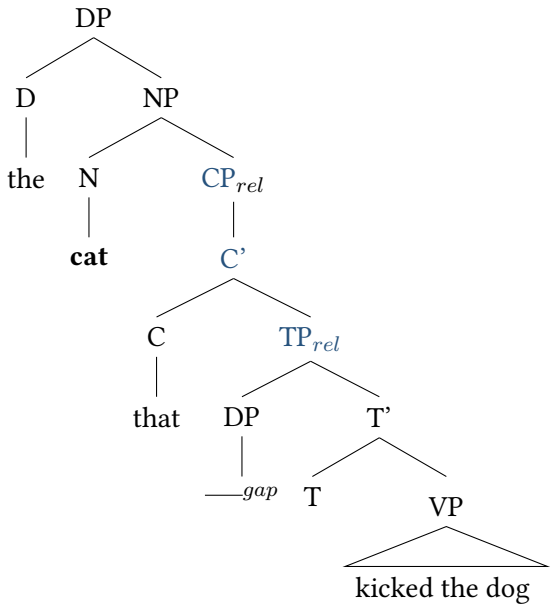
If such a theory holds, we predict the same processing burden each time the relative clause is in object position, no matter its nature (Subject or Object). As seen throughout the different experiments cited above, this is not what is observed.

In all three hypotheses, the metrics for complexity is directly linked to variation from a norm. King and Kutas (1990) and King (1991) studies have shown that complexity is rather linked to working memory and syntax. This finding is at the core of two alternative hypotheses; the LINEAR DISTANCE (Gibson 2000) hypothesis and the STRUCTURAL DISTANCE hypothesis (Hawkins 1999). Both of them rely on the idea that speakers need to keep the head of the RC in their memory until they encounter its base position in the relative clause, the gap. In the structural account, the complexity arises from the greater number of nodes and projections that

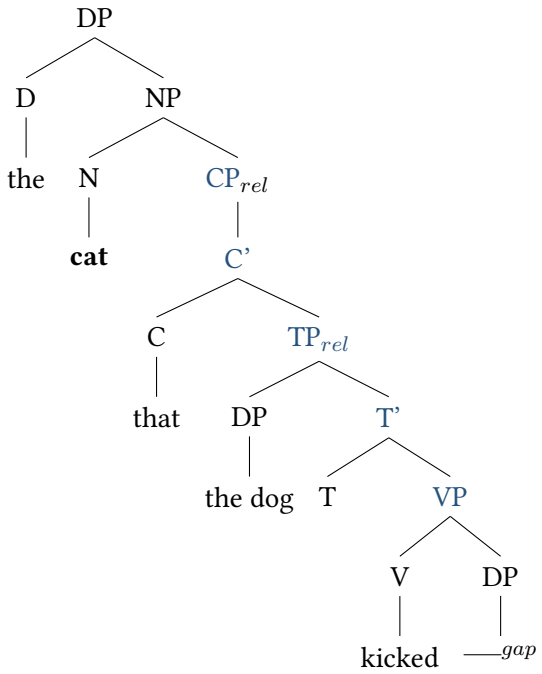
the parser has to cross in ORC compared to SRC. In the linear account, the principle is the same, but the complexity arises from the higher number of words that need to be stored and kept in working memory. While the structural account predicts a universally shared Subject Advantage, the linear distance predicts cross-linguistic variations depending on the typology of the relative clause (i.e., prenominal vs. post-nominal). It also predicts on line differences if one manipulates linear distance language internally (by adding more intervening words, for example).

From a structural point of view, objects will always be more deeply embedded than subjects, no matter the surfacing word order. This is illustrated by the comparison between (155) and (156).

(155) ... the **cat** that $___{gap}$ kicked the dog.

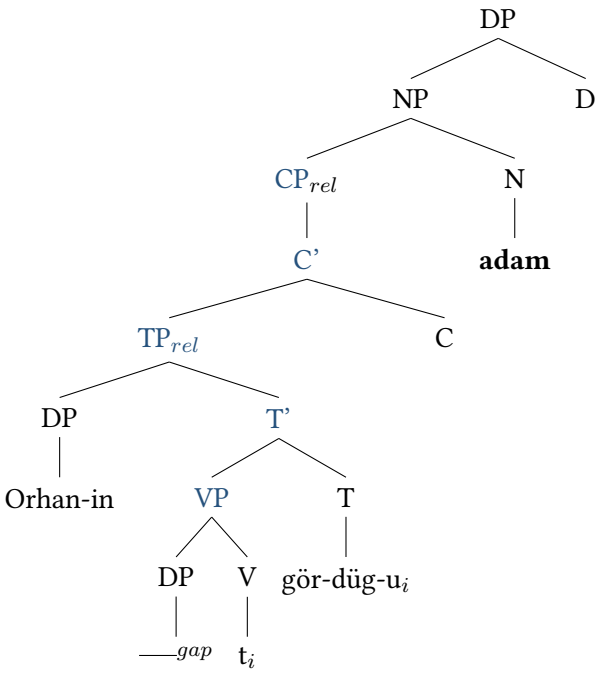


(156) ... the **cat** that the dog kicked $___{gap}$.



In (155), the head crosses three nodes[2] while it crosses five nodes in (156). Notice that, with another relative strategy such as prenominal externally headed RC, the result is the same. We present the tree of the Turkish example (35), repeated here as (157)).

(157) [Orhan-in gör-düg-u $___{gap}$] **adam** cik-ti
[Orhan-GEN see-NR-POSS.3] man leave-PAST
" The man that Orhan saw left."



We see in the Turkish example that the number of projections crossed-out is the same as in the English sentence.

Now, if we adopt the linear hypothesis, the number of words crossed by the parser varies according to surface word order. Compare the object relatives in English in (158) and in Turkish in (159).

(158) The **cat** ~~that the dog kicked~~ $___{gap}$. *English*

(159) [[*pro* geçen yaz ada -da $___{gap}$ ~~gör-düg-üm~~] **kişi -ler**] *Turkish*
last summer island-LOC see -FN -1.SG **person -PL**
'The people who(m) I saw on the island last summer'

In (159), only one word is crossed since the gap and its filler, the head, are closer to each other. In this language, the sentence is therefore predicted to be easier than the subject relative clause (see 160).

(160) [[$___{gap}$ ~~geçen yaz ada -da ben-i gör-en~~] **kişi -ler**] *Turkish*
last summer island -LOC I -ACC see-(y) An person -PL
'The people who saw me on the island last summer'

On the other hand, in English, (158) shows that the filler crosses four elements before reaching its final position, while in the subject alternative, it only crosses the relativizer. Based on this comparison, the linear hypothesis predicts ORC to be harder to process than SRC, in English.

[2] Illustrated by the blue nodes in the tree

4.1.2 Is the Subject Advantage universal?

A large number of psycholinguistic studies have found the existence of a Subject Advantage within several languages (Frauenfelder, Segui, and Mehler 1980 for German, Traxler et al. 2005 for English, Yun et al. 2015 for Japanese, Baudiffier et al. 2011 for French, a.o.). These results led to the idea that the Subject Advantage is universal, contra to the LINEAR DISTANCE HYPOTHESIS' prediction. The debate is still open, however, as can be seen through the case of Mandarin Chinese or more recent multi-factorial studies (Vasishth and Lewis 2006).

4.1.2.1 The case of Mandarin Chinese prenominal relative clauses.

(161) Chinese

a. [_ yaoqing fuhao de] **guanyuan** xinhuaibugui *RC Subj*
_ invite tycoon REL official have bad intentions
"The official who _ invited the tycoon had bad intentions."

b. [fuhao yaoqing _ de] **guanyuan** xinhuaibugui *RC Obj*
tycoon invite _ REL official have bad intentions
"The official who the tycoon invited _ had bad intentions".

from Gibson & Wu 2013

Most studies on languages presenting prenominal EHRC, such as Japanese, Korean or Turkish, agree on the presence of a Subject Advantage (see among others Miyamoto 2003, Kwon et al. 2013, Kwon et al. 2010, Lin and Bever 2006, O'Grady, Lee, and Choo 2003, Slobin and Zimmer 1986 or Özge, Marinis, and Zeyrek 2009 among others) which rules out the linear hypothesis. However, the literature about the processing of Mandarin Chinese's relative clauses reports mixed results, with a pool of researches arguing in favor of the Subject Advantage (Lin and Bever 2006, Wu 2009, Lau 2016 or, more recently, Jäger et al. 2015 and Huang 2019 a.o.) and another arguing the contrary (Gibson 2000, Qiao, Shen, and Forster 2012 or Chen and Shirai 2015 a.o.).

Similarly, in acquisition, Chen and Shirai (2015) show that ORC surfaces before SRC in the production of the children, while Lau (2016) found that children produce fewer errors for SRC than for ORC.

This mixed picture goes hand in hand with a growing literature showing that not all object relative clauses are equal, especially when we add semantic and pragmatic factors into the picture (Vasishth and Lewis 2006).

4.1.2.2 Other factors contributing to the interpretation of Relative clauses

4.1.2.2.1 Features: Traxler et al. (2005), Mak, Vonk, and Schriefers (2002) or Mak, Vonk, and Schriefers (2006) show that inanimate heads in ORC drastically reduce the Subject Advantage in English. Similarly, Friedmann and Novogrodsky (2004) show that children easily understand ORC if the relative clause has a pronominal subject as in example (162).

(162) I prefer the **princess** [that you draw $______{gap}$].

4.1.2.2.2 Pragmatics: Other factors, such as the effect of saliency in the preceding context (Roland et al. 2012, Hale 2016), have led more and more researchers to consider that the Subject advantage is the result of the interaction of multiple factors.

For example, Hodgson (2019) proposes that, in Mandarin Chinese, syntactic subjects are less commonly associated with topics than it can be the case in other languages. This could reduce

the salience of the head of the relative clause in contexts, decreasing the subject advantage observed in other languages.

A solution to better isolate the factors at play in the Subject Advantage is proposed by Pozniak (2018), who conducted a cross-linguistic study (French, English, Mandarin Chinese, and Cantonese) using the same experimental design. Using an eye-tracking protocol in which she controls for animacy and context effects, she found that there exists a Subject Advantage in all four languages, although varying in intensity.
In our study, we will only focus on whether there is a subject advantage in LSF without attempting to manipulating the other factors mentioned so far. For this reason, we chose to adopt and adapt Pozniak (2018)'s protocol, to add LSF to the cross-linguistic pool of data on the Subject Advantage.

4.1.3 Using eye-tracking to investigate relative clauses processing

4.1.3.1 Tracking eyes to obviate decision-making bias

Eye-tracking refers to several methods that aims at tracking and describing eye movements while performing a task. They usually provide information regarding eye movement's path and its speed. The first observation of the importance of eye movements dates back to 1900, when an ophthalmologist noticed that, while reading, eyes make quick non-linear movements (= saccades) (Leggett 2010). With the help of measuring devices dedicated to this use, seminal works such as Yarbus (1967) and later Cornsweet and Crane (1973), demonstrated the robustness of eye-tracking data compared to self-reported data (answers which are given 'consciously' by participants). Participants can be biased in their answers. One consequence of this is that the will to give a good impression can bias the active choice of an answer, to conform to social expectations, or because of self-confidence issues. On the other hand, eye movements conclusively show participants' focus of attention. For this very reason, eye-tracking methods have also been primarily used in the marketing and advertisement domains (Schiessl et al. (2003)).

4.1.3.2 Eye tracking to understand language and world processing

In the linguistic field, the use of eye-tracking has been claimed to be more informative and productive compared to behavioral methods like self-paced reading, rapid visual stimulations, or lexical decision tasks (Rayner and Sereno 1994,Hyönä, Laine, and Niemi 1995).

Eye-tracking is now more and more used to investigate all levels of the linguistic process, from phonological aspects to sentence processing (see Duchowski 2017, Holmqvist et al. 2011 or Sagarra and Hanson 2011 for a review). Several experimental designs exploit this device, one of them, the Visual World Paradigm (VWP), permits to record the eye-movements while performing an audio-visual task: objects or pictures are presented visually while a sentence is displayed aurally. This paradigm has been used to investigate many linguistic domains ranging from word recognition (Tanenhaus and Brown-Schmidt 2007) to semantic processing (Sekerina, Campanelli, and Van Dyke (2016)) (see Huettig, Rommers, and Meyer 2011 for a review of experimental works using this method). While some authors prefer recording eye movements and fixations on the whole screen, others advocate in favor of defining specific areas that are directly relevant to the research question. These are called Area Of Interest (AOI). Researchers define some areas that participants are likely to consider while processing input. For example, in (163), the two competitors are likely to be considered at different points of the sentence processing.

(163) 'I appreciate exotic fruits like apples '

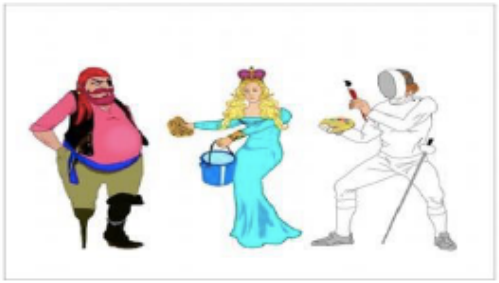


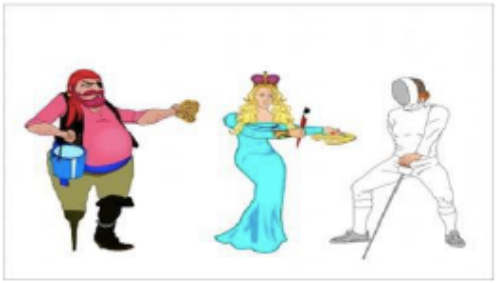


In her work, Pozniak (2018) has used effectively the VWP to investigate relative clauses processing. This convinced us to replicate her study on LSF.

4.2 Adapting eyetracking protocol to a visual-only design [3] [4]

The original protocol used in Pozniak (2018) has an audio-visual design (illustrated in Figure 49). The pictures are from Knoeferle et al. (2003) and have been validated across multiple experimental designs (see Pozniak 2018 or Knoeferle et al. 2003 a.o.).





[Auditory stimulus] "Please find the correct princess, meaning, the beautiful princess that paints the fencer on the picture"

Figure 49. Audio-visual protocol, used in Pozniak (2018).
The pictures are displayed at the same time as the sentence.

The VWP initially involves two sensory modalities: the visual modality is used to display two pictures on a screen while a sentence is played on earphones. Both sounds and pictures happen at the same time, allowing them to follow, through eye-tracking, the wandering of the participants' eye-gaze as they evaluate the pictures with respect to the sentence they are hearing.

For items, participants see two competing pictures: one corresponds to a subject relative interpretation (*'the princess that draws the fencer'*), and the other one corresponds to a relative object interpretation (*'the princess that the fencer draws'*). For each pair of pictures, the stimulus displayed is counterbalanced across conditions, meaning that for a single item picture, half of

[3] **This section is based on a joint-work with Dr. Céline Pozniak.**

[4] **The experimental presented here received the validation from the ethical committee 'CER-PD' (Comité d'Éthique pour la Recherche - Paris Descartes), see Appendix** (C)

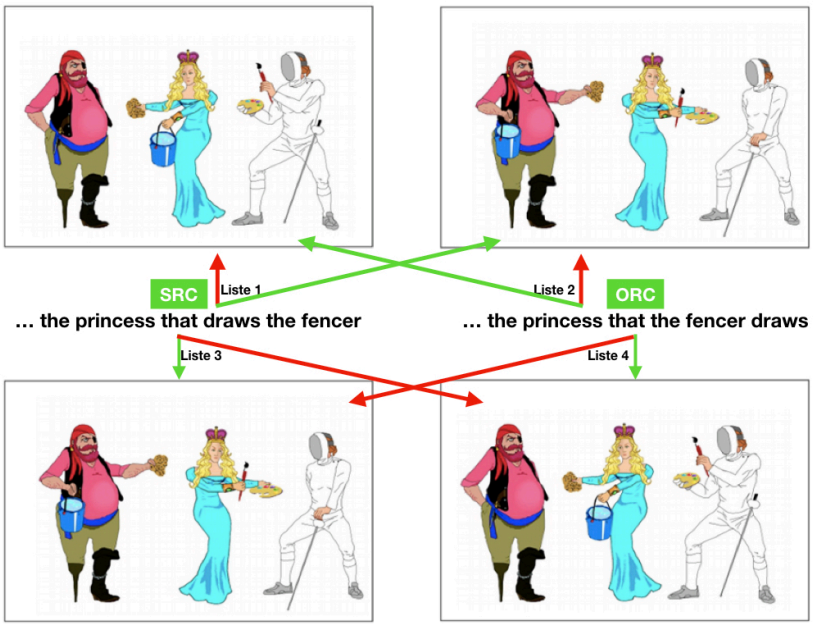


Figure 50. Example of the four alternatives presented across the four lists of items.

the participants will hear a SRC stimulus, while for the other half will hear an ORC. Similarly, for a single item, the position of the correct picture is counterbalanced such that, for half of the participants, the correct answer will be on the right (whether it is SRC or ORC) and for the other half it will be on the left. This is illustrated in Figure (50).

The result is four different lists containing the same number of SRC on the right, SRC on the left, ORC on the right, and ORC on the left and each list displaying the item pictures only once. With this design Pozniak (2018) is able to minimize effects of lateralization (e.g. if the correct answer is always on the right, this bias participants' answers) and possible effects of character saliency (e.g. if a character is accidentally more salient than others and also happens to be the correct answer, it can bias the participants).

Items are randomly alternating with fillers, which are the same across all four lists. Fillers are such that the two alternatives are simple pictures comparing objects or animals, as can be observed in Figure (51).



[Auditory stimulus] "Please find the correct picture, that is to say the picture showing a dog."

Figure 51. Example of a filler.

The function of the fillers is two-folded. 1) Participants do not need the same level of concentration throughout the whole experiment and can rest with fillers. 2) To obtain an objective measure of attention and comprehension since, if participants are lower than chance[5] on such an easy task, they cannot be expected to perform typically on items.

Finally, all trials are introduced by a slide, the context, stating, from left to right, the characters which will appear in the following item/filler (see 164).

(164) a. Context Item: Here are two pictures, both with a pirate, a princess, and a fencer.

b. Context Filler: Here are two pictures a dog and a boot.

These contexts help participants to identify faster each character within the item/filler pictures, and it also allows each character to be equally salient in the context.

The experiment is made of three constitutive steps (Instructions, practice, and experiment), with a time break in the middle to allow participants to rest and refresh. Each trial follows the following order:

Trial structure:

Context > Fixation point > Item or Filler > Greenlight > (If no button pressed: Warning sign)

For our experiments, we used the same pictures, protocol, and stimuli (translated in the language tested) as Pozniak (2018), to the difference that we adapted the original audio-visual design to a visual-only display (to be suitable with a Deaf population). Hence, our first goal was to verify whether similar results could be obtained in the two versions of the test.

For that purpose, we started by conducting an experiment on French native speakers to be compared with previous results obtained in this population. In other words, we started by testing a language for which the Subject Advantage had already been proven through many studies, including through Pozniak (2018)'s audio-visual protocol, in order to control if a visual-only protocol could replicate the effect.

4.2.1 Visual-only French experiment : design

4.2.1.1 Eyelink

We designed the experiment using the software Experiment Builder™and retrieved the experiment data using Data Viewer™. Both softwares are issued by the SR-Research enterprise, which produces the device we used, the Eyelink II, a head-mounted headband with two cameras filming whichever eye is selected. As is the case for most eye-tracking devices, the pupil is identified through the diffusion of infrared light, reflecting on the retina of participants.

One of the advantages of this device is that it leaves participants relatively free in their movements, allowing them to hold an additional controller (used for self-reported measures) while being in a comfortable position. Before the session, we tested the dominant eye for each participant using the Miles test (Miles 1930) and recorded it consequently. Participants wearing glasses or lenses were also accepted as long as it did not interfere with the recording.

[5] And, in fact, lower than 70 % since, considering the simplicity of the task, they should perform at high stake.

4.2.1.2 Visual World Paradigm

In our need to change the protocol to a visual-only display, we decided to separate the screen in two vertical spaces: the upper space was used to display the competing pictures while the lower space was used to display the sentence, the stimulus. We positioned pictures on the two sides of the screen while the stimulus was displayed in the center to allow maximal differentiation of the three zones. Each element (i.e., the two pictures and the stimulus) was coded as AOI for the eye-tracker.

The stimuli used were videos displaying a written French sentence, frame by frame, every two seconds (see Figure 52). The duration between each video frame has been determined after a pilot study, our goal being to find the right pace to allow both language fluidity and to give enough time to participants to investigate the pictures while receiving the linguistic input.



Figure 52. Illustration of the visual-only display for French participants.

4.2.1.3 Calibration

The calibration process took between 5 to 10 minutes, depending on participants, and consisted of a 9-points validation scheme. Calibration phases took place before and after the practice, after the break, and during the experiment, if needed. Following standard procedures, the fixation point appearing before each item/filler purposely served as a calibration check and ensured the correct capture of eye-gaze.

4.2.1.4 Material and variables manipulated

The protocol includes 24 items and 25 fillers as well as a training phase made of a mix of 10 items/fillers, whose results were excluded from the analysis. In this experiment, just like Pozniak (2018), we manipulate two variables; subject and object. They are counterbalanced following a two by two design (Latin square) (see Appendix C for the complete list of items and fillers).

4.2.2 Participants

We tested 21 native French speakers for our experiment. One was excluded based on their native bilingualism. Consequently, we analyzed the results of the 20 participants left. Our participants were mostly coming from Paris and its surroundings, aged between 20 and 69 years old, with a mean age of 36 years old (sd = 16). For this study, we collected data from 18 women and two men. Each participant's results are associated with a code, and no individual results will be presented. Every participant received a compensation of 8 euros for their participation[6].

4.2.3 Procedure

We received participants in the eye-tracking room of the Université de Paris. The experiment lasted a total of 45 minutes. Participants received compensation of 8 euros for their participation and transportation costs.

After adjusting the eye-tracker, participants read the written instructions of the experiment on the screen. Participants sat approximately 45 cm away from the computer screen.

At the end of the stimulus display, participants were also asked to validate an answer manually. To do so, they had to press either the right or the left button on a controller. The button could only be pressed at the end of the stimulus. Hence, we ensured that the participants had seen the whole sentence before answering. They had a one-second span to answer, whose boundaries were signaled by a green light. In case they did not answer in time, a warning sign appeared (see Figure 53). This measure is a way for us to control for comprehension but also to give a concrete goal to our participants, which naturally leads them to look more at the picture they want to validate (Hawkins 1999).

We also repeated the instructions orally to ensure that every aspect of the experiment was understood. The training phase was used as an opportunity to re-explain the instructions when they were not applied. After the calibration, we left our participants alone in the room.

[6] On LABEX EFL fundings 'Operation Relatives', which covered both reimbursements of participants cost and every other aspect such as the material used for this study.

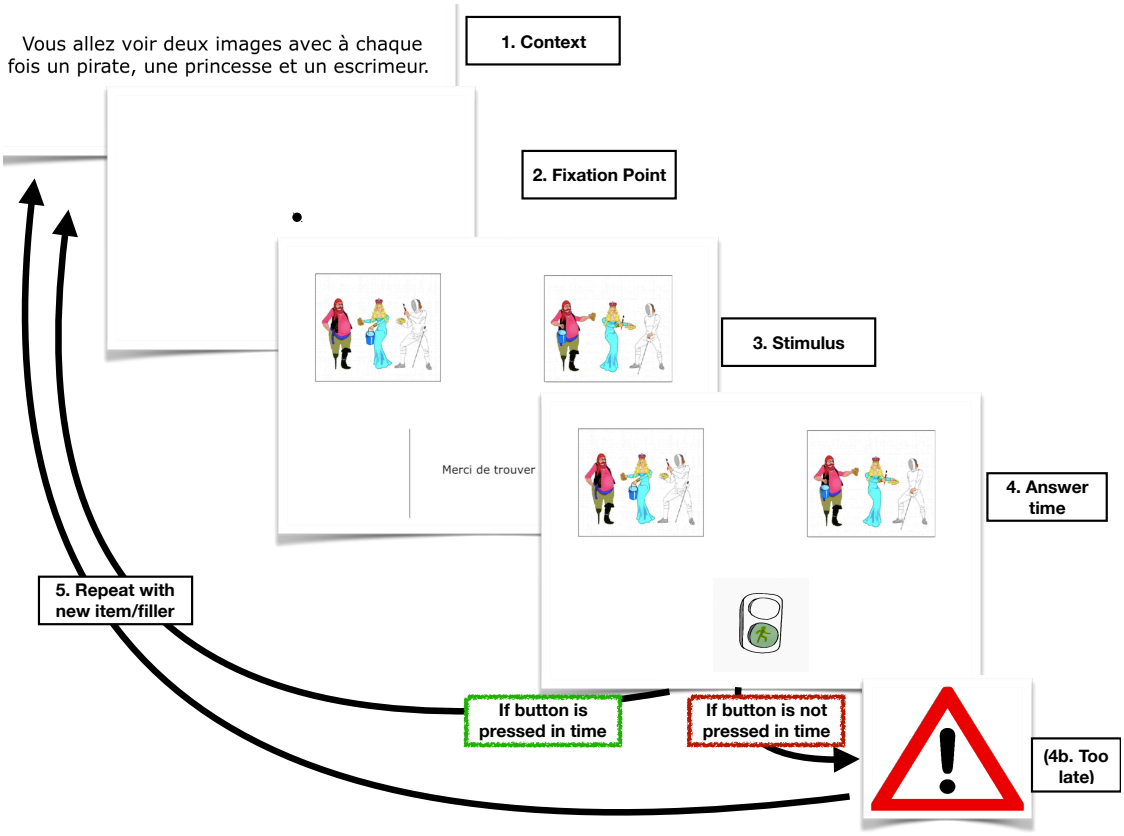


Figure 53. Illustration of the structure of each trial.

Following Pozniak (2018)'s design, each item and each filler was introduced by a context explaining the objects/animals/characters which were going to appear in the tested condition as in example (165).

(165) a. *Context for items:*
Vous allez voir deux images présentant chacune un pirate, une princesse et un escrimeur.
'You will see two pictures with a pirate, a princess and a fencer.'

b. *Context for fillers:*
Vous allez voir deux images présentant un chien et une botte.
'You will see two pictures with a dog and a boot.'

Participants were informed that the order of utterance in the context corresponded to the order from left to right of the objects/animals/characters in the actual condition.

To summarize, the general design is precisely the same as used in Pozniak (2018), except for the modality of the stimulus display.

4.2.4 Hypotheses

Our hypotheses are straightfoward. Given that subject relative clauses are easier to process than object relative clauses in French, if the visual-only protocol works we should find a significant difference in the proportions of eye fixations on the correct pictures between the two conditions. Similarly, the answer should be found faster for subject relative clauses than for object relative clauses.

4.2.5 Results

We will start by showing the results corresponding to the accuracy of the participants, namely which button they pressed when answering at the end of the stimulus.

4.2.5.1 Comprehension

We have a ternary dataset since we coded '1' for correct answers, '0' for incorrect answers and '-1' for lack of button pressing. We planned to exclude participants displaying more than 25 % misses, which did not happen in this group. We then kept the binary set of data made of '1'(correct) and '0'(incorrect) as our dependent variables. Results were analyzed with the R software (R Development Core Team, 2005) using the Laplace Approximation model, a generalized linear mixed model fit by maximum likelihood using the glmer function (package lme4, Bates et al. 2015). The independent variables we manipulated were the two kinds of relative clauses, namely 'Subject Relative Clause' and 'Object Relative Clause'. The random variables are the participants and the items. The results are presented in Figure (7).

Condition	Percentage of correct answers
Subject relative clauses	96 %
Object relative clauses	81 %
Average	91 %

Table 7. French native: mean accuracy with respect to the condition, object and subject relative clause.

As expected, the results show high levels of accuracy in both conditions, with a mean performance of around 91 percent. Overall the accuracy is slightly better for the SRC with an accuracy of 96% against 86% for the ORC. The difference between the two condition is significant (sd=0.5, z-value= 3.2 and p-value < 0.01), see the Appendix (C) for the detailed statistics. This comforts the relevance of our design.

4.2.5.2 Visual processing

We now turn to the eye-tracking data, namely, the proportion of fixation of each AOI.

4.2.5.2.1 Validation of the visual paradigm The results were analyzed with R. We used the Eyetracking-R package Dink and Ferguson (2015) to clean, analyze and plot our data[7]. The independent variables were the same as before, but the dependent ones are now the different areas of interest. Following previous experiments using the VWP (Pozniak 2018), we analyzed our data through mixed linear models Barr et al. (2013) in which we included time and present the results in Figure (54). The two plots correspond to the two conditions, namely Subject relative and Object relative. The three curves correspond to the proportion of fixation of the correct

[7]We excluded trials presenting more than 25% of Trackloss, meaning that the eye-tracker was not properly calibrated or that, during the trial, participants were not looking enough at the AOIs. See eyetracking-r.com for complete documentation of the package.

picture, the incorrect picture, and the video stimulus. The x-axis represents the average time of items within trials. Measurement starts at the display of the head of the relative clause. The y-axis represents proportions within 50ms timebins.

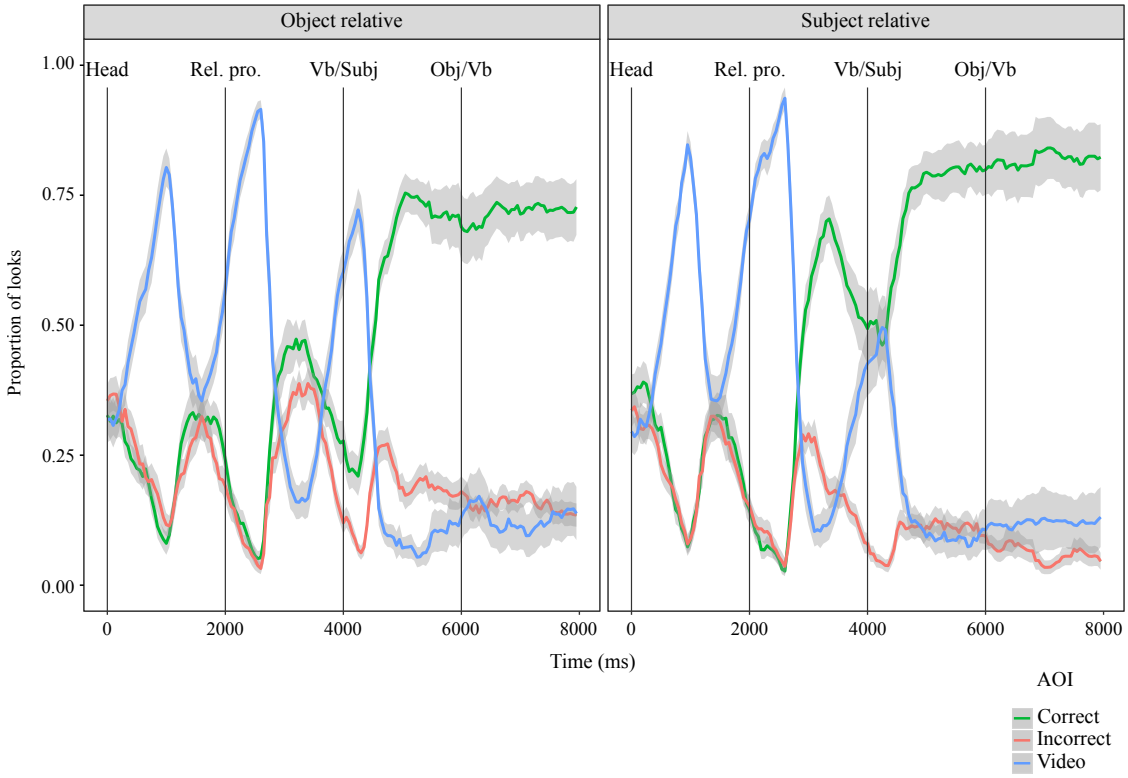


Figure 54. Fixation of correct picture (green), incorrect (red) picture and video-sentence (blue) in subject relative (right panel) and object relative (left panel) conditions.
The x-axis represents time and the y-axis represents the proportion of fixations. The black bars help situating each key element of the sentence, the head (0ms), the relative pronoun (2000ms), the verb (if it is a SRC) or subject (if it is a ORC) of the relative clause (4000ms) and the object or verb (6000ms).

In these results, we observe that participants start by looking exclusively at the video-sentence and progressively drop it to look more at pictures. Remember that the underlying question here was: 'Are participants able to look at a stimulus **and** compare possible answers at the same time?'. After statistical analysis, the answer is clearly 'yes'. Indeed, the general shape of the curve shows that participants are still able to compare and explore the pictures.

4.2.5.2.2 Asymmetries in the processing of relative clauses

The results presented above do not provide a clear answer to the question of the presence of an asymmetry in processing subject and object relative clauses in French because we compare two different kinds of data: the images, which correspond to correct and incorrect answers, and the video stimulus, which is not an answer. To better compare correct and incorrect answers, we have to look at the proportions of eye gaze when looking at a picture.

To obtain these data, we calculated the proportion of fixations corresponding to participants looking at the images. This was obtained by calculating the proportion of correct fixations divided by the sum of the proportion of incorrect and correct answer fixations [8].

The results of this operation are presented in Figure (55). We see here the direct comparison of fixations on the correct versus incorrect pictures, depending on the condition.

[8] In formula: % correct / (% correct + % incorrect)

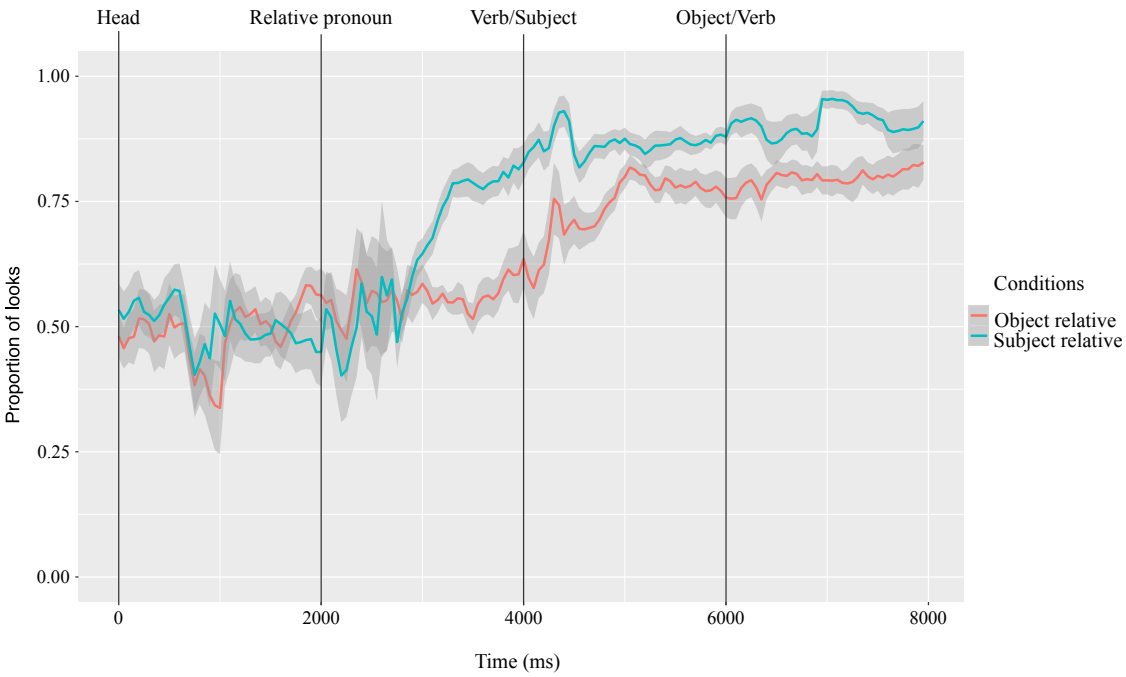


Figure 55. Fixation of correct pictures in subject relatives (red) and object relative (blue) conditions.

The x-axis represents time and the y-axis represents the proportion of fixations on the correct image. The black bars help situating each key element of the sentence, the head (0ms), the relative pronoun (2000ms), the verb or subject of the relative clause (4000ms) and the object or verb (6000ms).

In Figure (55), we see that the SRC are understood faster than ORC. The Satterwait's linear mixed model (see Appendix C) fit by maximum likelihood, shows that there is a significant effect of Relative Clause Type both across items (coef= -0.4, SE = 1,96, t = -20.8, p <.001)[9] and across participants (coef=4.3, SE=2, t = 21.39, p< .001). This effect means that it takes more time to process ORC than SRC and that the latter are processed more accurately than the former.

We thus confirm that the visual-only paradigm is able to capture the significant Subject advantage both across participants and across items in French.

4.2.6 Discussion

Through our visual-only paradigm, we effectively replicated the results obtained in its audio-visual alternative, as can be seen through the comparison of both designs' results in Figures (55)-(56).

[9]Since ORC is coded as negative and the coefficient of this effect is negative, it means the dependent variable is higher for the negative-coded condition, namely ORC.

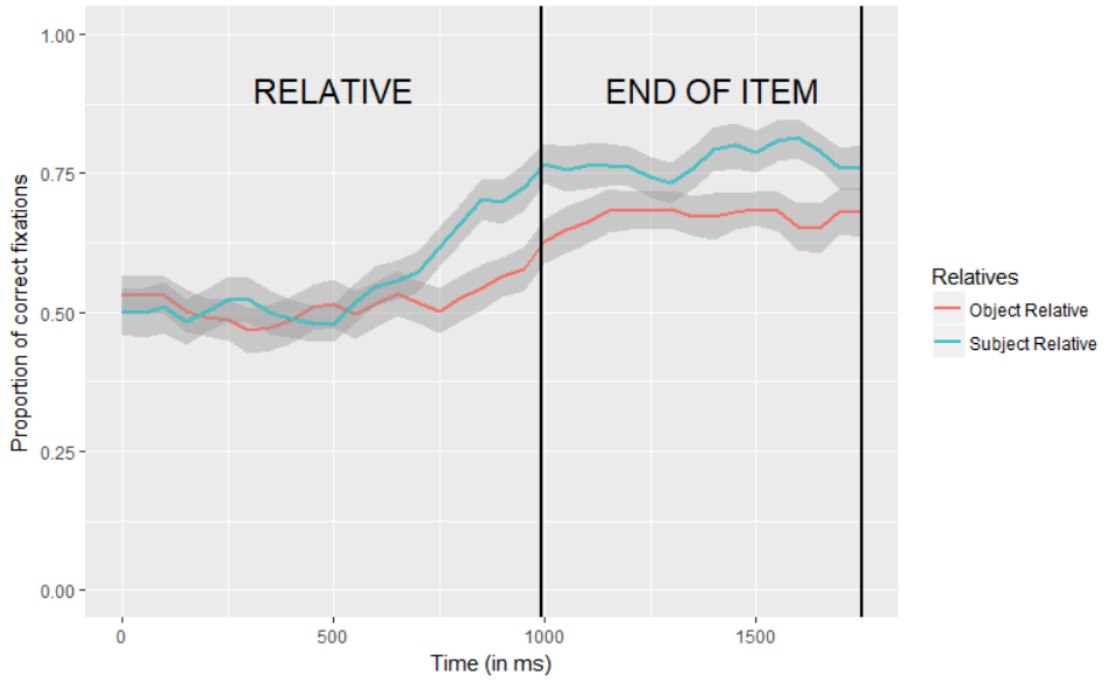


Figure 56. Correct fixations in SRC and ORC using the audio-visual Visual World Paradigm (data from Pozniak 2018).

Interestingly, it shows that, in French, the SRC are understood quicker and better than ORC independently from the sensory modality used for stimulus display.

Few remarks are still needed. The critical elements of our design are the speed of stimulus display and its naturality. Regarding speed, we had to find the right pace at which participants could receive the linguistic input while still being able to investigate the pictures (recall that we wanted to compare data over time, not once the sentence finished). Therefore, future visual-only studies should also conduct pilot studies, as we did, to find the right pace of display.

As for the naturality of the French sentences used, a founded critic could be the way utterances were segmented. Indeed, recall that an advantage of eye-tracking studies over self-paced reading tasks is that it allows presenting ecologic data at a natural pace. In our design, the scattered nature of the stimulus is visible in the presence of the peaks in video-sentences fixations in Figure (54). In future experiments, this point could be improved by using a dynamic display of the sentence (i.e., like in a movie generic instead of being chopped).

Nevertheless, with all these considerations in mind, the striking result of this study is that we were able to replicate the previous findings on French across protocol displays. We can, therefore, confirm that the asymmetry between SRC and ORC is very robust in French. Now that we have demonstrated the validity of our protocol in an already investigated language, we can use it to study LSF.

4.3 Testing relative clauses asymmetry on Deaf signers

4.3.1 Design

The design used was the same as the French visual-only protocol. We used the same eyelink, the visual world paradigm, and manipulated the same variables.

4.3.2 Material

The only difference lies in the stimuli displayed, which are LSF video and not written French (see Figure 57).

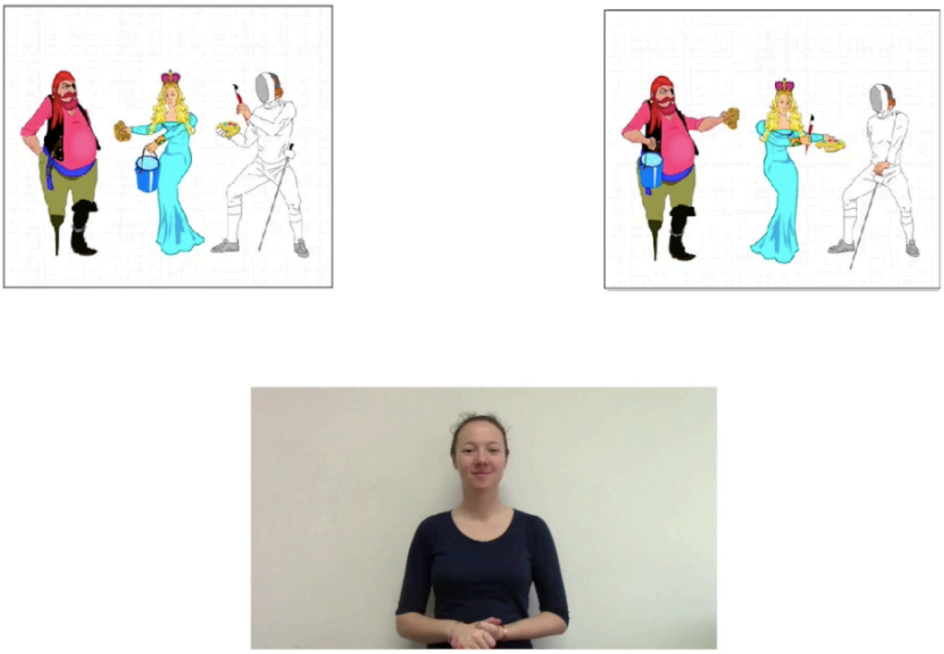


Figure 57. Experimental display of an item in LSF.

The stimuli were elicited with Lorène Loctin, who also recorded the instructions of the experiment and calibration procedures. She additionally signed half of the contexts while the other half was signed by Thomas Lévêque, another Deaf consultant regularly collaborating with our team. We recorded the same 24x4 items (following the Latin square design) and 25 fillers as in the French protocol, and ten practice items/fillers. No written French was involved at any stage of the experiment itself.

As for the French protocol, we checked the pace of the video-stimuli through a pilot study involving 5 Deaf people. At normal speed[10], our participants were not able to look at the LSF sentences while investigating the competing pictures. We slowed the videos down to 50 % of their original pace and controlled that the resulting videos were correctly understood and appeared natural to our pilot group. Similarly to the French experiment, we collected both eye-tracking data, across time, and accuracy input through button pressing on the controller.

4.3.2.1 Items and Fillers

All the pictures were the same as in the French experiment, hence coming from Knoeferle et al. (2003).

All the videos were annotated through ELAN in order to obtain the time code corresponding to critical signs, namely, for the subject relative clause: the head, the relative pronoun PI, the

[10] In fact, our informant, Laurène, signs very fast. Other informants' production might not need to be slowed down that much.

verb of the relative clause, its object and the end of the sentence (cf. Figure 58), and, for the object relative clause: the head, the relative pronoun, the subject of the RC, its verb and its end as well. We used only PI-relative clauses since, as explained in Chapter I.3, it is the only strategy that is clearly restrictive, hence compatible with the setting.

The mean of the time codes was then used to visually indicates them on the plot. This allowed us to understand at which moment of the sentence were the correct AOI fixated by participants.

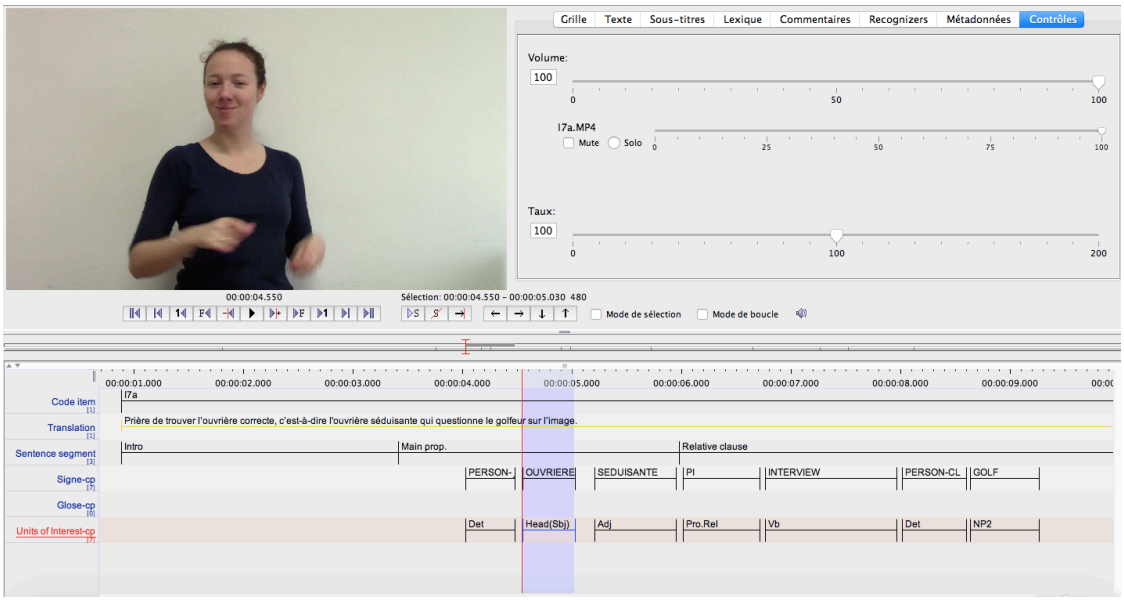


Figure 58. Screen capture of ELAN interface and the template used to retrieve the time codes of each critical sign.

Additionally, we asked our consultant to use the classifier 'PERSON-CL' before every noun-phrase depicting a human being in items. Indeed, while its presence is optional in many professional nouns, its presence is obligatory in a subset of them (cf. example 166). To avoid undesirable effects linked to its presence/absence, we preferred having it everywhere.

(166) a. * MAYOR
PERSON-CL MAYOR
'Mayor (of the town).'

b. LABOURER
PERSON-CL LABOURER
'Factory worker.'

As for fillers, we used other types of sentences, question/answers, to make sure that the sentences were easier than for the items, and that there was no use of PI as a demonstrative to avoid priming effects. An example of both SRC and ORC items and a filler, are provided in Examples (167)-(168). The full list is provided in Appendix (C).

(167) Items

a. PLEASE CHOOSE GOOD PERSON-CL PRINCESS, SO PERSON-CL PRINCESS BEAUTIFUL PI PAINT PERSON-CL FENCER SRC
'Please choose the correct princess, meaning the beautiful princess who paints the fencer.'

b. PLEASE CHOOSE GOOD PERSON-CL PRINCESS, SO PERSON-CL PRINCESS BEAUTIFUL PI PERSON-CL SWORDSMAN PAINT ORC
'Please choose the correct princess, meaning the beautiful princess who the fencer paints.'

(168) Filler

a. PLEASE CHOOSE GOOD PICTURE. IX-3 WHAT DOG
'Please choose the correct picture. That is the dog.'

4.3.3 Participants

We recorded data from 33 Deaf signers. We collected meta-data regarding their signing background (age of first exposure to LSF, presence or not of Deaf relatives, modality of communication with parents, siblings, other relatives, type of education whether oralist, bimodal or mostly LSF...) through a questionnaire[11] (see Appendix C) in order to be more representative, we included native/near-native signers and early/late signers. The meta-data have been anonymized following the CER-PD[12] and the CNIL[13] recommendations.

As mentioned in the introduction, the population of Deaf signers varies significantly in their linguistic background. In our group we recruited 15 native/near native[14] (mean age of acquisition = 1.3 y.o., SD = 1.3) and 18 early and late LSF/signers (mean age of acquisition = 9 y.o., SD = 6.3)[15]. We analyzed the results of the whole group of participants and controlled for effects of age of acquisition in accuracy scores. On average, the majority of participants were signing in their everyday life with their Deaf partners, children or friends, and a minority wore a hearing-aid. We also have a considerable age variation since participants range from 19 to 72 years old, with a mean of 39 years old. We recorded data from 18 women and 15 men.

4.3.4 Procedure

We received participants in the eye-tracking room of the Université de Paris. The experiment had a total duration of 1 hour. Participants received 20 euros as compensation for their time and transportation costs[16].

Instructions were provided in LSF on screen and we repeated them in LSF to ensure maximum clarity. Here again, the training phase was used as an opportunity to explain better the instructions (namely the need for participants to look at the image they choose, as quick as they find the answer).

The rest of the procedure was the same as in the French experiment. After the 9-points calibration phase, items and fillers appeared randomized on-screen, always preceded by a LSF context and a calibration fixation point. A break was offered in the middle of the experiment.

[11] The questionnaire is an adaptation of the Sign-Hub's questionnaire, elaborated for the needs of this project. We shortened it a bit and translated it into French. To ensure its understanding by our participants, we signed and explained every question upon request.

[12] Comité d'Éthique pour la Recherche - Paris Descartes

[13] Commission Nationale de l'Informatique et des Libertés.

[14] Exposed to a sign language before the age of 3.

[15] In fact, we collected data from a person who started signing at 31 years old, presenting the double of age than the second participant in rank of the latest age of acquisition. Therefore, we decided to consider him/her as an outlier and consequently excluded her/him from our analysis.

[16] On LABEX EFL fundings 'Opération Relatives', which covered both reimbursements of participants' cost and every other aspect such as the material used for this study.

4.3.5 Hypotheses

Here again, the prediction is straightforward; if there is an effect of relative clauses type, we should observe an asymmetry in the proportion of fixations between the two conditions. So, if SRC are easier than ORC, the correct answers in the first condition should be fixed longer and more accurately than in the second condition.

4.3.6 Results

4.3.6.1 Comprehension

For self-reported answers, we excluded participants who provided no answers (i.e., they just did not press any button in time) for more than 25% of the trials[17]. For the LSF group, this corresponded to 3 participants. Two of them were also part of the six participants excluded for displaying less than 70% of accuracy on fillers. Such a low accuracy is interpreted either as a lack of attention, a lack of LSF understanding, or a factor which surely prevented them from performing correctly on the items as well. All in all, we discuss the accuracy measures of 25 participants. This is presented in Table (8).

Condition	Percentage of correct answers
Subject relative clauses	81 %
Object relative clauses	69 %
Average	75 %

Table 8. LSF signers: mean accuracy with respect to the condition, object and subject relative clause.

We see in Table (8) that the SRC are accurately understood in 81% of the cases on average, while ORC are accurately understood in 69% of the cases. Using the same Laplace Approximation as in the previous experiment, we see that the condition had a significant effect on accuracy (sd=0.9, z-value=2.8, and p-value$<$0.01), comparable to the one observed for French native speakers.

So far, we mentioned the presence of both native and non-native LSF signers. We wanted to see whether this distinction correlates with accuracy. For this purpose, using the generalized linear mixed model again, we used the age of acquisition as a predictor of the overall accuracy and found that it had a marginal effect (coef. =-0.06, SE = 0.04, z-value = -1,7, p$<$0.1). There was no interaction between the age of acquisition and the conditions, as presented in Figure (59).

The absence of interaction shows that the later the LSF is acquired, the lesser participants' **overall** performance is likely to be. This is in line with previous studies showing that the age of acquisition of sign language can lead to differences in the linguistic competence of adult signers (Friedmann and Novogrodsky 2004, Emmorey et al. 1995).

[17] Note that these participants were excluded from accuracy analysis but not automatically from the eye-tracking measures since pressing a button under time pressure is not correlated with the visual behavior.

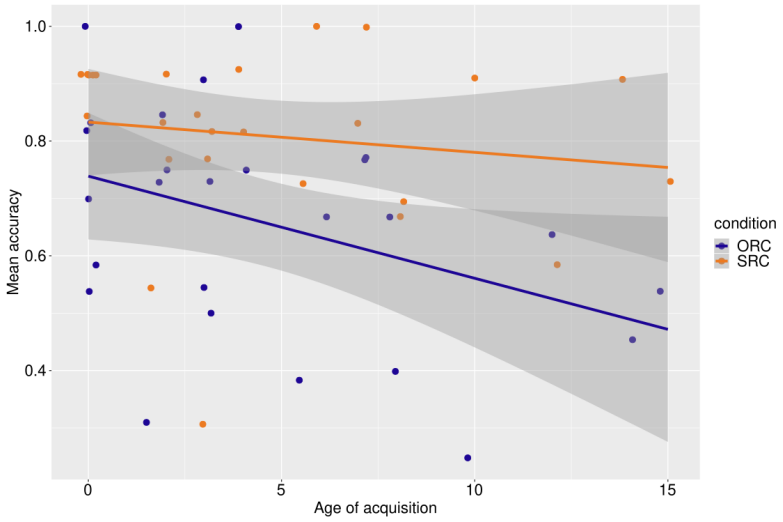


Figure 59. Accuracy of LSF participants in function of the age of acquisition of the LSF .

4.3.6.2 Visual processing

Following what we did in the French experiment, we conducted our data analysis using the Eyetracking-R package Dink and Ferguson (2015) to clean and analyze our data.

4.3.6.2.1 Validation of the task design The independent variables we manipulated were again the two conditions, SRC and ORC. Other randomized independent variables were the participants and the items. Dependent variables were the three possible AOIs, and Time was used as a predictor. We first checked whether participants looked solely at the LSF-stimuli or if they were able to look at pictures at the same time. Results are presented in Figure (60).

The curve of fixations on the video-stimulus is sharply decreasing as the sentence progresses, showing that participants are indeed investigating the pictures.

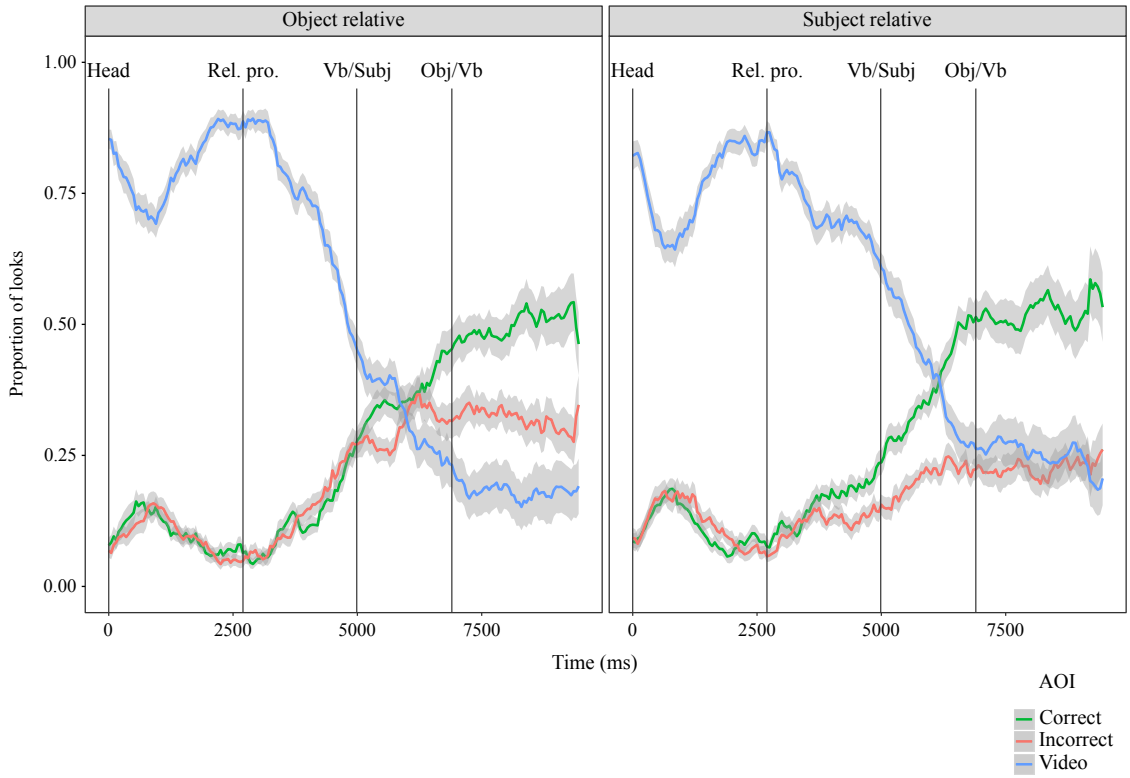


Figure 60. Fixation of correct picture (green), incorrect (red) picture and video-stimulus (blue) in subject relative (right panel) and object relative (left panel) conditions.

The x-axis represents time and the y-axis represents the proportion of fixations on the correct image. The black bars help situating each key element of the sentence, the head (0ms), the relative pronoun (≃ 2700ms), the verb or subject of the relative clause (≃ 5000ms) and the object or verb (≃6900ms).

4.3.6.2.2 Asymmetries in the processing of relative clauses We now turn to the relevant results comparing, when participants look at pictures, whether they are looking at the correct one or the incorrect one. The results of our linear mixed model are visually presented in Figure (61).

With the data presented in Figure (61), we observe an asymmetry between subject relative clauses and object relative clauses. Just like the French experiment, we consider that the correct answer is found when the correct AOI is fixed and that the curve of fixations follows an increasing path. Looking in greater details at the results, we can observe that the understanding of subject relative clauses happens before object relative clauses. The difference between conditions is significant both across items (coef. = -0.27, SE = 1.8, t = -15.1, $p<0.001$) and across participants (coef. = 0.26, SE = 1.8 1.8, t = 14.9 , $p<0.001$).

4.3.7 Discussion

Through our visual-only adaptation of Pozniak (2018)'s audio-visual protocol, we have been able to investigate the processing of relative clauses in LSF. The results indicate that this language presents a Subject Advantage since signers process SRC faster and better than ORC.

To the best of our knowledge, this is the first time that such an asymmetry is tested in sign language. We can now conclude that the phenomenon of Subject advantage also extends across sensory modalities.

Along our path, we also showed that it is possible to adapt the existing protocol into a visual-only display to make them suitable for Deaf studies. In this respect, our study paves the

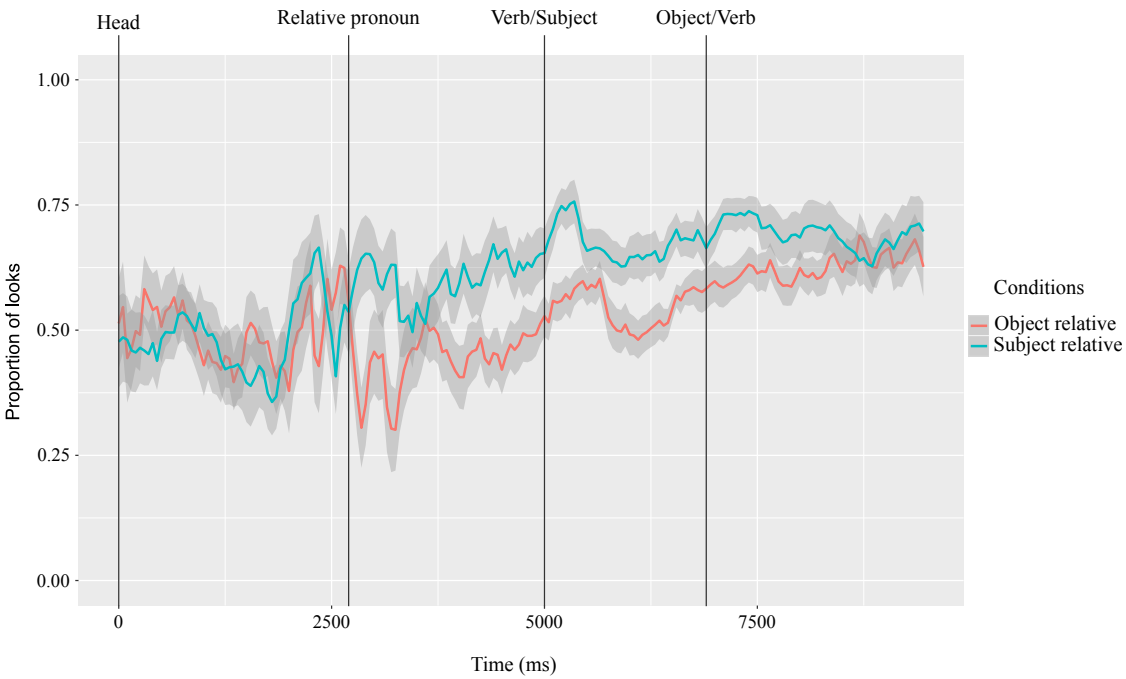


Figure 61. Fixation of correct pictures in subject relatives(red) and object relative(blue) conditions. *The x-axis represents time and the y-axis represents the proportion of fixation on the correct image. The black bars help situating each key element of the sentence, the head (0ms), the relative pronoun (≃ 2700ms), the verb or subject of the relative clause (≃ 5000ms) and the object or verb (≃ 6900ms).*

way for future fine-grained investigations of sign language processing.

A final aspect that we believe further researches could face is the interaction between the age of acquisition and linguistic performance. In our study, we operated a simple separation between native and non-native, leaving the latter as a very diverse group. In this respect, further studies presenting a fine-grained division of the age of first exposure should be carried out.

Conclusion Part I

Throughout the first Part of this dissertation, we have demonstrated that LSF behaves like any language in showing the ability to embed, recursively, clauses into others. In the first chapter, we presented the state of the art of the literature on relative clauses, enriching the framework with a review of relativization strategies in sign languages. We also reviewed the different formal frameworks used to account for the typological variations among RC in the literature. In the second chapter, we presented the formal analysis of LSF based on the data presented previously and the competing syntactic theories. We have shown that LSF uses in majority externally headed relative clauses introduced by PI, PERSON-CL or through non-manual marking. We have also shown that all participants of an event can be relativized, whether human, non-human, or inanimate. It is even possible to take the whole clause as the head of the relative, as we have seen in the PI-final strategy. We finished our description by implementing all LSF data within a head-raising framework.

In the third chapter of the Part, we experimentally investigated the processing of relative clauses in LSF. To do so, we replicated a previous psycholinguistic study conducted on Chinese, French, and English speakers, that we adapted to a visual-only modality. Through our eye-tracking experiments, we have shown that there is a Subject Advantage in LSF. This demonstrates that languages are processed similarly, no matter the modality used to convey/receive it. Along our path, we have seen that these promising results could pave the way to the adaptation of other traditional eye-tracking paradigms to be used for investigating sign languages.

Part II
Subordination at the sentential level

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CHAPTER 5

Temporal Constructions [1]

This chapter presents a study of LSF temporal constructions. While we know from spoken language research that temporal constructions can be expressed through a variety of syntactic strategies involving subordination, juxtaposition, and coordination, finding their equivalent in sign languages is often a challenge due to the absence of overt complementizers and other function words such as coordinators. This study explores temporal constructions in LSF and frames them within a broad typological perspective. We show that LSF temporal clauses are very different from those of Italian Sign language (LIS). Specifically, LSF constructions are composed of two coordinated clauses, and the temporal marker is integrated into the second conjunct.

5.1 Introduction

Temporal constructions are complex syntactic structures whereby an adverb expresses a temporal relation between the events described in two clauses. Syntactically, temporal constructions can be expressed by using several strategies (subordination, coordination, and juxtaposition), and languages vary typologically concerning the strategy adopted.

These constructions have been investigated in spoken languages from a syntactic, semantic, and typological point of view. However, very few studies have focused on this topic in sign languages. Our Chapter aims to fill this gap by investigating the syntax of temporal constructions in LSF from a syntactic perspective and to systematically compare them to their LIS counterparts studied in Aristodemo and Geraci (2017).

We organize the Chapter as follows: Section II.5.2 presents an overview of temporal constructions in spoken languages as well as several diagnostic tools to identify the different syntactic strategies. Section II.5.3 focuses on sign languages and, in particular, we report the case of LIS temporal constructions in which Aristodemo and Geraci (2017) has applied these tools. In Section II.5.4, we apply the same diagnostic to LSF data, showing that LSF temporal constructions are instances of asymmetric coordination. Section II.5.5 integrates LSF results in a typological perspective and finally, Section II.5.6 concludes the chapter.

[1] This chapter is based on a joint work with Dr. Valentina Aristodemo.

5.2 Temporal constructions in spoken language: typology and diagnostics

In spoken languages, temporal constructions usually involve a complex syntactic structure made of two clauses. The main strategy used to express them is subordination, namely a configuration where one clause is syntactically dependent on another. Semantically, they express a temporal relation between the events described by the two clauses (Thompson and Longacre 1985). This relation can be of precedence, succession or simultaneity, as illustrated respectively by the English *before*-, *after*- and *when*-clauses in (169).

(169) a. John arrived **before** Marie fell.
b. John arrived **after** Marie fell.
c. John arrived **when** Marie fell.

In several languages, *before*-clauses are characterized by the presence of negation. This is due to the semantic interpretation of the construction, which states that, by the time the event named in the main clause took place, the event expressed by the subordinate clause has not yet happened. The presence or absence of negation is a typological parameter of variation. For instance, a negative marker is optional in Mandarin, while it is obligatory in Lakhota, as illustrated in (170) and (171).

(170) Ta (mei) lai yiqian, women yijing hui jia le.
he NEG come before we already return home ASPbe-3s arrive-PAST-PART
'Before he arrived, we had already gone home.' (Thompson, Longacre, and Hwang 2007: 248) '

(171) T'e ni it'okab c'inca-pi kin wahokon-wica-kiye
die NEG before child-PL the admonish-3PL-PATIENT
'Before he died, he admonished his children.' (Buechel 1939: 251)

Negation can also be observed in languages such as Italian and French (cf. 172-173), while in English the negative environment is made visible through the presence of negative polarity items, such as *any* and *ever* (cf. 174).

(172) Lo fermerai prima che non faccia qualche sciocchezza.
Him-CLIT stop-2SG-FUT before that not do3SG-SUBJ some folly
'You will stop him before he does anything silly.' Del Prete (2008)

(173) Je pars avant qu' elle ne vienne.
I leave-1SG-PRES before that she not come1SG-PRES
'I leave before she arrives.'

(174) a. You should get more information before making any decision.
b. Before I ever heard of generative grammar, I knew Chomsky's name from his political essays.

Temporal information can also be expressed using other syntactic strategies. One possibility is a juxtaposition, which involves two independent clauses (cf.175). Another strategy is asymmetric coordination in which the two clauses are coordinated, as in (176).

(175) Pierre est arrivé. Après, Jean est tombé
Pierre be-3s arrive-PAST-PART. After, Jean be-3s fall-PAST-PART
'Jean felt. After that, Pierre arrived.'

(176) Pierre est arrivé et après, Jean est tombé
Pierre be-3s arrive-PAST-PART and after, Jean be-3s fall-PAST-PART
'Jean felt and after that Pierre arrived.'

The asymmetry in (176) comes from the temporal adverb, which creates a semantic dependency between the time of the two events. In contrast with what happens in symmetric coordination, here, inverting the two conjuncts provokes a change in meaning (Culicover and Jackendoff 1997; De Vries 2008).

In some cases, temporal constructions are also expressed by using relative clauses[2]. This is the case in Mandarin, where the head noun *shihou* 'time' is used, as in (177), or in Swahili, in which the relative marker *po* is inserted in the subordinate clause, as shown in (178).

(177) Ta lai de shihou women dou zou le
he come REL time we all leave ASP
'When he arrived, we all left.' (Thompson, Longacre, and Hwang 2007: 247)

(178) Baba a-na-po-pika chakula, kuna pilipili sana
father SUBJ-PRES-REL-cook food there-is pepper plenty
'When father cooks, there is plenty of pepper.' (Thompson, Longacre, and Hwang 2007: 247)

From a morphological point of view, all the complex syntactic configurations presented so far display distinguishing properties: the presence of a linker often characterizes coordination; juxtaposition does not contain a linker; subordination contains elements such as complementizers, relative pronouns and/or relative particles.

The three strategies also display different syntactic properties that can be readily revealed by applying several syntactic tests such as inversion, the possibility to stand in isolation, and *wh*-extraction (Ross 1967). Inversion applied to juxtaposed clauses results in a pragmatically odd structure (see 179); it reverses the interpretation in asymmetric coordination[3] (cf. 180); while in subordinate temporal clauses, inversion is acceptable and does not change the original meaning of the sentence, as shown in (181).

(179) a. Pierre achètera un portable. Après, Jean prendra le train.
Pierre buy-3s-FUT a cellphone. After, Jean take-3s-FUT the train
'Jean will take the train after Pierre will buy a cellphone.'

b. # Après, Jean prendra le train. Pierre achètera un portable.

(180) a. Pierre achètera un portable et après, Jean prendra le train.
Pierre buy-3s-FUT a cellphone and after, Jean take-3s-FUT the train
'Jean will take the train after Pierre will buy a cellphone.'

b. Après, Jean prendra le train et Pierre achètera un portable.
'Later, Jean will take the train and Pierre will buy a cellphone.'

(181) a. Jean prendra le train après que Pierre achetera le portable.
Jean take-3s-FUT the train after that Pierre buy-3s-FUT the cellphone
'Jean will take the train after Pierre will buy a cellphone.'

[2] Bhatt and Pancheva (2017) propose an analysis of *when*-clauses in term of free relatives.

[3] Note that in this case, we keep the conjunction between the two clauses. Otherwise, it would result in ungrammaticality.

b. Après que Pierre achètera un portable, Jean prendra le train
'After Pierre will buy a cellphone, Jean will take the train.'

Moving to the isolation test, we observe that juxtaposition allows isolation (cf. 182), while asymmetric coordination and subordination do not, as shown in (183) and (184).

(182) Après, Jean prendra le train.
After, Jean take-3s-FUT the train
'Later on, Jean will take the train.'

(183) # Et après, Jean prendra le train.
And after, Jean take-3s-FUT the train

(184) * Après que Pierre achètera le portable
After that Pierre buy-3s-FUT the cellphone

Table (9) summarizes the results of the inversion and isolation tests applied to the three syntactic configurations.

	Inversion	Isolation
Juxtaposition	# pragmatic	✓
Asymmetric coordination	Change of meaning	X
Subordination	✓	X

Table 9. Results of inversion and isolation

The three different strategies also behave differently as far as extraction possibilities are concerned, as illustrated by the English sentences in (185)-(187). Given that the structures we are interested in contain two clauses, *wh*-extraction can be performed, in principle, in three different ways: symmetrically[4], by extracting the same *wh*-element from the two clauses at the same time (see examples 185a,186a and 187a); from the first clause only (cf. 185b, 186b and 187b) and/or from the second clause only (cf. 185c, 186c and 187c).

(185) Paul ate a strawberry. After that, Marie stole a bike.
a. * **What** did Paul eat $___{gap}$. After that, Marie stole $___{gap}$?
b. * **What** did Paul eat $___{gap}$. After that, Marie stole a bike?
c. * **What** did Paul eat strawberries. After that, Marie steal $___{gap}$?

(186) Paul ate a strawberry and after that, Marie stole a bike.
a. **What** did Paul eat $___{gap}$ and after that, Marie steal $___{gap}$?
b. * **What** did Paul eat $___{gap}$ and after that, Marie stole a bike?
c. * **What** did Paul eat a strawberry and after that, Marie steal $___{gap}$?

(187) Paul ate a strawberry after Marie stole a bike.
a. **What** did Paul eat $___{gap}$ after Marie stole $___{gap}$?
b. **What** did Paul eat $___{gap}$ after Marie stole a bike?

[4] This is also called the 'across-the-board' (ATB) strategy (Ross 1967).

c. * **What** did Paul ate a strawberry after Marie stole $____{gap}$?

The examples in (185) show that, in juxtaposition, it is not possible to ask a question either symmetrically or in one of the two clauses. As expected for coordination, the examples in (186) show that only the symmetric extraction is permitted (see 186a). In such structures, asking a question from only one of the two conjuncts always results in ungrammaticality (cf. 186b-186c).

Finally, subordinated temporal clauses (cf. 187) allow extraction in a symmetrical fashion[5] (cf 187a) and from the main clause (see 187b) but, crucially, not from the subordinated one (187c)[6]. Table (10) summarizes the results of the *wh*-extraction test applied to the three syntactic configurations.

	Wh-extraction		
	Both	Second clause	First clause
Juxtaposition	X	X	X
Asymmetric coordination	✓	X	X
Subordination	✓	X	✓

Table 10. Summary of the extraction pattern depending on syntactic properties, rationale.

5.3 Temporal constructions in Sign Languages

In the Introduction of this dissertation, we have described the non-manual means to convey temporal information through the use of spatio-temporal lines. However, temporality can also be conveyed using manual lexical items. Indeed, Pfau, Steinbach, and Woll (2012) show that, in sign languages, the time of the utterance is primarily indicated through temporal adverbials, just like in spoken languages. Cross-linguistically, temporal adverbs can be found sentence-initial, sentence-final, and/or between the subject and the verb. For example, ASL display all three possibilities, as shown in (188).

(188) a. **TOMORROW** J-O-H-N BUY CAR ASL
'John will buy a car tomorrow.'

b. J-O-H-N BUY CAR **TOMORROW**
'John will buy a car tomorrow.'

c. J-O-H-N **TOMORROW** CAN BUY CAR
'John can buy a car tomorrow.'

(from Aarons 1994: 238)

In their study of LIS' temporal clauses, Aristodemo and Geraci (2017) used these temporal adverbs as accurate indicators of the presence of temporal clauses.

5.3.1 Italian Sign Language

The first description of temporal adverbs in LIS comes from Pizzuto et al. (1995) who describe the phonological, morphological, and semantic properties of eight different spatio-temporal

[5] This phenomenon is usually referred to as a 'parasitic gap' when associated with an island, such as the temporal adjunct, see Levine et al. (2001) for an extensive description.

[6] The ungrammaticality of (187c) is traditionally reduced to an adjunct island violation (Ross 1967).

signs. In their paper, Pizzuto et al. (1995) argue that some temporal adverbs can only be used in coordinated contexts (e.g., the sign 'FIRST') while others (e.g., 'BEFORE') can be "the only appropriate choice when the relationship between two events placed in a sequence is one of subordination". However, they do not provide any supporting evidence for this claim.

Aristodemo and Geraci (2017) filled this gap by providing a detailed analysis of LIS temporal clauses in terms of subordinated structures akin to relativization. Their work is supported by both the observation of non-manual markers and the result of the application of the diagnostic tools presented in Section II.5.2. The following examples illustrate respectively a *before*-, a *when*- and an *after*- clause in LIS.

(189) a. $\overline{\text{BOSS STOCK SELL } \textbf{NOT-YET/MUST}_{future}}^{\text{re}}$ [$\overline{\textbf{BEFORE}}^{\text{NMM}}$], SECRETARY STAMP BUY

b. $\overline{\text{BOSS STOCK SELL}}^{\text{re}}$ [$\overline{\textbf{MOMENT PI/SAME}}^{\text{NMM}}$], SECRETARY STAMP BUY

c. $\overline{\text{BOSS STOCK SELL}}^{\text{re}}$ [$\overline{\textbf{AFTER}}^{\text{NMM}}$], SECRETARY STAMP BUY

'The secretary bought the stamps { **before** / **when** / **after** } the boss sold the stocks.'

Regarding non-manual marking, temporal constructions in LIS display two different types of eyebrow-raising. The first (i.e. *re*) spreads on the temporal clause, while the second (i.e. NMM) spreads on the temporal marker only. This type of distribution of non-manuals is typical of other subordinate clauses, such as *if*-clauses, left dislocated sentential complements, and comparative correlatives in which raised eyebrows spread on the entire clause.

From a morphological point of view, *before*-clauses involve the presence of a either the negative word NOT-YET or the future marker MUST_{future} (cf. 189a), while *after*- and *when*-clauses do not. Furthermore, in *when*-clauses the temporal relation is expressed using 'MOMENT' followed by 'SAME' or by the relative marker PI[7] (cf. (189b)).

Moving to syntactic properties, Aristodemo and Geraci (2017) show that temporal constructions in LIS have a fixed order. It is not possible to invert the two clauses as shown by the ungrammatical sentences from (190) to (192). This property has already been observed for other types of subordinated structures in LIS, such as *if*-clauses (Barattieri 2006). Note that the same observation has been made by Wilbur (2016) for adverbial clauses in ASL. In this respect, temporal clauses in sign languages behave differently from their spoken language counterparts in which inversion is allowed without a change of meaning, as already shown in example (181) in Section II.5.2.

(190) a. * **BEFORE** SECRETARY STAMP BUY BOSS STOCK SELL NOT-YET/MUST_{future}

b. * **BEFORE** BOSS STOCK SELL NOT-YET/MUST_{future} SECRETARY STAMP BUY

c. * SECRETARY STAMP BUY BOSS STOCK SELL NOT-YET/MUST_{future} **BEFORE**

intended: 'The secretary bought the stamps before the boss sold the stocks.'

(191) a. * **MOMENT PI/SAME** SECRETARY STAMP BUY BOSS STOCK SELL

b. * **MOMENT PI/SAME** BOSS STOCK SELL SECRETARY STAMP BUY

c. * SECRETARY STAMP BUY BOSS STOCK SELL **MOMENT PI/SAME**

intended: 'The secretary bought the stamps when the boss sold the stocks.'

(192) a. * **AFTER** SECRETARY STAMP BUY BOSS STOCK SELL

[7] Note that the gloss PI is taken from Aristodemo and Geraci (2017)'s thesis but it is exactly the same as PE described in Donati and Branchini (2012) and Cecchetto, Geraci, and Zucchi (2006)

b. * **AFTER** BOSS STOCK SELL SECRETARY STAMP BUY

c. * SECRETARY STAMP BUY BOSS STOCK SELL **AFTER**

intended: 'The secretary bought the stamps after the boss sold the stocks.'

Applying the isolation test (cf. 193), Aristodemo and Geraci (2017) reject the juxtaposed analysis[8].

(193) * $\overline{\text{BOSS STOCK SELL (NOT-YET)}}^{\text{re}}$ $\left\{ \begin{array}{c} \overline{\textbf{BEFORE}}^{\text{NMM}} \\ \overline{\textbf{MOMENT PI}}^{\text{NMM}} \\ \overline{\textbf{AFTER}}^{\text{NMM}} \end{array} \right\}$

Intended meaning: Before/when/after the boss sold the stocks.

Finally, as expected for subordinate clauses, *wh*-extraction is possible only from the second clause, as shown in (194), but not from the first one (cf. 195). This indicates that the first clause is subordinated to the second clause since island effects Ross 1967 prevents extraction.

(194) a. $\overline{\text{BOSS STOCK SELL NOT-YET/MUST}_{future}}^{\text{re}}$ $\overline{\text{BEFORE}}^{\text{NMM}}$, t_{who} STAMP BUY **WHO**

b. $\overline{\text{BOSS STOCK SELL}}^{\text{re}}$ $\overline{\text{MOMENT PI}}^{\text{NMM}}$, t_{who} STAMP BUY **WHO**

c. $\overline{\text{BOSS STOCK SELL}}^{\text{re}}$ $\overline{\text{AFTER}}^{\text{NMM}}$, t_{who} STAMP BUY **WHO**

'Who bought the stamps $\left\{ \begin{array}{c} \textbf{before} \\ \textbf{when} \\ \textbf{after} \end{array} \right\}$ the boss sold the stock?'

(195) a. * t_{who} $\overline{\text{STOCK SELL NOT-YET/MUST}_{future}}^{\text{re}}$ $\overline{\text{BEFORE}}^{\text{NMM}}$, SECRETARY STAMP BUY **WHO**

b. * t_{who} $\overline{\text{STOCK SELL}}^{\text{re}}$ $\overline{\text{MOMENT PI}}^{\text{NMM}}$, SECRETARY STAMP BUY **WHO**

c. * t_{who} $\overline{\text{STOCK SELL}}^{\text{re}}$ $\overline{\text{AFTER}}^{\text{NMM}}$, SECRETARY STAMP BUY **WHO**

Intended meaning: Who is such that the secretary bought the stamps, $\left\{ \begin{array}{c} \textbf{before} \\ \textbf{when} \\ \textbf{after} \end{array} \right\}$ s/he sold the stock?'

Extraction from both clauses is also possible, as shown by the sentences in (196) and (197) in what can be interpreted as an instance of a parasitic gap[9].

(196) a. $\overline{\text{PIZZA}}^{\text{topic}}$ GIANNI $_____{pg}$ EAT NOT-YET/MUST$_{future}$, BEFORE PIERO t_{pizza} PAY (DONE)
'Pizza, Piero pay before Gianni ate.'

b. $\overline{\text{PIZZA}}^{\text{topic}}$ GIANNI $_____{pg}$ EAT, MOMENT PI PIERO t_{pizza} PAY (DONE)
'Pizza, Piero pay when Gianni ate.'

c. $\overline{\text{PIZZA}}^{\text{topic}}$ GIANNI $_____{pg}$ EAT, AFTER PIERO t_{pizza} PAY (DONE)
'Pizza, Piero pay when Gianni ate.'

[8] Aristodemo argues that the adverbial forms a constituent with the first clause. See Aristodemo and Geraci (2017) for more details on this aspect.

[9] The acceptability judgments are degraded due to independent reasons. Example (196) that involves object topicalization is acceptable.

(197) a. ?? GIANNI ____$_{pg}$ EAT NOT-YET/MUST$_{future}$, BEFORE PIERO t$_{what}$ PAY (DONE) $\overline{\text{WHAT}}^{\text{wh}}$
'What did Piero pay before Gianni ate?'

b. ?? GIANNI ____$_{pg}$ EAT, MOMENT PI PIERO t$_{what}$ PAY (DONE) $\overline{\text{WHAT}}^{\text{wh}}$
'What did Piero pay when Gianni ate?'

c. ?? GIANNI ____$_{pg}$ EAT, AFTER PIERO t$_{what}$ PAY (DONE) $\overline{\text{WHAT}}^{\text{wh}}$
'What did Piero pay after Gianni ate?'

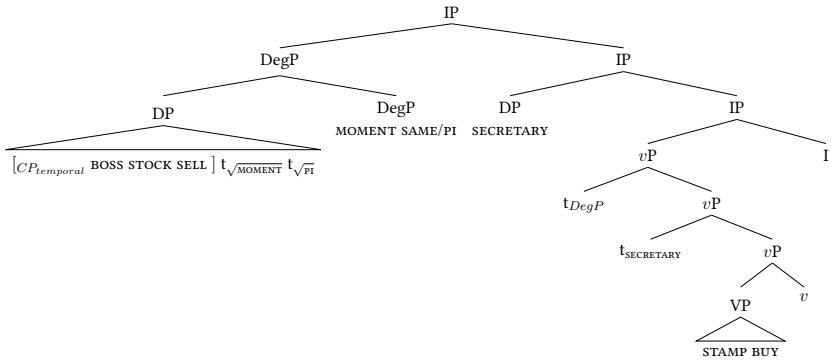
To summarize, LIS temporal constructions involve a subordinate clause. They are characterized by a fixed order with the subordinate clause preceding the main clause and the temporal marker between them. All the properties just discussed, summarized in Table (11), point towards this conclusion.

	Isolation	*Wh*-extraction		
		Both	Subordinate clause	Main clause
Juxtaposition	✓	X	X	X
Coordination	X	✓	X	X
Subordination	X	✓	X	✓
LIS	X	✓	X	✓

Table 11. Summary of the extraction pattern found in LIS.

In their analysis, Aristodemo and Geraci (2017) propose that the subordinate clause is headed by a Degree Phrase (DegP), which is generated as a VP adjunct and is then left-adjoined to the main IP, as shown in (198). A semantic analysis justifies the choice of the degree phrase in terms of comparative constructions.

(198) *Temporal constructions in LIS*



5.4 Investigating temporal constructions in French Sign Language

We can now use the diagnostic tests to investigate temporal constructions in LSF. Doing so, we will verify whether the conclusions we just drew for LIS can extend to this neighboring

language.

5.4.1 The baseline

The baselines of temporal clauses in LSF are presented in (199). This chapter focuses on the three lexical items 'AFTER','BEFORE' and 'SAME TIME', leaving aside other types of temporal constructions which are worth further investigations. The glosses in (199) include pieces of information about NMMs and localization of signs in space (square brackets and 'left/right' mention indicate the side on which the sentence is signed).

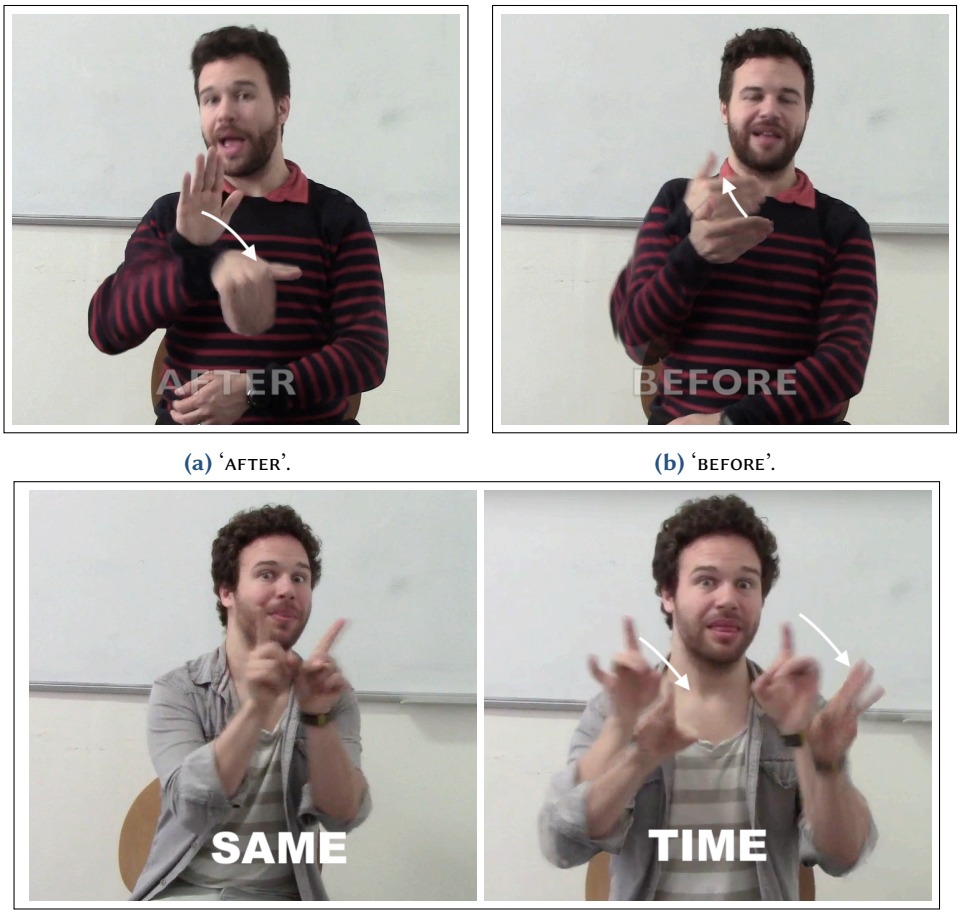
(199) a. [$_{left}$ JEAN BUY FLOWER] $\overset{re}{\overline{\textbf{AFTER}}}$ [$_{right}$ MARIE STEAL BIKE]
'Jean bought flowers and after Marie stole a bike.'

b. [$_{left}$ JEAN BUY FLOWER] $\overset{re}{\overline{\textbf{BEFORE}}}$ [$_{right}$ MARIE STEAL BIKE]
'Jean bought flowers and before Marie stole a bike.'

c. [$_{left}$ JEAN BUY FLOWER] $\overset{re}{\overline{\textbf{SAME TIME}}}$ [$_{right}$ MARIE STEAL BIKE]
'Jean bought flowers and at the same time Marie stole a bike

We see in (199) that, no matter the temporal marker, the set of NMMs is the same: the first clause is signed on the left side of the signing space while the second is realized on the right one. It is worth noticing that this type of marking is typical of coordinated structures in sign language descriptions (see Quer et al. 2017a), and it differs from the one found in LIS baselines.

As for the manual signs, Figure (62) illustrates the LSF temporal markers used by our informants. AFTER is signed with the handshape  , a forward movement and a change in the orientation of the palm. BEFORE is also articulated with a  handshape but it has a backward movement. Finally, SAME TIME is a complex sign composed by two sub-parts, the sign for SAME is a symmetrical two-handed sign with a  handshape in which the two hands move toward each other, while the sign for TIME has a forward movement with an handshape change from  to  .



(a) 'AFTER'. **(b)** 'BEFORE'.

(c) 'SAME TIME'.

Figure 62. The signs 'AFTER' (a), 'BEFORE' (b) and 'SAME TIME' (c).

The temporal markers in (199a)-(199c) are signed in the middle of the signing space and are marked by raised eyebrows. This is illustrated with an *after*-clause in Figure (63).

$[_{left}$JEAN BUY FLOWER$]$ $\overset{re}{\overline{\textbf{AFTER}}}$ $[_{right}$MARIE BUY VASE$]$

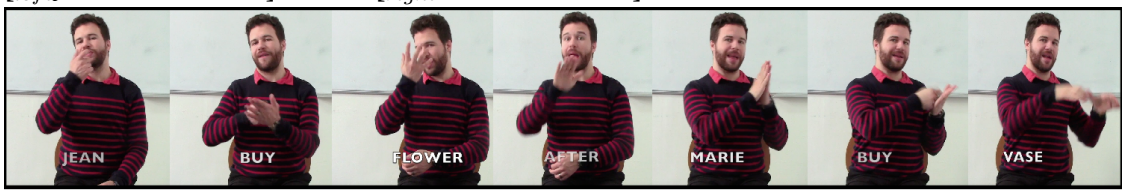


Figure 63. Non-Manual marking in LSF

To allow a direct comparison with LIS, we tested the possibility of inserting the relative marker PI (see Hauser and Geraci 2017) and the negation NOT YET. Both are not possible, as shown by the ungrammatical sentences in (200) and (201). In particular, the sentence in (200) shows that the temporal marker SAME TIME cannot be replaced by 'TIME PI' to create a relative clause headed by the noun 'TIME'.

(200) * $[_{left}$ JEAN BUY FLOWER $]$ $\overset{re}{\overline{\textit{TIME}\ \textbf{PI}}}$ $[_{right}$MARIE BUY VASE$]$
Intended: 'Jean bought flowers at moment at which Marie bought a vase.'

Moreover, the presence of the negation 'NOT YET' results in ungrammaticality (cf. 201).

(201) * [$_{left}$ JEAN BUY FLOWER **NOT YET**] $\overset{re}{\overline{BEFORE}}$ [$_{right}$MARIE BUY VASE]
Intended: John bought flowers before Marie bought a vase

5.4.2 Testing the syntactic properties

In this section, we test how LSF temporal constructions behave with respect to the diagnostics we introduced in Section II.5.2. This fine-grained investigation is necessary to establish the nature of the syntactic relation between the two clauses of LSF temporal constructions.
To verify if the construction involves two separate sentences, we tested whether the second clause can stand alone. The results are presented from (202a) to (202c).

(202) [$_{left}$ JEAN BUY FLOWERS] $\overset{re}{\overline{\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}}}$ [$_{right}$MARIE BUY VASE]
'Jean bought flowers and after/before/at the same time Marie bought a vase.'

a. $\overset{re}{\overline{\textbf{BEFORE}}}$ MARIE BUY VASE
'Before (now), Marie bought a vase.'

b. $\overset{re}{\overline{\textbf{SAME TIME}}}$ MARIE BUY VASE
'At the same time (as now/as we are talking), Marie bought a vase.'

c. $\overset{re}{\overline{\textbf{AFTER}}}$ MARIE BUY VASE
'After (now), Marie will buy a vase.'

The sentences (202a)-(202c) show that the second clause can be expressed in isolation. However, given that no manual coordinator is present in LSF, it is difficult to determine whether the isolated clause corresponds exactly to the second part of the temporal construction or if the signer produces a new independent sentence. A piece of evidence for the latter option could be the absence of the right localization of the sentences in (202a)-(202c). To deepen our investigation, we apply the inversion test.

In this case, we observe that in LSF, it is possible to swap the two clauses (cf. 203). This result highlights an important difference between LIS and LSF. In the former, the inversion results in ungrammaticality.

(203) [$_{left}$ JEAN BUY FLOWER] $\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}$ [$_{right}$ MARIE BUY VASE.]
'Jean bought flowers and after/before/at the same time Marie bought a vase.'

a. $\overset{re}{\overline{\textbf{BEFORE}}}$ [$_{left}$ MARIE BUY VASE] [$_{right}$ JEAN BUY FLOWER]
'Before (now), Marie bought a vase and Jean bought flowers.'

b. $\overset{re}{\overline{\textbf{SAME TIME}}}$ [$_{left}$ MARIE BUY VASE] [$_{right}$ JEAN BUY FLOWER]
'At the same time (as now), Marie bought a vase and Jean bought flowers.'

c. $\overset{re}{\overline{\textbf{AFTER}}}$ [$_{left}$ MARIE BUY VASE] [$_{right}$ JEAN BUY FLOWER]
'After (now), Marie will buy a vase and Jean will buy flowers.'

However, if we compare the translation of the LSF sentences in (203) and those obtained after inversion in (203a)-(203c), we observe that the meaning changed after inversion. In the baseline, the events are temporally related one to the other. After inversion, the two events are both temporally located before/at the same time/after the time of the utterance. There is no order between them anymore.

These results, summarized in Table (12), coupled with the pieces of evidence from non-manual components converge towards analysis in terms of a coordinated structure. However, they are not sufficient to entirely exclude alternatives analyses such as juxtaposed clauses.

	Inversion	Isolation
Juxtaposition	Pragmatic problems	✓
Asymmetric coordination	Change of meaning	X
Subordination	✓	X
LSF	Change of meaning	✓

Table 12. Results of inversion and isolation for LSF

The extraction tests will shed light on this matter. Here, predictions are straightforward: if we can extract from both clauses at the same time, the syntactic structures cannot be juxtaposed. The symmetric extraction is compatible with both coordinated and subordinated clauses. On the other hand, if one can extract from a clause but not from the other, this is only compatible with a subordination analysis. This is due to island-effects that prevent extraction from the subordinate clause.

The results for LSF are presented in examples (204)[10].

(204) $[_{left}$JEAN BUY FLOWER$]\overline{\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}}^{re}[_{right}$ MARIE STEAL BIKE$]$

'Jean bought flowers and before/at the same time/after Marie stole a bike.'

a. *Extraction from the first clause only*

*$[_{left}$**WHO** BUY FLOWER$]\overline{\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}}^{re}[_{right}$MARIE STEAL BIKE$]$?

Intended meaning: '*Who bought flowers and before/at the same time/ before Marie stole a bike?'

b. *Extraction from the second clause only*

*$[_{left}$JEAN BUY FLOWER$]\overline{\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}}^{re}[_{right}$**WHO** STEAL BIKE$]$?

[10]Note that LSF uses mainly an in-situ strategy for questions (see Geraci 2017 and Hauser 2016), which explains the absence of gaps in (204c)-(204b).

Intended: '*Who Jean bought flowers and before/at the same time/after stole a bike?'

c. *Extraction from both clauses*

$$[_{left}\textbf{WHO}\ \text{BUY FLOWER}]\overset{re}{\overline{\left\{\begin{array}{c}\textbf{BEFORE}\\ \textbf{SAME TIME}\\ \textbf{AFTER}\end{array}\right\}}}[_{right}___{}_{gap}\ \text{STEAL BIKE}]?$$

'Who bought flowers and before/at the same time/after stole a bike?'

The sentences in (204a) and (204b) show that asymmetric wh-questions are not possible, while the sentence in (204c) shows that symmetric question on both clauses at the same time is allowed. These results point towards coordination and are not compatible with an analysis in terms of juxtaposition or subordination (see Table (13))[11].

	Both	First clause	Second clause
Juxtaposition	X	X	X
Asymmetric coordination	✓	X	X
Subordination	✓	X	✓
LSF	✓	X	X

Table 13. Extraction patterns compared to LSF data.

5.4.3 Analysis

LSF temporal constructions are coordinated clauses with a temporal marker in the second conjunct. This analysis is based on the sum of our previous observations: the non-manual marking of LSF temporal clauses is typical of coordination; i) it is ungrammatical to use a relative pronoun; ii) the two clauses can be inverted but inversion results in a different interpretation of the sentence and; iii) extraction can only be symmetrical. We summarize these results in Table (14).

[11] Recall from Chapter I.2 that despite being an in-situ language, LSF displays islandhood effects and typical-extraction behavior. Hence, we use in the table the term 'extraction' as a generic term referring to either LF or PF extraction movement.

	Isolation	Inversion	*Wh*-extraction		
			Both	First clause	Second clause
Juxtaposition	✓	♯ pragmatic	X	X	X
Coordination	X	Change meaning	✓	X	X
Subordination	X	X	✓	X	✓
LSF	✓	Change meaning	✓	X	X

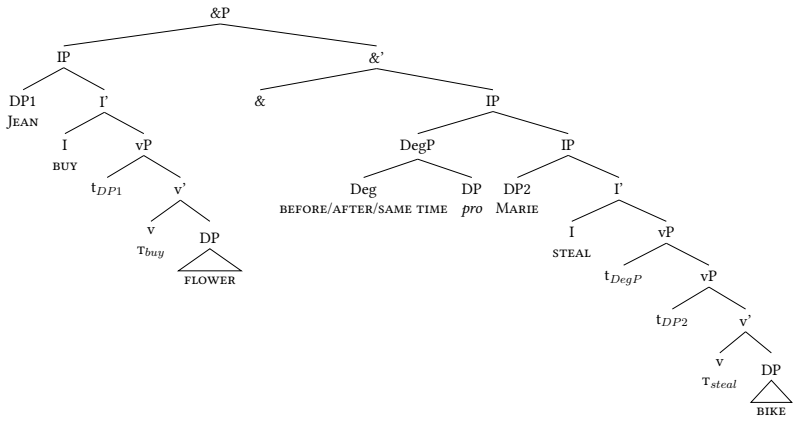
Table 14. Summary of the syntactic tests for LSF

LSF behaves consistently like coordinated structures except for the isolation test. We attribute this difference to the absence of the typical non-manual markers of coordination (i.e., right/left use of space) in the sentences expressed in isolation. As discussed in the previous section, this could be an attempt by the signer to rescue the sentences in order to produce simple declarative grammatical utterances.

Regarding the temporal markers, we analyze them as comparative elements, capitalizing on Aristodemo and Geraci (2017)'s analysis of LIS. This choice follows from preliminary observations that LSF temporal markers display the same iconic properties that we found in LIS. The timeline is mapped onto the signing space, and, as for LIS, the amplitude of the movement of the temporal markers can be iconically modulated along this line.

We analyze LSF temporal clauses as two asymmetrically coordinated clauses with the second conjunct containing a degree phrase, as illustrated by the syntactic structure in (205). The *pro* in the structure is an anaphoric pronoun that refers to the degree time established in the first clause.

(205) *Surface structure of temporal constructions in LSF*



5.5 Typological remarks

LSF and LIS do not belong to the same typological class.

While at first look, LIS and LSF temporal constructions seem to differ only in their word order (cf. 206-207), once we take into account the set of non-manual markers, the distinction between the two languages becomes clearer. In LIS, the whole sentence is signed in the neutral

space in front of the signer. Moreover, the first clause is signed with the eyebrows raised, which is a typical marker of subordination. This is not the case for LSF, which adopts the standard marking of coordination by signing the two clauses on the two opposite sides of the signing space (see Figure (64)).

(206) $\overline{\text{GIOVANNI FLOWER BUY}}^{\text{re}}$ $\overline{\textbf{AFTER}}^{\text{nmm}}$ MARIA VASE BUY *LIS*
'Gianni will buy flowers after which Maria will buy a vase.'

(207) [$_{left}$JEAN BUY FLOWER] $\overline{\textbf{AFTER}}^{\text{re}}$ [$_{right}$MARIE BUY VASE] *LSF*
'Jean will buy flowers and after that Marie will buy a vase.'

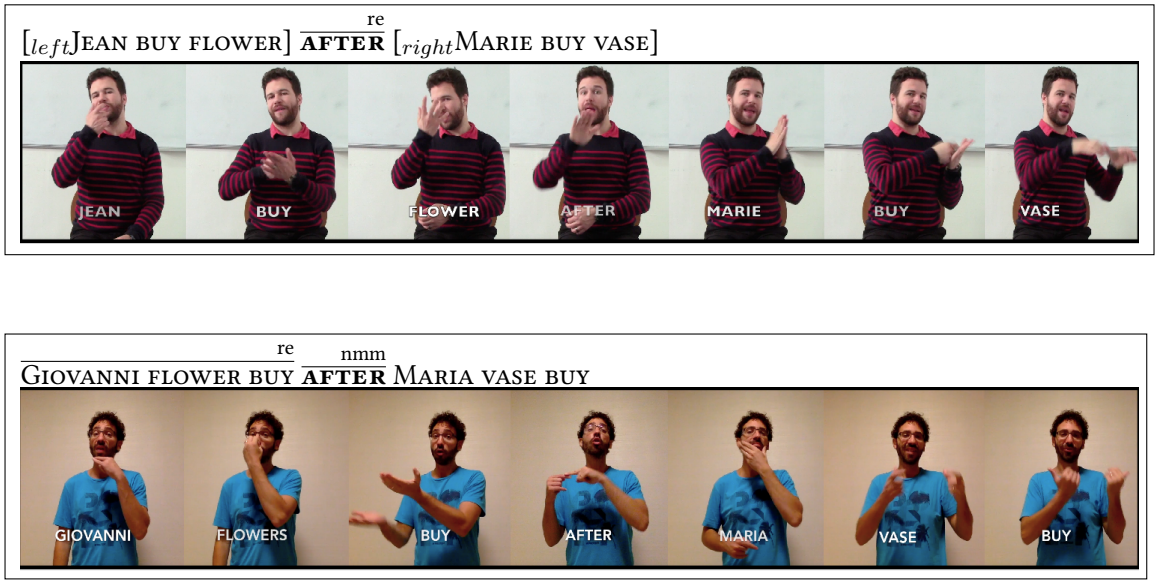


Figure 64. Comparison of non-manual markers for After-clauses in LIS and LSF.

Regarding the manual signs, the two languages display other differences. While LIS allows a negative element and the presence of a relative marker, LSF does not. These observations are additional indications that LIS and LSF differ in their syntactic structure.

However, to attain the conclusion, a more sophisticated investigation was needed. After observing the outcomes of several tests, namely isolation, inversion, and question-pattern, the differences became striking: LIS and LSF display two separate syntactic structures (see Table 15).

	Isolation	Inversion	*Wh*-extraction		
			Both	First clause	Second clause
Juxtaposition	✓	♯ pragmatic	X	X	X
Coordination	X	Change meaning	✓	X	X
Subordination	X	X	✓	X	✓
LSF	✓	Change meaning	✓	X	X
LIS	X	X	✓	✓	X

Table 15. LSF and LIS mirror results to all syntactic tests.

Through this fine-grained investigation, we have shown that sign languages can display the same typological variation that we find in spoken languages. LIS temporal constructions are conveyed through a subordinate clause akin to relativization, just like Swahili (178), while LSF express them using a coordinated structure. Regarding the presence of negation in *before*-clauses, it is interesting to remark that in sign languages, we observe the same kind of distinction found in spoken languages. While in LIS, the negative marker is obligatory; this is not the case for LSF[12].

Along the same line, the results of our study confirm that syntactic diagnostics used to investigate spoken languages can also be applied to sign languages, but with great caution. Indeed, as the research on sign languages grows, modality-specific properties come to light. For example, unlike spoken languages, subordinate clauses in sign languages tend to display a fixed order. Indeed, Wilbur (2016) observes that ASL adverbial clauses, including temporal clauses (cf. 208), usually precede the main clause, as in LIS.

(208) BELL RING $\overline{[\quad]^{hn++}}$, MARY LEAVE
'Mary left when the bell rang.'

This is also the case for other types of subordinate structures such as relative clauses in LIS (Branchini and Donati 2009), DGS (Pfau and Steinbach 2015) or HKSL (Tang and Lau 2012).

The overt realization of functional words is another example of a typological variation between spoken and signed languages. These elements are conveyed through non-manual marking in the visual modality, while they are often lexicalized in spoken languages (Baker and Padden 1978).

Even if some properties can be modality-specific, comparative studies between sign and spoken languages are still relevant since both modalities display the same type of typological variation.

5.6 Summary

In this chapter, we have investigated the syntax of temporal constructions in French Sign Language, concluding that they involve asymmetric coordination. Evidence for this analysis

[12]The presence of NPI has not yet been studied in LSF. Therefore, a more in-depth investigation is needed to check whether LSF behaves like English in allowing NPI in *before*-clauses.

comes from morpho-phonological and syntactic properties. Temporal constructions in LSF display the typical non-manual marking of coordinated structures, that inversion of the two clauses provokes a change of meaning and that *wh*-extraction is only possible across-the-board. We compared our results to those of a previous study on temporal clauses in Italian Sign Language concluding that, despite a *prima facie* similarity between LIS and LSF constructions, an in-depth and detailed syntactic investigation reveals that the syntactic structure used in LSF is different from the one used in LIS, which involves subordination. These results confirm that temporal constructions in the visual modality exploit the same typological categories available in spoken languages.

Chapter 6

Question-Answer pairs

A growing literature has emerged on sign languages describing a particular construction that looks like a question followed by its fragment answer, but which crucially is not interpreted as such. In the sign language literature, it has successively been referred to as pseudoclefts (Wilbur 1996, Branchini 2014), rhetorical questions (Hoza et al. 1997), question-answer constituents (Davidson, Caponigro, and Mayberry 2008a), or, more recently, QAP in Kimmelman and Vink (2017)). We will adopt here this most recent theory-neutral terminology. Across these works, a number of arguments have been made to reject a pseudocleft analysis. Some of these arguments are based on the languages' properties, others, on the pseudoclefts literature. For the latter category, we will show that most of them are, in fact, improper generalizations and simplifications, which should not be taken as conclusive arguments against a pseudocleft analysis. Regarding the properties of Sign languages themselves, we study here LSF QAP[1] and show that this language does not display the same strategy as ASL, NGT, and LIS. The four languages are minimally distinct, leading us to postulate the existence of a grammaticalization process between them. In that respect, we will extend Kimmelman and Vink (2017)'s proposal, in order to integrate LSF and LIS data.

This chapter is organized as follows: the first Section II.6.1 describes the linguistic properties of the QAP displayed across sign languages, including our work on LSF. The second Section II.6.2 addresses each argument made over the SL literature against a pseudocleft analysis and discusses it in perspective with the general linguistic literature on the topic. Finally, the last Section II.6.3 argues for a grammaticalization process which takes information-seeking questions as its base and turn them progressively into free-relatives.

6.1 Question Answer Pairs across Sign languages

6.1.1 Introduction

The construction we want to focus on here is illustrated in ASL in example (209).

[1] The first mention of these structures dates back to Moody, Hof, and Dufour (1983) description of what is still called 'false-question'. This name is part of the LSF lexicon and refers to the same structures we analyzed. While we found traces of a memoir named 'Etude syntaxique de la question rhéthorique en LSF' (translation: Syntactic study of LSF's rhetorical question.), we were never able to read its content, despite our attempts. We thus propose our own analysis in this chapter.

(209) $[_{Q-constituent}$ $\overset{\text{br}}{\overline{\text{JOHN BUY WHAT}}}$], $[_{A-constituent}$ BOOK]
'What John bought is a book.' *(Caponigro and Davidson 2011)*

In (209), the signer subsequently produces what looks like a question ('JOHN BUY WHAT') and its answer ('a book') as a focalization strategy.

In the literature, it goes under many names; from rhetorical questions (Hoza et al. 1997) to pseudoclefts (Wilbur 1996, Branchini 2014) depending on authors and analyses. We use, from now on, the most recent term " Question-Answer Pairs" (QAP) (Kimmelman and Vink 2017) as a purely descriptive term to refer to any construction superficially displaying a sequence of a question followed by a fragment answer, uttered by a single signer.

On a superficial level, QAP look like pseudoclefts both by the constituents at play (a wh clause and a focalized constituent) and by their pragmatic use.

Cleft sentences come in a variety of shapes. In the literature, the term 'clefts' can either refers to 'it-clefts', as in (210), or 'wh-clefts' in which case they are often called pseudoclefts (see 211). We will keep this name from now on.

(210) It was a dog who made that weird noise.

(211) What made that weird noise was a dog.

Pseudoclefts are further divided between Predicational PseudoCleft (PPC) (as 212) and SPC (as 213) (Ross 1967). The difference between the two constructions is semantic and, as argued by many authors[2], also syntactic. Many different terminological terms have been used to refer to the pre- and post-copular parts of the constructions. To avoid any confusion, we will refer to the pre-copular constituent (between brackets in 212 and 213) as the wh- or the question-constituent. We will refer to the post-copular constituent as the answer-constituent or the counterweight.

(212) [What Charlotte cooked] is delicious. PPC

(213) [What Charlotte cooked] are courgettes farcies. SPC

In (212), the wh-constituent is a free-relative, a DP. In this respect, even without knowing what was cooked, we can predicate the property of it being delicious.

In (213), on the other hand, the wh-constituent introduces a variable of which the counterweight specifies the value. So, at the end of a predicational pseudocleft, we have no precise knowledge of what was cooked, while at the end of a specificational pseudocleft, we do. The value 'courgettes farcies' has filled the gap of the wh-cleft. We will describe the properties of the two constructions in the next section thoroughly.

6.1.1.1 Previous studies of QAP in sign languages

It is the superficial resemblance between QAP and pseudoclefts which justifies that they were primarily analyzed as such by Wilbur (1996). Later on, ASL's QAP have received different analyses, varying on the type and number of clauses that were claimed to be involved in the construction. The main features of the analyses are summarized in Table (16).

In their corpus study on NGT, Kimmelman and Vink (2017) highlight the coexistence of different forms of QAP in NGT, some surfacing as two clauses and others as one single clause. This finding leads the authors to postulate the existence of a grammaticalization process actually at play in NGT and in ASL by which two separate clauses eventually get merged into one undergoing morpho-phonological and semantic transformations (see Figure 65).

[2] See among others Schlenker 2003, Declerck 1994, Frascarelli and Ramaglia 2013 or Den Dikken 2001

Author(s)	*Number of clauses*	*Nature of the question constituent*	*Nature of the answer constituent*
Hoza et al. (1997)	2	matrix question	juxtaposed clause
Wilbur (1996)	1	wh-cleft	matrix small clause
Caponigro and Davidson (2011)	1	embedded question	embedded clause

Table 16. Analyses of question-answer pairs in ASL.

Figure 65. Grammaticalization process, Kimmelman and Vink (2017)

(regular question →) rhetorical question → discourse-level question-answer combination → question-answer clause

Through the corpus study of NGT, the authors argue that the process does not get as far as pseudoclefts based on the observation that "even the clearly grammaticalized QAP show some properties that are incompatible with a wh-cleft analysis" (Kimmelman and Vink 2017, p. 440). The data we obtained in LSF, along with Branchini (2014)'s work on LIS, point towards the opposite conclusion as we will now demonstrate by offering detailed description of the properties of the QAP in LSF.

6.1.2 Morpho-phonological properties

As observed in ASL and LIS, QAP in LSF do not display the morpho-phonological properties of questions. Indeed both rhetorical (example 214b) and information-seeking questions (example 214a) are signed with the eyebrows furrowed. On the other hand, QAP are realized with raised eyebrows and chin (see example 214c). These NMMs are most of the time restricted to the wh-word, but depending on the signer, they can spread on the whole question constituent, as shown in Figure (66). It should also be noted that the answer-constituent in QAP can optionally be introduced by a sign glossed as PALM-UP, which does not have a precise translation but resemble 'well', a filler. Finally, although we do observe polar question/answer sequences in spontaneous speech (see example 215), we follow Wilbur (1996) in excluding them from the QAP group on interpretive grounds. Indeed, these constructions are similar to those rhetorical questions that can be used in spoken French and English and are interpreted as a sort of exclamative expressions denoting surprise or shock.

(214) a. $\overset{\text{bf}}{\overline{\text{WHO}}}$ OFFER FLOWER GIRL *Wh.Qu.*
' Who offered flowers to the girl?'

b. $\overset{\text{bf}}{\overline{\text{WHO EAT CANDY?}}}$ $\overset{\text{br}}{\overline{\text{ME}}}$? $\overset{\text{bf}}{\overline{\text{NO}}}$! *Rh.Qu*
' Who ates the candies (then)? Me? No! '

c. OFFER FLOWER GIRL $\overset{\text{br}}{\overline{\text{WHO}}}$ (PALM-UP) BOY *QAP*
'The person whom offered flowers to the girl is (,well,) the boy.'

(215) $\overset{\text{br}}{\overline{\text{IX-1 LAUGH?}}}$ NO!
'Me? Laughing? No (I wasn't)!'



'The person whom offered flowers to the girl was the boy.'

(a) Spreading of the NMMs on the wh-word only.



'Where Marie went to school was in Marseille.'

(b) Spreading of the NMMs on the whole wh-constituent.

Figure 66. Spreading of the NMMs in Question-Answer Pairs.
In (66a), the NMMs associated to QAP are limited to the wh-word while in (66b), they are spreading over the whole question constituent.

In order to go beyond this observation and verify that NMMs actually distinguish questions and QAP, we conducted a preliminary study with our three informants using a discrimination task. We presented them with 8 pairs of cut QAP and questions. For QAP (example 216b), we cut the videos at the end of the wh-sign, before a transition movement could occur, removing the answer constituent. To avoid giving unwanted hints, we cut all the videos of questions making sure that the wh-signs (example 216a) had the same duration as in QAP. We then presented all the videos in a randomized order, asking the informants to determine which were true questions. All of them performed at the ceiling in the task, identifying only and all questions as being such. These results cannot be interpreted conclusively since more complex, controlled, and representative experiments need to be conducted, but they seem to confirm the existence of two very different structures displaying distinct morpho-phonological properties.

(216) a. BOY OFFER FLOWER $\overline{\text{WHO}}^{\textbf{bf}}$ — **Question**

b. BOY OFFER FLOWER $\overline{\text{WHO}}^{\textbf{br}}$ — ~~GIRL~~ **QAP**

Additionally, as reported for ASL, LIS and NGT (Davidson, Caponigro, and Mayberry 2008b, Branchini 2014 and Kimmelman and Vink 2017 respectively), every wh-word normally available for questions can also be found in QAP. An example of each is presented in (217).

(217) a. BOY$_i$ FLOWER OFFER $\overline{\textbf{WHO}}^{\text{br}}$ POSS-3$_i$ LOVER GIRL
'The person to whom the boy offers flowers is his girl fiancee.'

b. BOY OFFER GIRL $\overset{\text{br}}{\overline{\textbf{WHAT}}}$ FLOWER
'What the boy offers to the girl are flowers.'

c. MOM BOY PET $\overset{\text{br}}{\overline{\textbf{WHERE}}}$ FRONT TOWN-HALL
'Where the boy hugs his mom is in front of the town-hall.

d. BOY ARRIVE SCHOOL $\overset{\text{br}}{\overline{\textbf{HOW}}}$ PALM-UP WALKING
'How the boy arrives to school is by walking.

e. NEXT-SUNDAY BOY $\overset{\text{br}}{\overline{\textbf{DO-WHAT}}}$ PALM-UP GO CINEMA
'What the boy is doing next Sunday is going to the cinema.'

f. MARY NOT-WANT BUY $\overset{\text{br}}{\overline{\textbf{HOW-MANY}}}$ THREE VASES.
'The number (of vases) that Mary does not want to buy is three vases.'

g. WOMAN PREPARE EAT INVITE DIRECTOR $\overset{\text{br}}{\overline{\textbf{WHY}}}$, PALM-UP THEY-TWO DISCUSS PROJECT BIG FUTURE
'The woman is cooking, the reason why she invites the director is so the two of them can discuss their big project for the future.'

An important remark has to be made regarding the use of the wh-word 'WHY' (see example 217g). Although it does appear in QAP, it is obligatorily followed by the 'PALM-UP' sign. This might be due to the fact that, in LSF, WHY also translates as 'because' in declarative sentences such as (218). PALM-UP might be necessary in questions and QAP in order to disambiguate the why/because meaning.

(218) MARIE$_i$ SICK WHY IX-3$_i$ FORGOT POSS-3$_i$ SCARF YESTERDAY
'Marie is sick because she forgot her scarf yesterday.'

With the description of the morpho-phonological properties of LSF QAP, we can conclude that QAP are very similar in the four sign languages under investigation: in all of them QAP do not pattern like a proper question.

6.1.3 Syntactic properties of question answer pairs

As noted in Wilbur (1996) and Caponigro and Davidson (2011), the syntax of content questions and QAP differ. LSF patterns like the three other sign languages described in the literature in this respect, and this is first shown by the fact that the whole QAP can only be embedded under a verb taking a non-interrogative clause as its complement (see example 219).

(219) JEAN HOPE/*ASK MARIE EAT $\overset{\text{br}}{\overline{\text{WHAT}}}$ STRAWBERRY
'Jean hopes that what Marie eats is a strawberry.'

Following the reasoning of Caponigro and Davidson (2011), we can show that the 'answer' constituent of the QAP does not involve direct speech quotation, since we do not observe role shift[3] nor switching in the reference pattern when a pronominal is introduced (see example 220).

(220) IX-3$_i$ PIERRE$_i$ HOPE JEAN$_j$ BUY PRESENT FOR WHO POSS-1$_{i*/k}$ LOVER
Available: 'Pierre hopes that the person to whom Jean offers a gift is my$_{(signer)}$ girlfriend.'
Not Available: 'Pierre hopes: "the person to whom Jean offers a gift is my$_{(Pierre)}$ girlfriend."'

[3]Recall from the Introduction that Role-shift is characterized by the signer's act of impersonating one's perspective.

Another manifest piece of evidence for a syntactic difference comes from word order and is specific to LSF. While the main strategy to create questions is in situ for both information-seeking and rhetorical questions (Geraci 2017) as shown in example (214a) and (214b) in the previous subsection, QAP require the wh-word to be at the right edge of the question clause (see example 214c).

This obligatory movement hints in the direction of a syntactic change of the wh-constituent from CP to DP. The movement of the wh-word is required to generate the appropriate constituent (i.e., a nominal element). This particular process can be easily analyzed within Cecchetto and Donati (2014)'s framework[4] as we have seen in Chapter I.2.

In ASL and NGT, authors also observe other differences between questions and QAP concerning doubling: the doubling of the wh-element is significantly less used or impossible in QAP while it is present in rhetorical questions. This difference could not be observed in LSF since the doubling of the wh-word is barely used in content questions and in general. In LIS, Branchini (2014) shows that the wh-word used in QAP cannot pied-pipe any material, differently from its indirect and matrix questions alternatives.

Finally, an essential property of QAP across sign languages, which also holds for LSF, is that the question-constituent and the answer-constituent cannot be inverted: this is shown in example (221).

(221) *BOOK JEAN BUY $\overline{\text{WHAT}}^{\text{br}}$
Intended: 'A book is what Jean bought.'

This property is used as a conclusive argument against a pseudocleft analysis (Hoza et al. 1997, Davidson, Caponigro, and Mayberry 2008b or Kimmelman and Vink 2017)[5] we will come back to the reasons against such a conclusion in the next Section.

To summarize, the syntactic and morpho-phonological features of LSF QAP are really close to their counterparts in ASL, LIS and NGT. While we do acknowledge the similarity between these constructions, we show now that LSF QAP also present some syntactic and semantic properties which single LSF out and discourage a unified account of the four languages.

6.1.3.1 LSF QAP & syntactic variation

In their article about ASL, Hoza et al. (1997) notice that the equivalent of (222a), in which the negation only scopes over the answer constituent and not over the whole pseudocleft, is not possible in ASL (see example 222b)[6]. Interestingly, in LSF, QAP do allow negation: a QAP more or less equivalent to (222a), namely (222c) is perfectly acceptable.

(222) a. What Mary saw was not a book.

b. * $\overline{\text{MARY SEE WHAT?}}^{\text{rh/wh}}$ $\overline{\text{NOT BOOK}}^{\text{neg}}$ **ASL**

(Hoza et al. 1997)

[4] Recall that along with Cecchetto and Donati (2014)'s analysis, labeling, and re-labeling operations motivate movement. In that respect, the movement of the wh-word is needed to re-label the structure. Contra to Cecchetto and Donati (2015), however, we will argue that the change is progressive, with the syntactic properties of the DP being merged late in the process of grammaticalization.

[5] Inversion and predication are not described in Branchini (2014) in relation to LIS.

[6] Personal discussions with ASL native signers brings up to our knowledge that, in fact, this might also be possible in ASL contra to what is said by the authors.

c. MARIE EAT WHAT (br) NO ALMOND (neg) **LSF**
'What Marie ate were not almonds.'

In the same article, Hoza et al. (ibid) remark that QAP in ASL cannot be interrogated while this is possible with pseudoclefts in English (see example 223a and example 223b). They used this difference as a proof of the question-nature of QAP.

(223) a. Was what Mary saw a book?

b. *MARY SEE WHAT? (rh/wh) BOOK (wh) **ASL**
(Hoza et al. 1997)

In LSF, on the other hand, it is possible to interrogate a QAP: see (224). This is clearly against an analysis of the LSF construction as including a question, since questioning a question is not possible.

(224) JEAN EAT WHAT (br) CHOCOLATE? (bf) **LSF**
'Was what Jean ate Chocolate?'

All in all, we observe clear syntactic differences between ASL QAP and LSF QAP. While QAP in ASL differ from pseudoclefts of the English type for a number of properties, this is less true for LSF. For this reason the analyses that have been proposed for ASL, with the latest being Caponigro and Polinsky (2011)'s analysis of the question-constituent as an embedded question, cannot be extended to LSF. In LSF, the question-constituent is clearly different from a question from a syntactic point of view.

6.1.4 Semantic properties of question answer pairs

The semantics of QAP and pseudoclefts across languages is a complex topic. A crucial aspect on which QAP, questions, and rhetorical questions are semantically distinct regards their 'answer'. Following Belnap (1982)'s answerhood thesis, questions have to be characterized with respect to their answers. In this perspective, information-seeking questions are defined as requiring an answer which, crucially, must come from the addressee. On the other hand, rhetorical questions do **not** require answers (see, for example, 225).

(225) Have we ever seen such a coward?

If they receive an answer, it can come from the utterer itself or the addressee since the answer to the question is understood as shared between the two (Groenendijk and Stokhof 1989, Caponigro and Heller 2007). QAP behave like neither of the two types of questions since they require an answer constituent (like wh-questions, unlike rhetorical questions), which has to be uttered by the same person (unlike both rhetorical and wh- questions).

Another semantic aspect of being considered here is the semantic properties of the answer-constituent.

In the literature about spoken languages, the description of various semantics aspects (connectivity effects, referentiality and exhaustivity among others) leads to the identification of different types of pseudoclefts (PPC and SPC), to be further classified into subtypes (Type A and Type B SPC, see next Section). Regarding LSF, just like ASL, little is known about referential expressions, anaphora and pronominals. More careful studies are required before being able to use them as evidence of the presence or absence of connectivity effects. As a result, most

researches on the semantics of QAP in SL focus on the absence or presence of exhaustivity. In other terms, the need for the answer-clause to provide the complete (hence exhaustive) answer to the discourse-level question. This property has been argued to distinguish pseudoclefts from questions and QAP altogether.

In ASL, Caponigro and Davidson (2011) argue that the difference between pseudoclefts and QAP lies in the optionality of exhaustivity effects for the latter. According to the authors, pseudoclefts are obligatorily interpreted as being exhaustive, while QAP exceptionally allow non-exhaustive answers. We will address more thoroughly the relevance of this argument in the next section based on Declerck (1994)'s work.

In LSF, QAP are not exhaustive; the answer-constituent can be a sub-part of the possible answers available in the context. This is shown in (228) and (229) in which we replicated two tests proposed in Strickles (2013) to identify exhaustivity in ASL.

The first test compares the possibility for a second signer to refute a sentence based on its lack of exhaustivity. For example, a non-exhaustive declarative sentence as (226), cannot be refuted like the exhaustive sentence in (227).

(226) *Context: Marie bought chocolate and a banana:*
A: Marie bought a banana.
B: # 'No you're wrong! Marie also bought chocolate!'

(227) *Context: Marie bought chocolate and a banana:*
A: Marie bought only a banana.
B: 'No, you're wrong! Marie also bought chocolate!'

In example (228), we see that the QAP in LSF cannot be refuted by a second signer on the pretext that it is not exhaustive.

(228) *Context: Marie bought chocolate, milk, coffee and a banana:*
A: MARIE BUY WHAT MILK, CHOCOLATE COFFEE
'What Marie bought was milk, chocolate, and coffee.'
B: #NO, IX-2 MISTAKE, MARIE BUY ALSO BANANA
'No, you're wrong! Marie also bought a banana!'

As a second test, we observe that LSF allows the answer constituent to be made of an also-clause (see example 229) differently from ASL (Strickles 2013).

(229) JEANNE LIKE WHAT MUSIC ALSO
'What Jeanne likes is also music.'

In this respect, LSF QAP behaves neither like pseudoclefts nor like ASL QAP. However, this criterion does not appear to be an optimal diagnostic since it is not valid cross-linguistically and is subject to individual variations (Den Dikken 2001). While it holds for pseudoclefts in English, it does not hold, say, in French: in the dialogue in (230a), the reply of B is awkward; and the also-sentence in (230b) is possible.

(230) a. *Context: Marie likes chocolate and strawberries:*
A: Ce qu'elle aime c'est le chocolat.
'What she likes is chocolate.'
B: # Non tu te trompes! Elle aime aussi les fraises!.
'No, you're wrong! She also likes strawberries!'

b. Ce qu'elle aime c'est aussi la danse.
'What she likes is also dance.'

The results of this short overview confirm our conclusion that QAP in LSF and in ASL are different since the latter displays exhaustivity while the former does not. We will argue in Section II.6.2 that this semantic behavior is not necessarily indicative of the underlying surface of the QAP, contrarily to Caponigro and Davidson (2011)'s approach.

6.1.4.1 Free-relatives, predication and referentiality

As presented in the introduction of this Chapter, typical predicational pseudoclefts in English involve a free-relative constituent. Yet Hoza et al. (1997), Caponigro and Davidson (2011) and Wilbur (1996) argue that ASL does not have free-relatives at all; wh-words are never used in relative constructions in ASL.

In LSF, on the other hand, there is some evidence for a relative use of wh-words: example (231) illustrates this.

(231) $\overset{\text{br}}{\overline{\text{IX-2 CAN EAT WHAT PREFER}}}$
'You can eat whatever (you) prefer.'

Nevertheless, unlike what has been reported for LIS (Branchini 2014), this construction appears to be severely restricted: in particular, the free-relative in (231) can only be interpreted as a free-choice free-relative (of the type "-ever"). If we try to force its referentiality, as in (232), the result is unacceptable.

(232) *IX-1 KNOW WHAT IX-2 PREFER
Intended: 'I know what you prefer.'

This pattern is confirmed by the contrast between (233a) versus (233b).

(233) LSF

a. MARIE EAT WHAT DESSERT **Specificational**
'What Marie ate was a dessert.'

b. *MARIE EAT WHAT DELICIOUS **Predicational**
'What Marie ate was delicious.'

Similarly to ASL and NGT, the impossibility to predicate over the question-constituent excludes the possibility to analyze it as being an entirely referential DP-like element.

Since very little is known about adjectives in SL, we wanted to make sure that the asymmetry observed between (233a)-(233b) was not linked to their use in the answer constituent[7].

To distinguish between the two factors (adjective or predication), we elicited an ambiguous (between specificational and predicational) QAP, which involved no adjectives in LSF. The sentence is presented in (234).

(234) IX-1 EAT NOT WHAT FOOD POSS-3 DOG
'What I don't eat dog food.'
* ⇝ whatever meal I don't eat, I give it to the dog **Predicational**
⇝ (the thing) I don't eat is the dog's food. **Specificational**

[7] See Fornasiero 2018 who analyze adjectives as bound morphemes, hence not compatible with a post-copular position such as (233b).

In (234), only the specificational reading is available.

A straightforward account for SL data would then be that unlike English which displays both specificational and predicational pseudoclefts, LSF only displays specificational pseudoclefts.

We present a summary of the properties of the signed languages in Table (17).

Sign Language	Morph. properties	Position of the wh-word	Neg. in answer constituent	Inversion	Question on the QAP	Exhaustivity	Predicative use	Free-choice free-relative	Referential free-relative
ASL	Raised eyebrows	Preferably on the right of the q-constituent / No doubling	**X**	**X**	**X**	✓	**X**	**X**	**X**
NGT	Raised eyebrows	Preferably on the right of the q-constituent / No doubling	**X**	**X**	**X**	✓	**X**	**X**	**X**
LSF	Raised eyebrows	Forced on the right of the q-constituent	✓	**X**	✓	**X**	**X**	✓	**X**
LIS	Raised eyebrows	On the right of the constituent	NA	**X**	NA	NA	✓	NA	✓

Table 17. Summary of the properties of QAP across SL.

In the light of the morpho-phonological, syntactic and semantic properties of LSF QAP, we analyze them as being specificational pseudoclefts and provide the syntactic structure in Figure (67)[8].

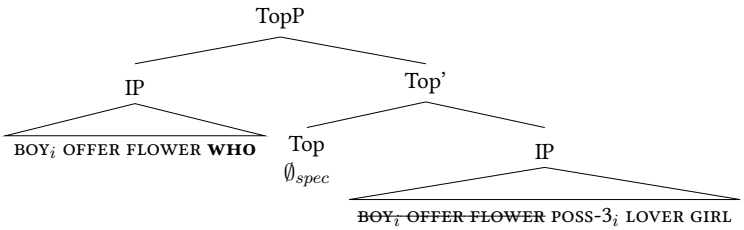


Figure 67. Derivation of LSF specificational pseudocleft, following Den Dikken, Meinunger, and Wilder (2000).

If we are right, this entails that LSF represents a further step in the grammaticalization

[8]Different syntactic derivations have been proposed in the literature, we choose to implement here the analysis proposed by Den Dikken, Meinunger, and Wilder (2000) for reasons which will become more evident in the next section.

process proposed by Kimmelman and Vink (2017). The same is true for LIS. We will present the full process in the last section of this chapter.

Our conclusion in favor of a specificational pseudocleft analysis was already proposed in SL literature (Wilbur 1996, Caponigro and Polinsky 2011, Kimmelman and Vink 2017) but the authors themselves systematically rejected it based on several arguments. Because of their repetition across studies, some of these arguments appeared to be stronger than they were. By reviewing each of these arguments, we will show that they are often referring to a part of the truth and should not be maintained across future studies.

6.2 Persistent myths about pseudoclefts in Sign Language literature

Many authors conclude that QAP cannot be analyzed as specificational pseudoclefts based on many arguments linked to the nature of questions and of pseudoclefts. In what follows, we will try to review the validity of each of these arguments in connecting them to the wider literature on questions and pseudoclefts. Along our path, we will show that the two phenomena are very intricately connected and that a neat opposition between the two is impossible to maintain. In particular, specificational pseudoclefts have been analyzed as involving 'questions under disguise' by many authors (see Ross 2000, Den Dikken 2001 or Schlenker 2003 among others).

6.2.1 Claim 1: 'No language displays specificational pseudoclefts only.'

By far, the most widespread and hurtful claim is that no language exists such that it only displays SPC. This claim can be traced back to Hoza et al. (1997), who repeat one of the conclusions from Iatridou and Varlokosta (1995)'s study of Modern Greek pseudoclefts in a less nuanced tone than the source study they cite.

Hoza et al. claim: " (...), Iatridou and Varlokosta (1995) have found no languages with pseudoclefts only [of the specificational type]. This is precisely the kind of language that Wilbur (1996) claims ASL to be." (Hoza et al. 1997:18).

However, in the study cited, the authors are considering the notions of specificational and predicational pseudoclefts in a specific theoretical framework, along with Akmajian (1970) legacy. In this respect, all pseudoclefts (whether PPC or SPC) involve a free-relative as their question-constituent, within a predicative copular sentence. Therefore the typological terms are homonymous but not synonymous to PPC and SPC as Higgins (1973) originally defined them. To avoid mixing them, we call SPC and PPC in Akmajian and Iatridou & Varlokosta's terms: SPCb and PPCb.

In detail, the sentence in (235) is ambiguous between two readings, one in which a property is directly predicated of the question constituent referent (which they call specificational) and one corresponding to a free-choice interpretation in which a property is indirectly predicated of the question-constituent (that they call predicational).

(235) What Butters is is silly.
⇝ [Butters] is silly *SPCb*
⇝ [Butters' property] is silly *PPCb*

Along Iatridou and Varlokosta (1995) and Akmajian (1970), the specificational-b reading of the sentence translates as 'Butters is silly', the property of being 'silly' is directly predicated of

'Butters'. On the predicational-b reading, the sentence translates as 'a property of Butters is silly', so, for example, if he is a fly hunter, this particular property is being predicated over by the predicate of being silly. In this respect, since both readings involve free-relatives and are, thus, nominal, the distinction between the two interpretations is instead one of directness. In SPCb, a property is directly predicated of the subject of the wh-clause. In PPCb, being silly is predicated of another property of the subject of the wh-clause. Crucially, in both cases, there is predication. Another way to explain the difference between the two is that in the SPCb interpretation, we know who is silly since it predicates over Butters. In the PPCb interpretation, however, we do not know the property being predicated of: this is a free-choice relative.

Challenged by Den Dikken (2001), Den Dikken, Meinunger, and Wilder (2000) or Ross (1967), this usage of the terms also diverges from the definition provided by Higgins (1973), Ball (1977) or Declerck (1988). According to these authors, specificational sentences in general, including pseudoclefts, present a variable and a value that specifies it. Predicational sentences, on the other hand, do not present variables; they predicate the value of a **referent**. If we repeat our previous example in (236), we can see how the difference plays in the semantic operations they lead.

(236) What Butters is is silly.
⇝ [Butters is x]. x= being silly. *SPC*
⇝ [Butters' property] is silly. *PPC*

As can be observed by the comparison between (236) and (235), the 'specificationalB' reading coming from Iatridou and Varlokosta (1995) is the same as the predicational reading defined by Higgins (1973). What Iatridou and Varlokosta (1995) are comparing in their article are referential free-relatives and free-choices free-relatives. In this respect, their definition of specificational pseudocleft refers to cases in which the reference is clearly established, as typical of referential 'what' free-relatives. Their definition of predicational pseudoclefts, on the other hand, corresponds to pseudoclefts that can be paraphrased by 'whatever' as in (237), the so-called free choice free-relatives.

(237) What Butters is is silly.
⇝ Butters is silly *SPCb / PPC*
⇝ Whatever Butters is is silly *PPCb / PPC*

Therefore, the conclusion of Iatridou and Varlokosta (1995) regarding the absence of languages displaying specificational pseudoclefts only, does not apply to the SL data we presented in the previous section. Their conclusion should instead be reworded as 'there exist languages with both referential and free-choice free-relatives, but none displaying only referential free-relatives.'.

Finally, Hoza et al. (1997) do not explain the reason for the availability of either of the two readings advocated by Iatridou and Varlokosta (1995). Nevertheless, it is worth noticing that Iatridou and Varlokosta (1995) attributes the availability of the free-choice reading (a.k.a the PPCb reading) to the lexical item, which introduces free-relatives and pseudoclefts in the language they studied. Indeed, in Modern Greek, Bulgarian (Izvorski 1997) or Portuguese (Ross 2000), the lexical items used to introduce free-relatives are not derived from wh-words; they are dedicated words for these contexts. They have a universal quantifier force, precisely like 'whatever', and cannot be interpreted as denoting a specific individual.

To summarize the argument presented here, the claim made by Iatridou and Varlokosta (1995) only concerns predicational pseudoclefts, which they divide into two subtypes. What they compare are these two subtypes, differentiated by the lexical element introducing them.

The question of specificational pseudoclefts (as defined by Higgins 1973 and Declerck 1988) is barely addressed in the paper.

However, PPC and SPC have to be considered as two separate syntactic and semantic objects, as we will see in the next sections.

6.2.2 Claim 2: 'Pseudoclefts should be reversible'

The claim that pseudoclefts should be reversible (i.e., that the wh-clause should be able to appear before or after the copula) is too simplistic. It mixes all types of pseudoclefts, while only specificational sentences appear to be reversible. This important specificity of specificational sentences is illustrated in examples (238)-(239).

(238) What Sofiane is is cool.

a. ⇝ [Sofiane is z]. z = being cool. *SPC*
'Sofiane is cool'

b. ⇝ [Sofiane's property] is cool *PPC*
'Sofiane is something and this thing is cool.'

(239) Being cool is what Sofiane is.

a. ⇝ z = being cool. [Sofiane is z] *SPC*
'Sofiane is cool'

b. * Is cool [Sofiane's property] *PPC*
*'Sofiane is something and this thing is cool.'

While a sentence presenting the order wh-clause > answer-constituent (as 238) is ambiguous between an SPC and a PPC interpretation, the inverted sentence in (239) is only compatible with a SPC interpretation. This distinction is true for all types of predicational sentences (Moro and Andrea 1997), as shown by example (240).

(240) a. Scott is mean.

b. *Mean is Scott.

Many authors (Ross 1967, Akmajian 1970, Higgins 1973 or Faraci 1970 among others) have noticed that the sentences in (241) present different properties. We adopt Den Dikken, Meinunger, and Wilder (2000) conventions by referring to the wh-constituent as 'wh' and the answer constituent as XP.

(241) a. What Charlotte eats is a cake. wh > XP

b. A cake is what Charlotte eats. XP > wh

There are in fact three different ways to consider the variation in (241); a) (241a) is the base sentence and (241b) is derived by movement from it (Quirk 1972, Declerck 1988); b) (241b) is the base case and (241a) is therefore the inverted version (Prince 1978); c) the two constructions are separate constructions, each being generated independently (Ross 1967, Den Dikken 2001, Den Dikken, Meinunger, and Wilder 2000).

In this last proposal, Den Dikken, Meinunger, and Wilder (2000) follow Ross (1967) in proposing that there exist two types of specificational pseudoclefts, the one surfacing as wh > XP, the type A, involves a topic and a comment, while the one surfacing as XP > wh, the type B, involves a free-relative as its wh-clause. Their proposal is based on the different syntactic properties which differentiate Type A from Type B SPC. We present some of them here.

6.2.2.0.1 Pied-piping In some languages like German, specificational pseudoclefts presenting the order wh > XP allow pied-piping (see example 242) while those presenting the other order (XP > wh) pattern like free relatives: they forbid pied-piping (see 243).

(242) mit wem Maria gesprochen hatte, war mit Peter wh > XP
Lit. 'With whom Maria spoken had was with Peter.'

(243) a. * mit Peter war mit wem Maria gesprochen hatte XP > wh
Lit. 'With Peter was with whom Maria spoken had

b. * mit wem Maria gesprochen hatte kam gerade ins Zimmer. free relative
Lit. 'With whom Maria spoken had came just into the room.'

from Den Dikken, Meinunger, and Wilder (2000):64

6.2.2.0.2 Multiple wh Similarly, it is possible to construct Type A SPC (i.e., wh > XP) with multiple wh-words. While this is judged marginal in English (see 245), Meinunger (1998) found it possible in German (see 244). Notice that multiple wh-words are an acceptable strategy in questions in both languages (example 246).

(244) wer hier wem geholfen hat war die Hilde dem Heinz (und nicht umgekehrt) *German*
Lit. 'Who here whom helped has was the Hilde the Heinz (and not reverse).'

from Meinunger (1998)

(245) ? who ordered what was Tom (ordered) a beer and Jim a watermelon flip *English*

from Ross (2000)

(246) Questions

a. Wer hat was bestellt? *German*

b. Who ordered what? *English*

Crucially, Type B SPC (i.e. XP > wh) and free relatives can not display multiple wh-words, as illustrated in examples (247)-(249), from Den Dikken (2001):71-73.

(247) *die Hilde dem Heinz war wer hier wem geholfen hat *German*
Lit. 'The Hilde the Heinz was Who here whom helped has' *from Meinunger (1998)*

(248) *Tom (ordered) a beer and Jim a watermelon flip was who ordered what. *English*

from Hankamer (1974)

(249) Free relative

a. * wer hier wem geholfen hat scheint die Hilde dem Heinz gewesen zu sein. *German*
Lit. 'who here whom helped has seems the Hilde the Heinz been to be.'

b. *who ordered what should come to fetch it at the counter *English*

6.2.2.0.3 Wh-words restrictions Type B SPC allow a larger set of wh-words than the Type A SPC (Declerck 1988). Indeed, in English, it is less acceptable to have 'who', 'when', 'where', 'why' and 'how' heading the pseudocleft in Type A than in Type B, as illustrated by the contrast in (250)-(251).

(250) Type A SPC

a. ??Who I meant was the police chief.

b. ?? Where the accident took place is here.

c. ?? When the countryside is most beautiful is in Autumn.

d. ?? Why he did it is lack of money.

e. ?? How it should be done is with a gentle touch.

Judgments and examples from Declerck (1988):41

(251) Type B SPC

a. The police chief was who I meant.

b. Here is where the accident took place.

c. Autumn is when the countryside is most beautiful.

d. Lack of money is why he did it.

e. With a gentle touch is how it should be done.

There are many other properties (adverbial modification or connectivity effects, for example) for which the Type A and Type B SPC behave differently. On this respect, considering the two constructions as being unrelated – from a syntactic point of view – appears as a reasonable hypothesis. In this line, the absence of reversibility in sign languages QAP could be used as an additional argument that the Type A and Type B are different constructions.

To summarize, rejecting a pseudocleft analysis based on the fact that the question- and answer-constituent are not reversible is not as strong as an argument as it appeared. Indeed, Schlenker (2003) or Iwasaki (2012) use the theory developed in Den Dikken, Meinunger, and Wilder (2000) and Den Dikken (2001) to argue in favor of two separate constructions for the two orders.

6.2.3 Claim 3: 'Pseudoclefts involve relative clauses'

Hoza et al. (1997) and Caponigro and Polinsky (2011) underline the absence of structures presenting a wh-word outside of questions in ASL and use this as an argument against analyzing QAP as pseudoclefts. The rationale is as follows: since there is no relative clause presenting wh-word in ASL, there is no reason to postulate that the question-constituent is a relative clause (= a free-relative). We have already seen in Subsection II.6.1.4, that this claim does not extend to LSF which presents some cases of free-relatives.

What we want to show now is that the claim itself and its use do not have solid basis. We separate it into two sub-claims: a) 'relative clauses and free-relatives present the same lexical items' and b) 'pseudoclefts always include a free-relative'[9].

6.2.3.0.1 Relative clauses and free-relatives share the same lexical items Caponigro (2003) investigates 150 languages and states that questions, free-relatives, and relative clauses either share the same lexical items or display strategies shared among questions and free-relatives only.

In no languages did he found the other way around: free relatives and relative clauses patterning alike and being different from questions. Similarly, Catasso (2013) concludes that "These constructions [free-relatives ndlr] are considered to significantly differ from headed RCs in that they [...] utilize a set of relative pronouns which is completely unlinked to that of restrictive or appositive RCs" (ibid,: 274).

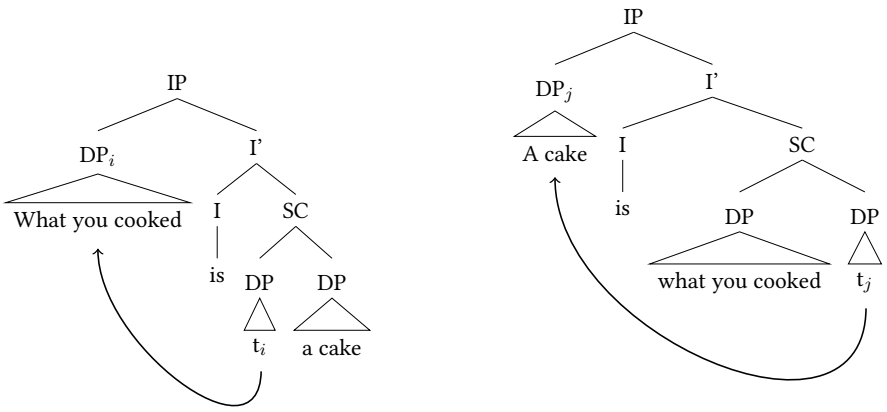
In other words, finding a strategy used for relative clauses does not entail that it has to be shared by free-relatives. This argument is, therefore, vacuous. The fact that wh-elements are not used in relative clauses in ASL does not entail that they are not used in free-relatives.

[9] We could have provided a third sub-claim, c) free-relatives are relative clauses, we will address this point in the last section of this Chapter.

6.2.3.0.2 Pseudoclefts include a free-relative We already partially addressed this claim when we dig into reversibility. In doing so, we highlighted some properties distinguishing Type A SPC on the one hand from PPC and Type B SPC on the other hand. As a summary, remember that they pattern differently concerning pied-piping, multiple wh, or wh-words restrictions. In what follows, we dig deeper into their differences by presenting some of the connectivity effects which further distinguish pseudoclefts containing a free-relative from pseudoclefts which do not.

Again, free-relatives are found in both PPC and Type B SPC. Type A SPC, on the other hand, have either been analyzed on a par with the two others (Akmajian 1970, Blom and Daalder 1977, Heggie 1988, Declerck 1988 or Guéron 1992 among others) or as involving a wh-question instead (Clifton 1969, Faraci 1970, Ross 1967, Grimes, Grimes, and Grimes 1975 Seuren 1985, Den Dikken, Meinunger, and Wilder 2000, Den Dikken 2001 or Schlenker 2003).

For proponents of a free-relative approach to Type A SPC, the surface structure is that of a copular sentences taking a free-relative as wh-constituent. In this respect, they do not differ from their predicational alternative, nor Type B pseudoclefts. The free-relative is generated in a small clause *à la* Moro (2000) (Figure 68), complement to the copula. The alternation between Type A and Type B SPC is seen as equivalent/symmetric, depending on which constituent moves to the subject position.



(a) Type A SPC wh > XP **(b)** Type B SPC XP > wh

Figure 68. Derivation of Type A (68a) and Type B (68b) SPC with a small clause structure

Analyzing pseudoclefts as involving free-relatives allows us to explain why they can freely alternate with 'th-' relatives[10], the impossibility to have yes/no questions and the restrictions about the wh-words, which can appear in some of the pseudoclefts.

However, unifying all pseudoclefts under a single structure does not allow us to explain the differences we mentioned so far between the three structures. Nor can it account for the variation in connectivity effects present across these structures. In Type A SPC, a range of connectivity effects are observable, which do not surface in the two other types. This is the case of NPI licensing, as shown in (252).

(252) a. What John didn't buy was any books. Type A SPC/*PPC

from Sharvit (1999)

[10]For a counterargument, see Hankamer (1974) who argues that they do not alternate freely since 'th-' relatives semantically identify instead of predicating. They are not on a par with free-relatives in this respect.

b. *Any books is what John didn't buy. Type B SPC

Conditions B and A effects (Chomsky 1973) are also visible in Type A but not in Type B SPC and PPC, as shown respectively in (253) and (254).

(253) Condition B

a. What he$_i$ is is proud of him$_{*i/j}$. Type A SPC

b. Proud of him$_{i/j}$ is what he$_i$ is. Type B SPC

(254) Condition A

a. What he$_i$ is is proud of himself$_i$. Type A SPC

b. *Proud of himself is what he$_i$ is. Type B SPC

c. What John likes is important to him$_i$ /*himself$_i$ PPC

from Schlenker (2003):6

The behavior of Type A SPC is problematic under current assumptions if we assume a structure as in Figure (68): here a pronoun or an R-expression in the free-relative should not be able to C-command the post-copular constituent. A possible interpretation of these data is that the wh-constituent is base generated in a C-commanding position when we observe connectivity effects (Den Dikken, Meinunger, and Wilder 2000, Ross 1967 or Schlenker 2003). Hence, finding connectivity effects in Type A SPC but not in Type B nor PPC indicates that the three constructions do not share their syntactic structure. As we will see in the following claims, Type A SPC can be analyzed as involving a hidden question. This is the line of analysis we also adopt in the last section of this Chapter.

To summarize this point, it is not the case that all pseudocleft types share the same structure. In that respect, they do not necessarily involve free-relatives. Additionally, free-relatives do not need to share their lexical items with relative clauses.

6.2.4 Claim 4: 'Pseudoclefts do not take a full clause as their answer-constituent'

The claim that pseudoclefts do not accept full clauses as their answer-constituent is used by Hoza et al. (1997), Caponigro and Polinsky (2011) or Kimmelman and Vink (2017). It comes again from the idea that pseudoclefts have to take free-relatives as their subject. We have seen, in the review of the previous claims, that this conclusion is not unequivocally accepted in the literature about pseudoclefts.

It is true that predicational pseudoclefts and Type B SPC (i.e., those presenting the order XP > wh) are analyzed across the literature as copular sentences in which the wh-constituent is a DP (free-relative). These constructions indeed forbid the counterweight to be clausal, an IP. This is illustrated in (255)-(256).

(255) *What Fonzy is is Fonzy is cool. *PPC*

(256) *He drank a beer is what Georges did. *Type B SPC*

However, in the case of Type A SPC Faraci (1970),Ross (1967) or Den Dikken, Meinunger, and Wilder (2000) note that they can have full IP counterweight as shown in (257).

(257) What Georges did was $[_{IP}$ he drank a beer $]$ *Type A SPC*

They also note that with verbs other than 'do', this option is degraded (258). Still, it is not as bad as the cases in (255) and (256).

(258) ? What Georges drank was Georges drank a beer.

Based on this contrast, they argued that the defining property of SPC is that the counter-weight, the answer-constituent, contains material which is preferably elided under identity restrictions. When it is not, the sentence is degraded. Remember that in QAP, there is no preference for an elided answer constituent.

6.2.5 Claim 5: 'The question part of pseudoclefts cannot be a yes/no question'

This argument has been raised in the SL literature but is not, and should not be considered, restricted to it. Faraci (1970)'s early proposal to analyze Type A SPC as involving a hidden question instead of a free-relative, was challenged by the very same argument by Huddleston (1971) and Akmajian (1970). It is a fact that polar questions are impossible in a Type A SPC (see 259).

(259) *Whether John bought a present was no (he didn't). *SPC*

This argument has not been challenged in the literature. However, its strength should not be overestimated. Wh-questions and polar questions are different, in particular in that a constituent answer can not follow the latter. This restriction might directly explain why a polar question cannot be used as a focalization strategy. Recall that, for LSF, it is instead an exclamative strategy than a focalization strategy.

6.2.6 Claim 6: 'Cross-linguistically pseudoclefts are always constrained in the wh-words which can be used'

With respect to wh-words used in pseudoclefts, one has again to distinguish between the three different main types of pseudoclefts we discussed so far. We consider PPC and Type B SPC on a par with respect to this property since they are both using free-relatives as their question-constituent. Type A SPC will be considered on their own.

While free-relatives have long been thought to allow every wh-word but 'why' (Caponigro 2003 or Cecchetto and Donati 2014), data from Mesoamerican languages, Romanian and Teramano[11] (Mantenuto and Caponigro Submitted 2019) show otherwise. In Teramano for example, free-relatives can be headed by 'who' (260a), 'where' (260b), 'how' (260c) , 'when' (260d), 'how much' (260e) and, crucially, 'why'[12] (260f).

(260) Teramano free-relatives

a. Chiame [ci'-a cucinite a la feste]. *who*
call.1SG who-have.3SG cooked at the.SG.F party.SG.F
'I will call {the one}/{those} who cooked at the party.'

b. Je so nate [addu'-/du'-/u'-a nite li ginitur-a mi] *where*
I be.1SG born where/where/where-have.3SG born the.PL.M. parent.PL.M-a POSS.1SG
'I was born where my parents were born.'

[11] Teramano is a language variety of Italian from Abruzzo, it belongs to the Upper Southern Italian languages.

[12] The authors remark that the free-relative involving 'why' can also receive a causative interpretation in which 'why' receive the meaning of because. This reminds LSF data on 'why' QAP.

c. Sò cucinite lu suche [‘nda faciave nonne]. *how*
be.1SG cooked the.SG.M sauce.SG.M how did.3SG grandma
‘I cooked the sauce how my grandma did it.’

d. Me ne sò ijte [quand’-a arrivite Marie]. *when*
REFL of.it be.1SG gone when-have.3SG arrived
‘I left when Marie arrived.’

e. Sò fatijte [quande hi fatijte tu]. *how much*
be.1SG worked how.much be.2SG worked you
‘I worked as much as you did.’

f. Lu sò fatte [pecca l-i fatte tu]. *why*
it be.1SG done why it-be.2SG done you ‘I did it for the same reason why you did it.’

from Mantenuto & Caponigro 2019:12-13

In the light of these data, it appears that languages vary in the variety and type of wh-element that can head a free-relative, and hence, given that PPC and Type B SPC involve free-relatives, this is also true of these more complex constructions.

Now, among Type A SPC, ‘what’ is the most common strategy used to introduce the question constituent, with only one occurrence of another wh-word surfacing in corpus studies of English (Geluykens 1984, Collins 1991/2002 or Heggie 1988). In his article, Akmajian (1970) acknowledges the rarity of alternatives to ‘what’ in Type A SPC but proposes that acceptable sentences headed by every type of wh-word can still be found, as shown in (261).

(261) a. What we need is Jerry drunk.
b. Where John finally ended up was in Berkeley.
c. When John arrived was at five o’clock.
d. Why John went to the bookstore was to buy a book about pseudoclefts.
e. How John did it was by using a decoder.
f. ? Who John visited was Bill.

from Akmajian 1979:18-19

What could possibly explain the asymmetry found between wh-questions, free-relatives (hence PPC and Type B SPC) and Type A SPC with respect to wh-words distribution? Declerck (1988) provides one possible explanation. He remarks that specificational sentences as a whole (so questions or SPC, for example) require to be provided with the correct value for their operator. In this respect, Declerck (1988) notes that ‘who’, in questions, can either require a specificational answer or a description (see 262). He remarks similar ambiguity in ‘where’-, ‘how’- and ‘when’-questions.

(262) - Who was the girl who came into the office yesterday?
a. - Justine (specificational)
b. - She was an actress (description)

The descriptive answer is not providing the reference of the value, hence its use in a focalization strategy as a pseudoclefts is not optimal. Having variation in the possible answers could lead to lesser use of these wh-words in specificational pseudoclefts.

For all the sentences in (261), ‘who’ included, the judgment and frequency of occurrence are greatly improved when they present ‘th’- relative, meaning relative headed by a finite class of nouns such as ‘the reason’, ‘the place’, ‘the moment’ or ‘the person’ in (263).

(263) a. The place where John finally ended up was in Berkeley.
b. The moment when John arrived was at five o'clock.
c. The person who John visited was Bill

Most authors (Den Dikken 2001 or Collins 1991/2002 among others) decide to consider such 'th-' relatives on a par with wh-relatives (but see Hankamer (1974) against this analysis). One could see these heads as being the solution to the ambiguity in the answers accepted by the wh-words. In specificational pseudoclefts, the nature of the variable is further specified to force a specificational answer-constituent.

To summarize, claiming that pseudoclefts are always constrained in the wh-word which can be used and, thus, QAP should not be analyzed as such needs to be nuanced. While this claim does not hold for free-relatives cross-linguistically, and, hence, for Type B SPC and PPC, it is correct for Type A specificational pseudoclefts. In the latter section, we will show that this property is symptomatic of the relationship between questions, 'th-relatives', and Type A SPC.

6.2.7 Claim 7: 'Pseudoclefts have to be exhaustive'

The argument that pseudoclefts have to be exhaustive is taken indirectly by Caponigro and Davidson (2011) and Davidson, Caponigro, and Mayberry (2008b) as an evidence that QAP are not pseudoclefts in ASL. In their analyses, they argue that pseudoclefts have to be interpreted as carrying exhaustivity while ASL's QAP can optionally be non-exhaustive, hence being different from pseudoclefts. This leads them to argue in favor of an exhaustivity operator in order to explain the ambiguity with respect to exhaustivity in ASL's question-answer-constituent.

We already explained how the question of pseudocleft exhaustivity was not entirely satisfying from a cross-linguistic perspective and that it did not seem to be valid for LSF or French (see Subsection II.6.1.4).

Additionally, again, PPC and SPC do not pattern alike since predicational pseudoclefts do not display exhaustivity, as shown by the contrast between (264) and (265).

(264) What you cooked is delicious. *PPC*

(265) What you cooked is a cake. *SPC*

In (264), the sentence is not understood as if only one thing was cooked, while the sentence (265) is understood as meaning that a cake, and nothing else, was cooked. Nevertheless, is the meaning derived an obligatory requirement of specificational pseudoclefts?

Declerck (1988) and Delahunty (1982) analyze the exhaustivity triggered by (265) as being a conversational implicature (hence facultative) and not a logical presupposition nor an entailment either. Their diagnostics classically come from truth values, since in these cases, if the entailed sentence is false, then the entailing sentence must also be false, by definition. An example is provided with a Type B SPC in (266) but it also applies to Type A SPC.

(266) Premise 1. If it was John who left the room, then only one person left the room.
Premise 2. Mary also left the room.
Conclusion. It was not John who left the room.

from Declerck 1988:29

If the entailment in (266) was the exhaustivity ('then only one person left the room') then the conclusion should have been that 'it is not true that only one person left the room'. This is not what we obtain in (266).

Another argument proving that the exhaustivity is not entailed in specificational sentences is visible through the negation of the sentences in (267)-(268).

(267) It was JOHN who left the room.

a. It was not John who left the room
→ another person has left the room.

(268) Only one person left the room.

a. ¬ [Only one person left the room]
→ Multiple people left the room

If (267) entails (268), then (267) could NOT be true if (268) is false. This is not what we find as there is no reason to rule out the possibility that John was among the people who left the room. In such a situation, we cannot say that (267) is false, we can say that it is incomplete.

In the light of these data, Delahunty (1982) and Declerck (1988) analyze exhaustivity as being a simple conversational implicature, following Gricean maxims (Grice, Cole, and Morgan 1975) of quality (the speaker should provide the correct value for the variable) and quantity (the speaker should provide all required information, not less, not more).

In addition, we can cite Den Dikken (2001): 'any copular construction that has an exhaustiveness implicature is specificational; but not every specificational copular sentence necessarily has this exhaustiveness implicature' (ibid: 30). This is in line with the variation we observed between ASL and LSF.

To summarize, predicational pseudoclefts do not trigger exhaustivity, and not all specificational pseudoclefts do either. For those triggering exhaustivity, it is rather a conversational implicature than an entailment, which leaves more space for cross-linguistic variations.

6.2.8 Claim 8: 'Pseudoclefts forbids indirect as well as non referential answers-constituents'

6.2.8.0.1 Pseudoclefts forbids indirect answers Hoza et al. (1997) use this argument to claim that ASL QAP as in (269) are not pseudoclefts.

(269) $\overline{\text{JOHN}_i \text{ COME WHEN NOW IX}_i \text{ VISIT SISTER FEEL IX}_i \text{ POSTPONE COME TOMORROW}}^{\text{rh/wh}}$
'When is John coming? Now he's visiting his sister. I think he's going to postpone (his visit). He'll come tomorrow.

from Hoza et al. (1997):12

In (269), the answer-constituent does not specify the value of the question constituent. In this respect, it is indirect. The actual value is provided later on. Such behavior is present in information-seeking questions and their answers (see 270) but is hardly accountable on a pseudocleft perspective, as shown with the ungrammaticality of (271).

(270) - What does John want?
- He is superficial, so he wants a Rolex before his 50's.

(271) *What John wants is he is superficial, so he wants a Rolex before his 50's.

A similar fact is discussed in Den Dikken, Meinunger, and Wilder (2000). They use restrictions on complementizer ellipsis as a diagnostic of the syntactic nature of the pseudocleft counterweight. The complementizer 'that' cannot be deleted in subject clauses and Type B SPC as shown by the ungrammaticality of (272).

(272) a. *(that) he was injured was what she said. Type B SPC
b. *(that) he was injured suprised us. Subject Clause

This is explained by the fact that Type B SPC sits in the subject position of a copular construction, and subject clauses need to be introduced by 'that' in English (see 272b).

In contrast, Type A SPC allows both alternatives as illustrated in (273).

(273) a. What Mary said was that John was hurt.
b. What Mary said was John was hurt.

However, the authors notice that NPI are no longer licensed when 'that' is elided, as shown by the contrast in (274).

(274) a. What Mary didn't say was that anybody was hurt.
b. *What Mary didn't say was anybody was hurt.

To explain this contrast, Den Dikken, Meinunger, and Wilder (2000) propose that (274b) is not an elided version of (274a), but rather an indirect answer[13]. In their analysis, indirect answers come as finite IPs and can also surface with verbs like 'happen' as shown in (275).

(275) What happened was he fell over.

As can be seen in (275), no material of the question-constituent is repeated in the answer-constituent; hence it is indirect. Therefore, the claim that pseudoclefts admit no indirect answers is, again, a generalization.

Notice though that it is true that the phenomenon at stake appears very limited. Den Dikken, Meinunger, and Wilder (2000) propose that indirect answers are permitted in pseudoclefts only if the answer-constituent allows to select an individual within the set of individuals referred to by the wh-word itself. In the case analyzed, 'what' requires a proposition or an event, which is what is provided by the answer-constituent.

To summarize, Type A SPC allow indirect answers in a much more restricted sense than ASL QAP or questions/answers. This is a point of similarity rather than an argument against a QAP analysis.

6.2.8.0.2 Pseudoclefts forbids non-referential answers The claim that pseudoclfets forbids non-referential answers seeds on data such as (276), from ASL, and its unagrammatical english counterpart in (277).

(276) rh/wh
WHAT HAPPEN DON'T-KNOW, IX-1
'What happened? I don't know, me.'

from Hoza et al. (1997):18

(277) *What happened is I don't know.
Who ate the cake is nobody.

Declerck (1988) provides an interesting account to explain the need for the complement of pseudocleft to be referential. If we analyze specificational sentences as introducing a variable

[13]To support their analysis, the authors show that elision cannot delete part of the focalized constituent, hence 'that' should not be able to be deleted. See Den Dikken, Meinunger, and Wilder (2000): 59 for further description of ellipsis patterns.

that needs to receive a value, it is clear that a non-referential argument will not fulfill this need. The variable will be left with no semantic content. In this respect, despite being also described as specificational sentences, questions and pseudoclefts behave differently.

To summarize, the claim that pseudoclefts do not admit non-referential answers is supported in the literature. Now, as suggested by Kimmelman and Vink (2017), a grammaticalization process entails the coexistence of the different structures in the hierarchy within the same language. Hence, finding QAP with non-referential counterparts does not prevent from finding actual SPC.

6.2.9 Summary

In the light of this review, it appears that a large portion of the arguments which have been made in the SL literature against a pseudocleft analysis of QAP need to be toned down. The first of such myths being the claim that 'no languages present specificational pseudoclefts only' which has never been demonstrated. To help future research, we provide the summarizing Table in (18).

What appears as crucial to be retained from the investigation we carried throughout this section is that many arguments are not new; they were already creating debates as early as in the 1970s. In this perspective, we do not see why these claims should be used **against** an analysis of sign languages QAP as relevant to the wider research on pseudoclefts. It should be the other way around, QAP in SL contribute to the debate on pseudoclefts and questions in disguise. With the fine-grained differences we noted between ASL, NGT, LSF and LIS's QAP, we have enough material to propose a grammaticalization process which starts with question-answer pairs and ends with referential free-relatives, used in predicational pseudoclefts.

In what follows, we will attempt at highlighting the links between each step of this process, using data from both spoken and signed languages.

Claim	Status	Reformulation
'No language displays specificational pseudo-clefts only'	**False**	'No language displays referential free-relatives only (they have to display free-choice relatives as well)'
'Free-relatives and relative clauses share the same lexical items'	**False**	
'Pseudoclefts are reversible'	**False for PPC** **Debated for SPC**	Type A and Type B SPC are not the mirror image of each other
'Pseudoclefts involve a free-relative'	**True for PPC** **True for Type B SPC** **False for Type A SPC**	PPC and Type B SPC involve a free-relative
'Pseudoclefts do not take full clauses as their counterweight'	**True for PPC** **True for Type B SPC** **False for Type A SPC**	Type A SPC preferably elid parts of the answer-constituent
'The question part of pseudoclefts cannot be a yes/no question'	**True**	
'Pseudoclefts are constrained in the wh-words which can be used'	**Not necessarily for PPC** **Not necessarily for Type B SPC** **True for wh- Type A SPC** **False for 'th-' Type A SPC**	Type A SPC are constrained in the wh-words used.
'Pseudoclefts have to be exhaustive'	**False for PPC** **Debated for SPC**	SPC often trigger an exhaustive implicature
'Pseudoclefts forbids indirect answers'	**True for PPC** **True for Type B SPC** **False for Type A SPC**	'Type A SPC allow indirect answers in restricted contexts
'Pseudoclefts forbids non-referential answers'	**True**	

Table 18. Arguments used in the SL literature against a pseudocleft analysis: Review

6.3 When questions find answers by themselves

Our aim, in this Section, is to capitalize on SL data to help refine the grammaticalization hypothesis proposed by Kimmelman and Vink (2017) by extending the process until SPC pseudoclefts and free-relatives. More broadly, we want to fill the blanks in the relation between questions/answers and SPC.

6.3.1 Kimmelman and Vink (2017): A premise on questions

Kimmelman and Vink (2017) argue in favor of a grammaticalization process at play in NGT, which would explain the coexistence of different kinds of QAP (with two clauses or only one) as well as several morpho-syntactic changes. However, the authors exclude that this process has gone beyond a mono-clausal question-answer constituent *à la* Davidson, Caponigro, and Mayberry (2008b). We repeat their scale in Figure (69).

(regular question →) rhetorical question → discourse-level question-answer combination → question-answer clause

Figure 69. Grammaticalization process, Kimmelman and Vink (2017)

LIS data already suggest that the grammaticalization process should be extended as this language instantiates referential free-relatives, which can be used in predicational pseudoclefts (Branchini 2014).

In LSF, which exhibits a distinct syntactic change forcing the wh-element to move to the edge of the clause in QAP and some cases of free-choice free-relatives, we believe that the grammaticalization process has to integrate two other intermediate steps.

The path we propose is presented in Figure (70).

1 Question/Answer → 2 discourse-level question-answer combination →
3 Question Answer constituent → 4 Specificational pseudocleft →
5 Identificational pseudocleft → 6 free choice free-relatives → 7. referential free-relatives

Figure 70. Grammaticalization process of Question/Answer into free-relatives

Contrary to Kimmelman and Vink (2017), we do not include rhetorical questions in our scale. According to Groenendijk and Stokhof (1989) or Jacobson (2016), rhetorical questions do not require an answer. They have even been considered on a par with content questions in Caponigro and Sprouse (2007) with the only difference that the possible answer to rhetorical questions is part of the common ground (i.e., the shared knowledge) of the two interlocutors. What concerns us is the case of actual questions requiring an answer.

6.3.2 Step 1. Question/Answer

A: $[_{CP}$ ***[+q] wh(x)]*** ***B:***$[_{CP}$ ***answer(x')]***[14]

[14] We adopt here our own conventions, the ' x' ' aims at capturing the fact that the answer provides the adapted value for the variable x.

As we have already mentioned in the previous section, questions are better analyzed together with their answers. As such, they are often treated in terms of Question-Answer Pairs. To avoid confusing this term with the QAP structure found across sign languages; we will refer to Question/Answer when we are talking about a question uttered by an interlocutor and an answer provided by someone else.

The first step of the grammaticalization process described here starts with typical wh-questions in which the wh-word requires a rather specific answer. For example, 'who' requires an individual (or a definition, recall Declerck 1988) 'where', a place, and so on. In absolute, the act of asking a question forces to obtain an answer, but this one does not need to fill the requirement imposed by the wh-word. See for example (278).

(278) - Who is Angélique?

a. - My colleague.

b. - Angélique is my colleague.

c. - I have no idea.

d. - I saw Caterina congratulating her.

e. - *Angélique is in the kitchen.

f. - # It is sunny outside.

All the answers from (278a) to (278c) are valid answers. The content of the answers seems, at least partially, governed by pragmatic principles, since they have to be informative and in relation with the topic discussed in the question (see the unacceptability of 278f). There are also semantic restrictions. If a direct answer is provided, as in (278e), it has to be within the domain determined by the wh-word of the question (who).

Interestingly, questions allow indirect answers (278d) as well as non-informative or non-referential answers such as (278c). This is because the person uttering a question assumes her addressee knows the answer but might be wrong. Following Declerck (1988) and Higgins (1973), questions and their answer can be considered as specificational in that the question contains a variable which requires a value, which is specified by the answer. Crucially, the variable allows for a broad set of possible values.

Now, consider a case in which the person asking a question knows the answer, but her addressee(s) does not necessarily. Like a teacher in front of the classroom. What would be the purpose of asking a question which we already know the answer to? Just like teachers do, it allows us to highlights a piece of information, to focalize it.
Accordingly, the teacher producing a question that she already knows the answer to is already diverting the wh-word and the question from their original use. The question does not seek an answer per se; it seeks a focalized constituent. Notice that in this case, the answer may well be non-referential (i.e., a student can answer with 'I don't know'). We think that this quest for a focalized constituent instead of an answer is the first act of a process of 'referentialization', which leads to the second step of our path: discourse-level question-answer combination.

6.3.3 Step 2. Discourse-level question-answer combination

A: $[_{CP}$ ***[+q] wh(x)]*** $[_{CP}$ ***answer(x')]***

This step is also present in Kimmelman and Vink (2017)'s path. What distinguishes this type of question/answer from the previous one is that the question and its answer are produced by

the same person, as a focalization strategy. That questions/answers are linked at the discourse level is not new; it is also proposed by Jacobson (2016) to account for elided answers.

This structure is widely attested in sign languages, as we have seen, but also in spoken languages where it is similarly used to focalize a constituent. Again, this construction differs from rhetorical questions in that it requires an answer and that the answer does not need to be known by the addressee. If we go back to the example of the teacher, he can well decide to save time by asking a question and, instead of waiting for the audience to answer, provide the answer directly. In that respect, this step of the path is yet further removed from the original purpose of a question since the answer is not required to be provided by someone else. As the prosodic distance between the question and its answer is often reduced, it is less and less likely that the answer will be provided by someone else.

Through extensive use of this strategy, the question and its answer get to be linked at a syntactic level (Caponigro and Davidson 2011 or Jacobson 2016). This is the third step, the question-answer constituent.

6.3.4 Step 3. Question Answer Constituent

A: $[_{CP}\ [_{IP}$ ***[+q] wh(x)*** $]\ \alpha_{spec}\ [_{IP}$ ***answer(x')*** $]]$

The last step of Kimmelman and Vink (2017) path, Question Answer Constituent roots in Caponigro and Davidson (2011) analysis of ASL QAP in which the questioned constituent clearly displays some properties of embedded questions. Furthermore, the whole construction presents clausal properties. On Caponigro and Davidson (2011)'s analysis, the whole construction is a declarative copular clause in which the subject (the question-constituent) is an interrogative CP, and the answer constituent is an IP with elided material. The silent copula is analyzed as an identity operator, returning the truth value '1' only if the question- and answer- constituents are logically equivalent. While we agree with the outline of Caponigro and Davidson (2011)'s analysis, we think that the copula is not yet an identity operator but still a specificational operator. Hence, the answer-constituent is not identical to the question-constituent; it specifies its variable.

Just like in Step 2, the variable contained in the question still seeks a value within the answer or as the answer itself, but the domain of this search is further reduced. What leads from this construction to specificational pseudoclefts, our fourth step, is the further matching between the variable and the value attributed.

6.3.5 Step 4. Specificational pseudoclefts

$[_{CP}\ [_{IP}$ ***wh(x)*** $]\ \alpha_{spec}\ [_{D/IP}$ ***answer(x')*** $]]$

In specificational pseudoclefts, as we have seen in the previous section, the answer-constituent is preferably a fragment. Also, indirect answers are limited to cases that are compatible with the domain selected by the wh-word. What appears to be the shift here is that the whole question clause is not anymore asking for any answer (non-referential, indirect, and so on); it has to correspond to the domain selected by the wh-word precisely. In other words, the question-constituent is not a question anymore but the wh-word within it continues to introduce a variable that needs to be specified by a value.

This narrowing of the variable/value domain could account for the lack of polar questions in specificational pseudoclefts; the wh-word requires a specific constituent.

This step is further supported by LSF QAP data which clearly present non-question clausal properties (recall that the QAP can be questioned, contra to ASL data) while mainly presenting Type A SPC properties.

6.3.6 Step 5. Identificational (specificational) pseudoclefts

*[$_{CP}$ [$_{IP}$ **wh(x)** α_{ident} [$_{DP}$ **answer(x')**]]]*

The fifth step, which we call identificational pseudoclefts, helps to settle the debate among semanticists about the nature of the copula. According to Higgins (1973), Ross (1967) or Declerck (1988), SPC are, as their name indicates, specifying in nature and not identifying or equative. In that respect, by providing a value to a variable, they 'reveal' it, but they do not equate it. This is disputed by other researchers such as Schlenker (2003) or Sharvit (1999) who argue the opposite.

Data from Hebrew might help to support the fifth step we propose. Heller (2002) identifies three different kinds of pseudoclefts; predicational pseudoclefts, specificational 'neutral' pseudoclefts and specificational 'agreeing' pseudoclefts. What we call identificational specificational pseudoclefts corresponds, in fact, to the latter type. We argue that this corresponds to the identifying use of the copula. Interestingly, the three kinds of pseudoclefts use different types of copulas in Hebrew. The PPC use the copula glossed as 'H' (see 279), the neutral SPC use the non-agreeing copula glossed as 'Z' in (280) and the agreeing SPC use the same copula except that it agrees with its complement, as shown in (281).

(279) ma ʔe-dan haya **hu** mo'il la-xevra — PPC
what that-Dan was **H** helpful to-the-society
'What Dan was is helpful to society.'

(280) ma ʔe-dan haya **ze** mo'il la-xevra — Neutral SPC
what that-Dan was **Z** helpful to-the-society
'What Dan was was helpful to society.'

(281) ma ʔe-dekart maca **hu/ze/zot** hoxaxa le-kiyum ha-el — Agreeing SPC
what that-Descartes found **H(m)/Z(n)/Z(f)** proof(f) to-existence the-god
'What Descartes found is/was a proof of God's existence.'

While the question-constituent in PPC in Hebrew is undoubtedly referential (see Heller 2002 for a long list of tests), both types of SPC have a non referential wh-constituent. Their differences are summarized in the Table (19), from Heller (2002): 277.

Heller (2002) accounts for their differences by showing that while neutral SPC (i.e., our 4th step) select for cross-categorical answer-constituents, agreeing SPC (i.e., identificational SPC, our 5th step) select only for real-world individuals. In this respect, the answer constituent could be analyzed as being turned into a DP. The copula also changes from a semantical standpoint since it becomes equative. The wh-word becomes more referential in that it further restricts its accepted values. [15]

[15] An intermediate step between the 5^{th} and the 6^{th} could be irrealis free-relatives. We have very few pieces of literature explaining their whereabouts. Grosu and Landman (1998) cite them as being part of the 'relatives of the third kind'. They are characterized by their irrealis mood, which makes them not fully referential. For this reason, Grosu and Landman (1998) and De Vries (2002) analyze them as being bare CP. An example from Romanian is provided in (1).

(1) Cine te-a atacat ieri e

Connectivity Effect	Neutral pronZ	Agreeing pronZ
Opacity	√(29a)	×(29b)
Bound Variable:		
"real world" individuals	√(32)	√(32)
property-like individuals	√(34a)	×(34a)
proposition-like individuals	√(34b)	×(34b)
Case	√(34)	√(37)
et marking	√(36a) *ma* ×(38) *mi*	×(36b), (38)
Agreement:		
"predicate"	√(41)	×(26c), (27b)
"subject"	×(44)	√(43)
Binding Theory:		
Principle A	√(49a)	?(49b)
Principle B	√(52a)	?(52b)
Principle C	√(53a), (54)	√(54)

Table 19. Differences between identificational and specificational pseudoclefts in Hebrew. From Heller (2002): 277

6.3.7 Step 6. Free-choice free-relative

*[$_{DP}$ [$_{IP}$ **wh(x)-answer(x')**]]*

In the sixth step of our grammaticalization path, the free-choice free-relatives, the wh-constituent is now fully nominal. Indeed following Den Dikken, Meinunger, and Wilder (2000), Grosu and Landman (1998) or Caponigro (2003), '-ever' free-relatives are undoubtedly DPs. To explain how this process takes place, we can use the presence of the morpheme '-ever' as indicative of a syntactic change. This is precisely what Citko (2010) proposes. The author argues that the presence of the equivalent of the '-ever' morpheme in Polish, '-kolwiek', is required on a syntactic level to bear the maximalizing operator present in their semantic interpretation.

Interestingly, on a semantic standpoint, addition of '-ever' carries two different interpretations: ignorance (282) or indifference of the speaker (283).

(282) Whatever she cooked yesterday, it was really delicious. *Ignorance*

(283) I'll eat whatever he cooks tonight, I'm starving. *Indifference*

We will focus here on the 'ignorance' part, which is redundant of the internal semantic of the wh-word itself. So far, we have said that the wh-word contains a variable that needs to be valued; in this respect, it continues to ask for an answer. '-Ever' free-relatives continue to carry

însurat cu sora mea.
who you-has attacked yesterday is married with sister-the my
'Who attacked you yesterday is married to my sister.'
From Grosu & Landman (1998): 155

If these structures were to be integrated into our path, they would follow specificational pseudoclefts, presenting similar semantic values but, crucially, integrated into a CP. The equative function of the copula is redundant and hence erased.

the meaning of questions (i.e., ignorance about an answer) while being syntactically referential, a DP.

An interesting ally of this theory might be Iatridou and Varlokosta (1995)'s work. Recall that translated into our typological framework, the conclusions of Iatridou and Varlokosta (1995) are that no language displays referential free-relatives alone. They either display free-choice free-relatives only (if the lexical word did not originate from questions) or both free-choice and referential free-relatives. This conclusion could indicate that free-choice free-relatives necessarily precede the other type in an evolutionary path since, if they were independent, we should find either one, the other, or both.

Additionally, the contrast between the referential (231) and non-referential (123) free-relative in LSF, repeated here as (284) is accounted for if we consider that LSF has not yet reached the last step of the process.

(284) LSF

a. ix-2 can eat what$^{\text{br}}$ prefer
'You can eat whatever (you) prefer.'

b. *IX-1 KNOW WHAT IX-2 PREFER
Intended: 'I know what you prefer.'

Now, with the free-choice free-relative being available in the syntactic strategies of a language, it can be used in a pseudocleft construction.

6.3.8 Step 7. Referential free-relative.

*[$_{DP}$ [$_{IP}$ **wh(xx')**]]*

This leads us to the final step of our process, where the construction involves a semantically and syntactically referential free-relative. Depending on the analysis, the DP layer hides a maximal operator which allows to select for any individual selected by the domain of the variable within the wh-word (Caponigro 2003). The wh-word has to raise in order to leave a variable that can be bounded by the maximal operator. Now that free-relatives are available in the grammar, they can be used, as any DP, as the subject of a copular clause, in which case they are in a predicational pseudocleft. This is in line with Frascarelli and Ramaglia (2013)'s analysis, which argues that pseudoclefts can only be specificational and that PPC are simple predicate sentences which happen to have a free-relative as their subject.

The difference between LIS referential free-relatives and LSF free-choice free-relatives can be accounted for by considering that LIS is at the last step of the grammaticalization process.

6.3.9 Summary

What seems to be happening is that questions progressively lose their ignorance features to acquire more and more referentiality both syntactically and semantically as a focalizing strategy. This process forces two separated CPs to be linked under a single CP, where the two former CPs get more and more nominalized.

The different steps of our hierarchy allow us to explain the difference between ASL QAP, which are integrated into a syntactic structure but are still questions in nature as they cannot be interrogated. In LSF, however, it is possible to ask a question on top of a question-answer pair. In that respect, we think that it is one step further than ASL. Additionally, we find cases

of free-choice free-relatives in LSF which are not found in ASL, moving LSF one further step forward. In LIS we find referential free-relatives which are not found in LSF, meaning that LIS is one step ahead of LSF. The process is summarised in Figure (71).

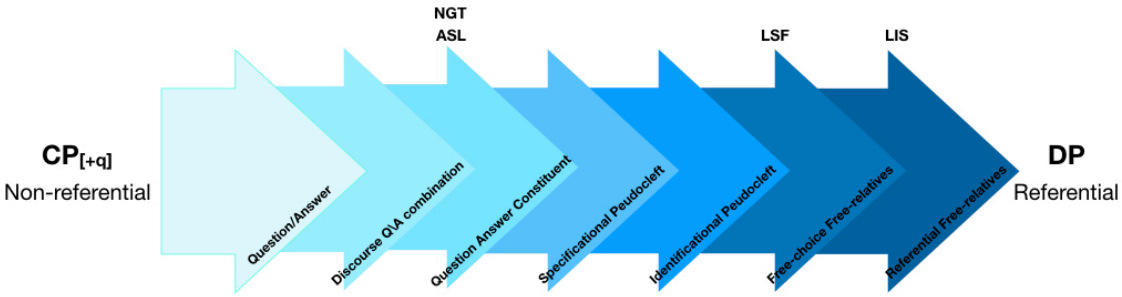


Figure 71. Grammaticalization process from questions/answers to referential free-relatives

Following Kimmelman and Vink (2017), we do not believe that being at a particular step of the process prevents previous steps to be available on the scale within a language. We also think that, once the two final steps of the hierarchy are reached, DP free-relatives become available to be used as the subject of a copular sentence, hence a predicational pseudocleft.

Chapter 7

Sentential complements

Throughout this dissertation, we saw that subordination, whether nominal or sentential, correlates with several properties that can be made visible through a variety of syntactic tests. We have also highlighted the intertangling of syntax and semantics in all the specific cases we studied. In this chapter, we focus on what we will call a 'favorable' setting for subordination to appear: sentential complements. This expression refers to a class of clauses which semantically complete the main predicate. These predicates are often also selected as complement arguments, thus being also syntactically embedded. However, cross-linguistically, other competing strategies such as coordination or juxtaposition are attested. In what follows, we will start by a short reminder of the properties which can be taken as pieces of evidence for syntactic subordination. We will then offer an extensive review of the different semantic classes of predicates taking sentential complements, using the classification adopted in Noonan (1985) and Quer et al. (2017b), and integrate our findings on LSF in this framework.

7.1 Introduction

In this section, we will start by presenting the semantic and syntactic properties of sentential complements, before presenting the syntactic tests which we applied to each LSF predicate in this study.

7.1.1 Semantic complementation

Sentential complements are primarily clustered and described through their semantic properties. The concept of semantic complementation refers to the interdependence of two 'states of affairs' (Cristofaro 2003). The first one is induced by the main verb, which requires a specification, provided by the second verb, within the sentential complement. Syntactically, the main predicate is (di)transitive so that, without its sentential complement, it is incomplete (see example 285).

(285) Marie wants { an apple / to go to the cinema / that Agathe leaves the place / * () }

Sentential complements are described in terms of their semantic content and its interaction with the main verb's semantics. We will detail this interaction for each semantic class. Sentential

complements are enclosed within either realis or irrealis modality (see Figure 72). Depending on languages, the distinction between the two can be morphologically marked through the use of a specific verbal inflection. For example, in Catalan and other romance languages, irrealis sentences are systematically identified through the use of the subjunctive.

	Complement role
Realis	assertion
	report of assertion
	positive propositional attitude
	background (factive)
Irrealis	negative propositional attitude
	hypothetical proposition
	dtr (commands, requests, intentions, desires, etc.)

Figure 72. Complement roles and modality *From Noonan, 1985: 106*

Finally, sentential complements can be categorized through their (in)dependence regarding their time reference. Indeed, the main predicate can impose a time reference, as in (286), where 'have to' only allows future or potential time reference.

(286) Marie have to { quit her job tomorrow / try her luck outside of linguistic examples someday / *liked the fish }

In other cases, the sentential complement can have an independent time reference. This is the case of the complement of 'hope' in (287).

(287) Marie hopes { that she'll quit her job tomorrow / to try her luck outside of linguistic examples someday / that Charlotte had a good time yesterday }

We will mention these properties whenever relevant, but our focus will mainly be on the semantic predicate classes, established in Quer et al. (2017b), after Noonan (2007), to which we turn now. Since there exists twelve classes[1] of predicates allowing for sentential complements, and since the differences between each class can be fine-grained, we will always present their formal description directly followed by the LSF relevant data.

The strong semantic link between the main and dependent clauses explains why sentential complements are considered as favorable contexts for syntactic subordination to occur. For this reason, we will submit LSF data to several syntactic tests in order to reveal their properties. We describe the syntactic tests we used in the next section.

7.1.2 Syntactic complementation

Throughout this dissertation, we used a variety of tests to detect the presence of syntactic subordination in LSF. For both relative clauses and temporal constructions, the extraction patterns were used as evidence for islandhood properties and coordinated/subordinated behavior (see Chapter I.2 & II.5). We also used the dependent/independent nature of clauses to reveal their syntactic status. For both constructions and QAP, we additionally used the distribution of morpho-phonological properties such as non-manual markers, as evidence of either subordination or coordination (see Chapter II.6). In the latter case of QAP, we interpreted pronouns'

[1] In Noonan (1985), the author presents two more classes which are not adopted either in Cristofaro (2003) nor in Quer et al. (2017b). These classes are negative predicates and coordinate predicates, which, to the best of our knowledge, are not found in LSF. For these reasons, we leave them out of the picture.

reference as an indication of embedding (versus role shift), especially when selected by verbs like 'say' and 'ask' (recall example 220). All of these tests were proven very useful for our investigation and will, therefore, be used again to probe the nature of sentential complements and determine whether we have clear cases of subordination or not.

As we have stated in the previous subsection, sentential complements are primarily grouped according to their semantic contribution to the main verb they are attached to. For this reason, Noonan (1985), Givón (1984) or Cristofaro (2003) acknowledge that they can vary greatly in their syntactic properties. For example, some are islands for extraction while others are not; some can present non-finite and/or finite forms; others can have an overt subject while allowing a covert alternative, and so on.

For all these reasons, applying only one test to all of them could lead to incomplete and possibly misleading results. To fully grasp the syntactic nature of each sentential complements we will analyze, it is a combination of tests that we have to use. For each test, we present the rationale, and its behavior, when combined with other tests, will be explicated through a decision tree presented at the end of this section.

7.1.2.1 Dependency: isolation test

The isolation test has already been used in Chapters (205), (5), and (6) to investigate relative and temporal clauses as well as QAP and has to be taken with caution. Indeed, the absence of overt complementizers in LSF quickly leads to possible reinterpretations of isolated sentential complements as being independent root independent clauses[2]. For example, a sentence such as (288) could be cut in two, with the second clause being able to stand in isolation (see 289). Notice that the optionality of the complementizer in English leads to the same results.

(288) MARIE $\overline{\text{DREAM}}^{\text{urg}}$ AGATHE $\overline{\text{VAVA}}^{\text{re}}$ GO CINEMA
'Marie dreams (that) Agathe will go to the cinema.'

(289) AGATHE $\overline{\text{VAVA}}^{\text{re}}$ CINEMA
'Agathe will go to the cinema.'

To minimize the risk for the sentence to be judged on its own, we cut already existing sentences in two in order to preserve the original NMMs. In other words, we did not ask our informants to sign parts of a sentence out of the blue; we showed them a cut video corresponding to the isolated sentential complement and asked for their judgments.

With these parameters in mind, only positive results in which our informants are judging the sentential complement as unable to stand alone will be taken as being informative. In other terms, finding that a sentential complement is judged acceptable in isolation will indicate that we need to carry on our syntactic investigation.

7.1.2.2 Control or raising predicates: covert subject test

The second test we will be using throughout this section is to test whether the sentential argument must have a covert subject. To avoid confusion between the surfacing subject of the main clause and the subject of the sentential complement, we will use the terms NP1 and NP2, respectively. In example (290), NP1 is 'Marie' and NP2 is covert (the gap is indicated through an underscore line).

(290) Marie wants _ to go to the cinema.

[2]Recall that this is what happened for temporal AFTER-clauses in LSF, when we presented the sentence in isolation.

In control or raising predicates, NP2 is covert. If we find similar cases in LSF, we will conclude that the sentential complement is indeed subordinated.

7.1.2.3 Infinitival or finite: tense test

Some verbs allow both covert and overt NP2. In such cases, we need to determine (when the subject is covert) whether this is a *pro*-drop or an infinitive *PRO*. If this is the latter, then the sentential complement should not allow for tense.

For example, predicates such as 'have to' in English are not compatible with tense (see 291a) and the ungrammaticality of (291b)-(291c).

(291) a. Marie has to PRO_i finish the movie.
b. *Marie has to that Agathe finishes the movie.
c. *Marie has to that finishes the movie.

However, predicates can present more than one strategy. The verb 'want', similarly to 'have to', can take an infinitival clause without an overt subject as in (292), but, crucially, also with an overt subject (see 293).

(292) Marie_i wants $PRO_{i/*j}$ to finish the movie.

(293) Marie_i wants $Agathe_j$ to finish the movie.

Following Kayne (1994), Noonan (1985) or Quer et al. (2017b), the presence of an infinitival form is an indicator of subordination.

In LSF, there is no clear distinction between finite and non-finite forms expressed in the morphology of verbs. We do find, as also noted by Millet and Verlaine (2017), tense markers such as the sign glossed 'VAVA', which indicates the future tense (see 294).

(294) a. GIRL VAVA 13 YEARS-OLD
'The girl is going to be 13 years old.'
b. INTERPRET_i PERSON-CL VAVA PRESENT WORK POSS-3_i
'The interpret is going to present his work.'

As such, it reveals the presence of a tense phrase in the sentential complement, and the impossibility of combining 'VAVA' with the sentential argument's verb will be taken as evidence of its infinitival nature.

7.1.2.4 Deictics and shift in reference: NP2/IX-1 test

In linguistic theories, a shift in indexicals is generally interpreted as an evidence of the presence of direct speech which is considered as being not subordinated to the main verb (Noonan 1985)[3]. This is the case in the English example in (295) in which the first-person pronominal is interpreted as referring to the subject of the main predicate, Marie, hence shifting from the narrator's perspective (in example 296).

(295) Marie imagines: "I_{Marie} could stop being a linguistic example"

(296) Marie imagines that $\text{I}_{Charlotte}$ stopped using her name in my examples.

[3]Except if we adopt Cristofaro (2003)'s definition of subordination which focuses on semantic dependence; hence she analyze direct speech as being subordinated to the utterance verbs which it has to complete. From a syntactic standpoint, which is our perspective, this definition is too broad and will, therefore, not be adopted

When we investigated QAP in Chapter II.6, we used the reference of first-person pronominals as evidence of their embedded status. This implication is not reciprocal; finding role-shift does not automatically entail that we are facing juxtaposition. Indeed, Schlenker (2003) has shown that despite the shift in indexicals, role-shift in ASL was still displaying properties of syntactic subordination, hence presenting a specific type of direct speech. These results were not replicated in LSF, and we will avoid any conclusions on the topic. Here, when we encounter role-shift, we will acknowledge it as such, without using it as a predictor for subordination/lack of subordination.

7.1.2.5 Question pattern: question on each clause

Up to this point, we have mentioned tests revealing the presence of either specific predicates (control or raising predicates) or infinitival clauses, but these are not the only forms of sentential complements. Taking again the example of 'want', we can see in (297) that, in English, this verb can also take finite clauses as complements[4].

(297) Marie wants that Agathe finishes the movie.

To determine the syntactic link between the main and the second clause, we will apply the extraction test, which was very useful across our topic of interest within this dissertation.

Again, due to the variety of shapes which sentential complements can take, there are some independent parameters (parasitic gaps, islandhood…), which could prevent us from asking a question inside the sentential complement. As such, when trying to extract material from the second clause, only positive evidence will be taken as being informative. Negative evidence will lead to the last test of our decision tree, extraction from the main clause.

In that respect, we will adopt van Gijn (2004)'s rationale: if we can ask a question on arguments of the main clause alone, then the two sentences are not coordinated. Recall from previous chapters that in the case of coordination, only the symmetric extraction, across the board, is available as in (298).

(298) What did Mary like ___ and John hate ___?

7.1.2.6 Non manual marking

For every class of predicates, we will describe the non-manual markers associated with the clause. We will use the conventions established in Quer et al. (2017b) and presented in the introduction of this thesis. We will use these markers to nuance the conclusions derived from the tests we applied.

7.1.2.7 Procedure and decision tree

All in all, not all tests will be required for every sentential complement tested in this study. Some properties can lead to quicker decisions. For example, the impossibility to stand in isolation for the sentential complement leads to an immediate analysis of it as being syntactically dependent, hence subordinated to the main clause. Similarly, the obligation for the sentential complement's subject (NP2 in Figure 73) to be covert is indicative of raising or a control predicate, consequently being subordinated. To sum up the tests we will apply and the conclusions which can be drawn from them, we created the decision tree presented in Figure (73). In the discussion of this Chapter, we provide a summary table of all the results we obtained (Table 22).

[4]Notice that in a pro-drop language such as Italian (297) could also appear without an overt pronoun and still characterize as a finite clause.

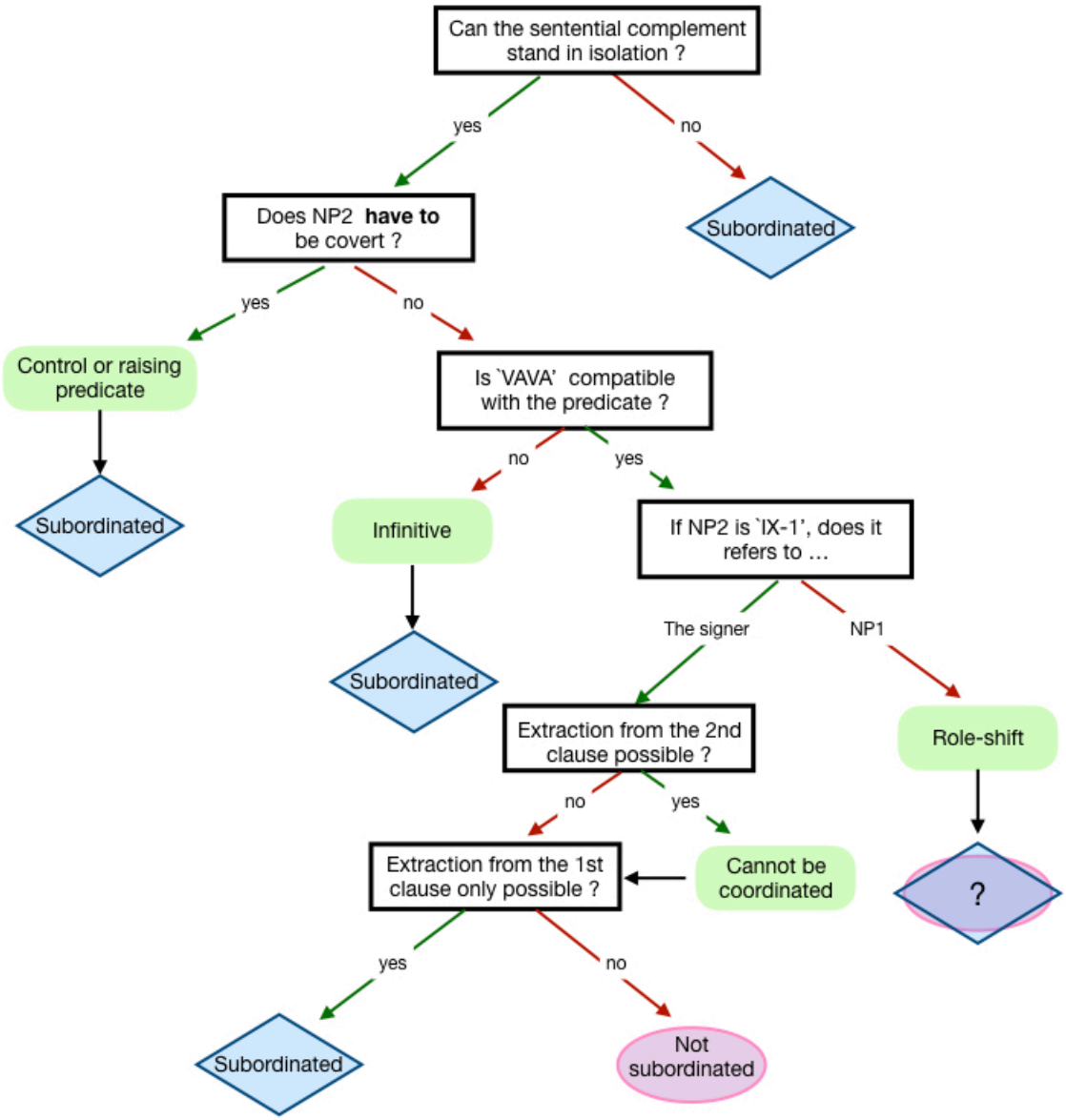


Figure 73. Decision tree designed to help highlighting the presence of subordination in the sentential complements we will analyze.

NP1 refers to the subject of the main clause. NP2 refers to the subject of the sentential complement.

7.2 Semantic classes of predicates

Since there are many syntactic tests to be applied to a large number of semantic classes, we organize the chapter as follows: every subsection represents a class of sentential-complement-taking predicates; their first subsection presents the description found in the literature, while the second subsection presents LSF data. Within the LSF subsection, we introduce the predicates we found with both examples and photographic illustrations. We then proceed to the number of tests required by our decision tree (some predicates require fewer tests than others). This means that we will present the isolation test, followed, depending on the results, by the covert/overt nature of NP2, the possibility for 'VAVA' to appear within the sentential complement, the reference associated to the first person pronominal IX-1 when it is the NP2 and, finally, the extraction test. For every cluster of predicates, we will also present the non-manual markers associated with their realization.

Finally, throughout our description of LSF data, we will always start by presenting all the predicates we investigated with examples and figures. The translation provided in English serves as an illustration of the general meaning of each predicate, irrespective of their syntactic properties.

7.2.1 Utterance predicates

7.2.1.1 Main properties

Utterance predicates involve predicates like 'say' or 'inform' and express the transfer of information from an agent (the subject of the predicate) to his interlocutor, which can be left out or expressed overtly. For these predicates, the sentential complement represents the information itself. Cristofaro (2003) and Noonan (2007) remark that the complement can either be a direct quotation (cf. example 299, in which case no judgment about the information itself is given and deictics have to be shifted, or an indirect quotation (cf. example 300).

(299) He said:'**I** like **your** shirt.'

(300) He said that **he** liked **my** shirt.

In (299), there is a shift in the pronominals used from the third person to the first and second person. The reference of the first person pronominal is shifted from the speaker's perspective (compare with 300) to the utterer's. This is characteristic of direct speech.

The availability of the two strategies varies across languages. For example, Shina and Agta have been reported as languages presenting no indirect quotation strategy (Mayfield 1972, Bailey 1924)[5]. Utterance predicates are non-factive since no judgment about the truth of the sentential complement can be established. In general, they are finite TP or CP at the indicative mode, but some languages use the subjunctive in indirect speech only or future tense (Noonan 1985). Finally, the time reference of complement verbs is independent of the main clause.

7.2.1.2 LSF

We provide an example of every verb collected in (301), they are all illustrated in Figure (74). SAY, INFORM and SIGN are all agreeing verbs and in the examples they show 3^{rd} person subject agreement and 1^{st} object agreement.

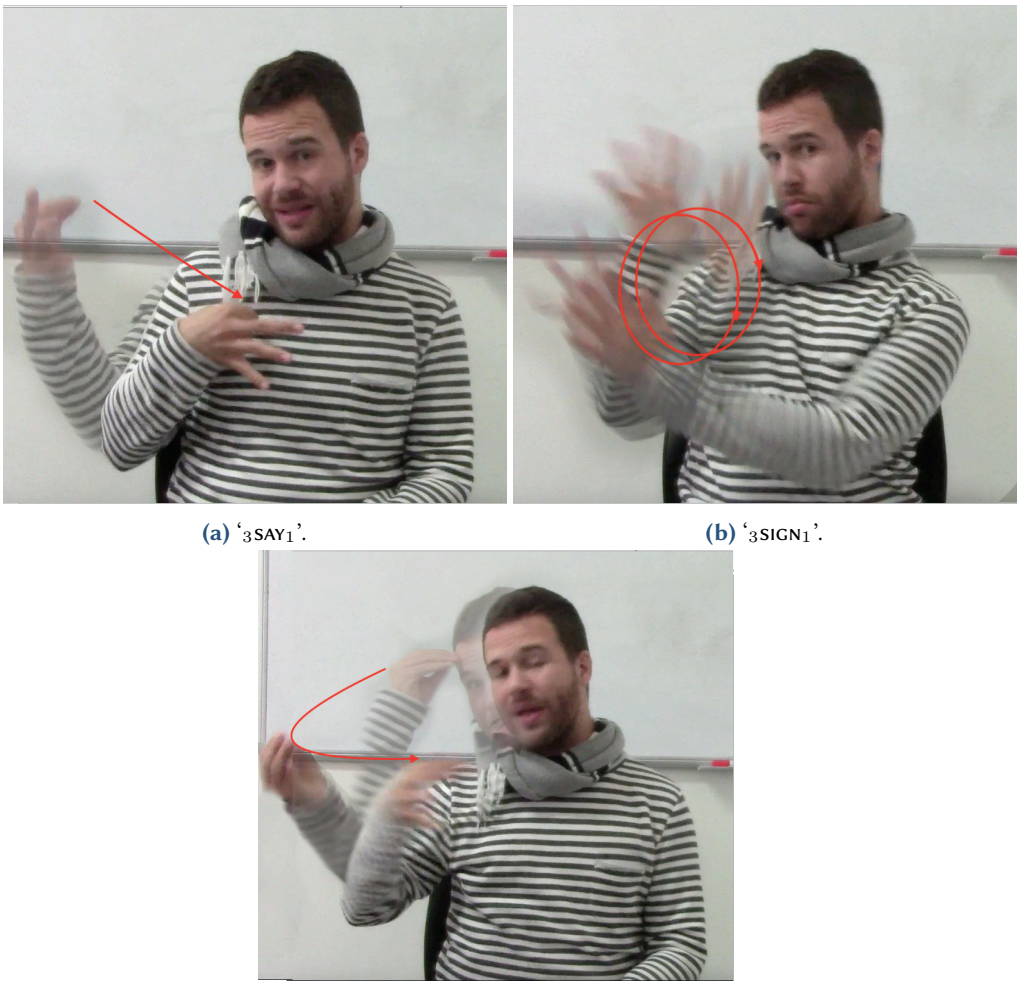
[5]Cristofaro (2003) considers that the difference between direct and indirect speech does not regard syntax but semantics instead (the first one is a quotation of the sound produced, the second, a report of utterance) and that they both are complements of the main verb and, therefore, embedded.

(301) Utterance predicates in LSF

a. $\overset{\text{bt,re}}{\overline{\text{MARIE}_i\ {}_3\text{SAY}_1}}\ \overset{\text{rg,re}}{\overline{\text{POSS-3}_i\ \text{SISTER NICE}}}$
'Marie says to me that her sister is nice.'

b. $\text{MARIE}\ \overset{\text{bt,re,rg}}{\overline{\text{INFORM}_x\ \text{AGATHE GO CINEMA}}}$
'Marie informs me that Agathe goes to the cinema.'

c. $\text{MARIE}\ \overset{\text{bt,re,rg}}{\overline{{}_3\text{SIGN}_1\ \text{AGATHE GO CINEMA}}}$
'Marie signs to me that Agathe goes to the cinema.'



(a) '${}_3\text{SAY}_1$'. (b) '${}_3\text{SIGN}_1$'.

(c) '${}_3\text{INFORM}_1$'.

Figure 74. Utterance predicates in LSF

7.2.1.2.1 Non-manual marking Interestingly, we find the same set of non-manual markers across all three predicates (see Figure 74): the signer's body is turned towards the NP1 (the subject of the main clause) location, the eye gaze is directed at the receiver. Finally, eyebrows raise either throughout the whole clause or from the main predicate to the end of the sentence. No clear pause is present. Therefore we do not postulate the presence of separate sentences. We will verify this observation with the syntactic tests we presented at the beginning of this chapter.

7.2.1.2.2 Isolation test We start with the isolation test and show that the first clause, containing the utterance predicate, cannot appear alone. We illustrate it with SAY in (302). This confirms that the second clause is its syntactic argument in the strict sense.
On the other hand, when we present the sentential complement alone (303), judgment varies across our informants. There is no strong unacceptability but rather an impression of weirdness due to the non-manual markers, especially the body turn, which felt weird if the sentence was presented alone.

(302) *MARIE$_i$ SAY (bt,re)
'Marie says'

(303) # POSS-3$_i$ SISTER NICE (rg,re)
'her sister is nice.'

We pursue our investigations.

7.2.1.2.3 NP2 forcefully covert? The verbs 'SAY', 'INFORM' and 'SIGN' are directional (see the Introduction for a presentation of the different types of verbs; directional, plain and spatial). Through the directionality of the verb's movement or configuration, we can encode information regarding the person corresponding to the addressee and the signer (1st, 2nd and 3rd persons). With the verbs SAY and INFORM, the addressee of the utterance can also be unspecified in which case the direction of the verb goes from the signer to his interlocutor. Compare Figures (74a) and (74c) to Figures (75a) and (75b).



(a) 'SAY$_x$' **(b)** 'INFORM$_x$'

Regarding the pattern of the complement, the complement of SIGN usually has an overt subject (NP2 in our decision tree), but it can also be covert (304). In this case, the reference of the embedded verb is the agent of the main verb, no matter the direction of the verb (see 304 and 305).

(304) a. MARIE 3SIGN$_1$ (gasp) GO CINEMA (bt; rg; re; bt)
'Marie signs to me that she goes to the cinema.'

(305) MARIE $\overline{\text{SIGN}_x}^{\text{rg}}$ GO CINEMA$^{\text{bt}}$
'Marie signs that she goes to the cinema.'

For INFORM and SAY on the other hand, the NP2 has to be overt, as shown by the unacceptability of (306) and (307).

(306) a. *MARIE $_3$INFORM$_1$ GO CINEMA
b. *MARIE $_3$INFORM$_1$ VAVA GO CINEMA
Int. 'Marie informs me that (will) go to the cinema.'

(307) a. *MARIE SAY GO CINEMA
b. *MARY SAY VAVA GO CINEMA
Int. 'Marie says to me that (will) go to the cinema.'

7.2.1.2.4 Tense test. Whether the NP2 is covert or overt, it is possible to use the tense marker VAVA with SIGN, as shown in (308).

(308) MARIE $\overline{\text{$_3$SIGN$_1$}}^{\text{rg}}$ $\overline{\text{VAVA}}^{\text{re,woe}}$ GO CINEMA$^{\text{bt}}$
'Marie signs to me that she will go to the cinema.'

This property shows that the sentential argument is finite.

7.2.1.2.5 Shift in indexicals? Regarding the test on indexicals, when the NP2 is the first person pronominal 'IX-1', the reference can be either the signer himself (309) or the NP1, Marie. In the latter case, the signer impersonates the agent, and a shift in non-manual marking shows this: the signer's face mimics the agent speaking. In this case, the shift in reference to the first-person pronominal indicates that the sentence presents role-shift.

(309) $\overline{\text{MARIE SAY}_x}^{\text{re}}$ WHAT_{amorce} $\overline{\text{IX-1}}^{\text{re,woe}}$ GO CINEMA$^{\text{bt}}$
'Marie says that I go to the cinema.'

Following our decision tree, we will, therefore, focus on the other case without role-shift.

7.2.1.2.6 Question about the second clause It is possible to ask a direct question within the second clause only, as shown by the acceptability of (310).

(310) $\overline{\text{MARIE $_3$INFORM$_1$}}^{\text{re}}$ WHO^6 PERSON-CL COME TOMORROW$^{\text{wh}}$
'Who does Marie inform me that is coming tomorrow?'

In that respect, the second clause could well be analyzed as being subordinated. We also tested whether we could ask a question on the material of the first clause only, in order to confirm this diagnostic.

7.2.1.2.7 Question about the first clause Depending on the directionality of the verb, asking a question on the main clause gives rise to different patterns. When the form '$_3$VERB$_1$' is used, the extraction seems degraded as shown in (311).

(311) # WHO $_3$SIGN$_1$ AGATHE GO CINEMA?
'Who signed to me that Agathe/she goes to the cinema?'

According to our informants, this is due to the directionality of the verb which encodes that the information was given to the signer himself. Therefore, it is strange that (s)he ignores 'who' told her/him something. In that respect, the impossibility of asking questions on the clause is due to pragmatic reasons. This is confirmed by the pattern presented in (312) with 'SIGN$_x$'.

(312) $\overline{\text{WHO}}^{\text{le}}$ $\overline{\text{SIGN}_x \text{ AGATHE GO CINEMA?}}^{\text{bt}}$
'Who signed that Agathe goes to the cinema?'

We see here that when the addressee of the main verb is not the first person, it is possible to ask a direct question on the main clause. This pattern is the same for INFORM and SAY (313-314).

(313) $\overline{\text{WHO INFORM}_x \text{ AGATHE GO CINEMA?}}^{\overline{\text{le}}}$
$\overline{\phantom{\text{WHO INFORM}_x \text{ AGATHE GO CINEMA?}}}^{\text{ht}}$

(314) $\overline{\text{WHO}}^{\text{le}}$ INFORM_x $\overline{\text{GO CINEMA?}}^{\text{bt,re}}$
'Who signed that Agathe/she goes to the cinema?'

7.2.1.2.8 Summary In light of these results, and considering the shared pattern between SIGN, SAY, and INFORM, we provide the same analysis for the three verbs: their sentential complement is finite and syntactically subordinated to them.

7.2.2 Propositional attitude predicates

7.2.2.1 Main properties

Propositional attitude predicates express the speaker/signer's confidence in the truth of the proposition corresponding to their complement. In English, it includes verbs such as 'to believe', 'to doubt' or 'to assume'. Depending on languages, the NP1 can be required to be overt, or the various propositional attitudes can be expressed through adverbs modifying a single verb dedicated to that purpose. Some of these predicates might be impersonal and include an expletive subject as in example (315).

(315) It's certain that Mary will come tomorrow.

Propositional attitude predicates can be overtly specified as being either positive or negative, as in (316).

(316) Carlo wrongly thinks that Caterina is coming too.

According to Cristofaro (2003), the complement of such predicates is non-factive since the truth of the proposition itself is not evaluated. She remarks, however, that some languages like Italian make a distinction between propositions being likely or unlikely by using indicative and subjunctive, respectively (cf. example 317).

(317) Italian
a. Carlo è convinto che Caterina arriv**erà**
'Carlo is convinced that Caterina will come (indicative).'
b. Carlo è convinto che Caterina arriv**i**.
'Carlo is convinced that Caterina might come.'

Finally, some languages may use specific complementizers to introduce the sentential complements of propositional attitude predicates. In English, for example, 'if' and 'whether' are directly linked to these predicates while in Irish, these contexts give rise to wh-complementizers.

7.2.2.2 LSF

We provide an example for every verb in (318), an illustration is provided in Figure (76).

(318) Propositional attitudes predicates in LSF

a. MARIE $\overline{\text{BELIEVE}}^{\text{woe,re}}$ AGATHE GO CINEMA
'Marie believes that Agathe went to the cinema.'

b. MARIE $\overline{\text{THINK}}^{\text{woe,cdm}}$ AGATHE GO CINEMA
'Marie thinks that Agathe went to the cinema.'

c. MARIE $\overline{\text{FEEL SURE}}^{\text{se}}$ AGATHE GO CINEMA
'Marie feels sure that Agathe went to the cinema.'

d. MARIE $\overline{\text{FEEL}}^{\text{se,cdm}}$ AGATHE GO CINEMA
'Marie feels that Agathe went to the cinema.'

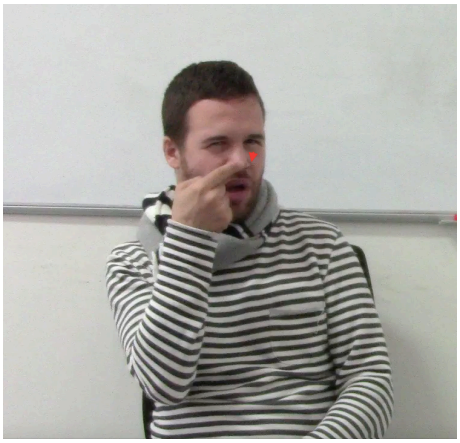
e. MARIE $\overline{\overline{\text{FEEL-POSSIBLE}}^{\text{cdm}}}^{\text{se}}$ AGATHE GO CINEMA
'Marie feels possible that Agathe went to the cinema.'

f. MARIE $\overline{\text{NOT-SURE}}^{\text{se,cdm}}$ AGATHE GO CINEMA
'Marie is unsure that Agathe went to the cinema.'

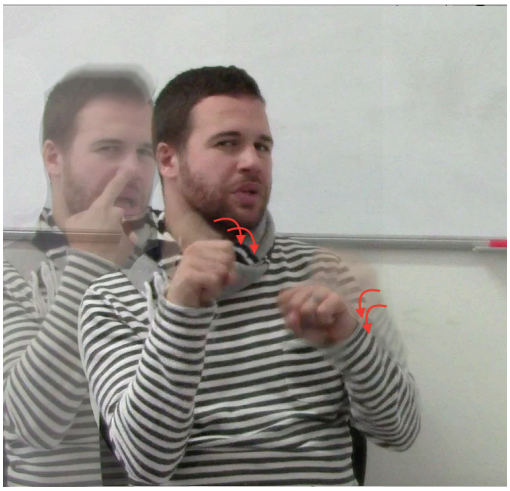
g. MARIE $\overline{\text{THINK-NOT}}^{\text{woe}}$ AGATHE GO CINEMA$^{\text{re}}$
'Marie does not think that Agathe went to the cinema.'



(a) 'UNSURE'.



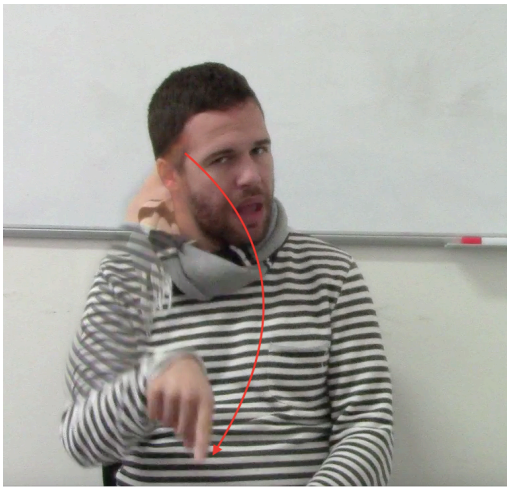
(b) 'FEEL'.



(c) 'FEEL-POSSIBLE'.



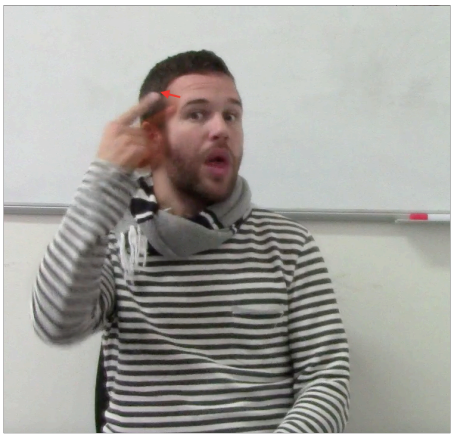
(d) 'FEEL-SURE'.



(e) 'THINK-NOT'.



(f) 'BELIEVE'.



(g) 'THINK'.

Figure 76. Propositional attitude predicates in LSF

7.2.2.2.1 Non-manual Markers Interestingly, the set of non-manual markers varies along two axes: the assertive character of the knowledge and its hypothetical aspect. For non-asserted knowledge, corresponding to an information guessed, it is realized with squinted eyes (see Figures 76b, 76d, 76c, 82d and 76a). When is it an asserted belief (BELIEVE, THINK and THINK-NOT), it is signed with wide opened eyes[7] (see Figures 76f, 76g and 76e). Additionally, the hypothetical character of the statement is indicated through a mouthing component. Whenever the experiencer doubts his belief, the signer produces a 'doubt'-mouth (= corner down mouth (cdm)) [8].

Using these two markers, we can obtain a scale of certainty depending on the combination of the different NMMs, which we illustrated in (20).

Note that a single verb can present different degrees of certainty, it is not obligatorily encoded in its morphology, as can be observed by the comparison of two occurrences of BELIEVE: one expressing certainty and the other one expressing a guess (Figure 77).

When observing the spreading of the NMMs, we see that in the vast majority, they spread from the main verb to the end of the sentence. This could be taken as an indicator of the subordinated link unifying the two clauses.

wide open eyes	wide open eyes corner down mouth	squinted eyes	squinted eyes corner down mouth
Strong belief		→	Weak belief

Table 20. Scale of certainty, expressed through NMMs.

[7] Note that this was already observed by Millet and Verlaine (2017), as presented in the Introduction.
[8] This is the same non-manual used for impersonal PERSON-CL Kuhn, Mantovan, and Geraci (2017)



MARIE BELIEVE VAVA GO CINEMA
'Marie thinks she knows that she will go to the cinema.'



MARIE BELIEVE IX-1 GO CINEMA
'Marie believes that I go to the cinema.'

Figure 77. Non-manual marking of BELIEVE changing depending on the degree of certainty of the agent.

All the verbs presented in (318) are non-directional and behaved the same regarding syntactic tests.

7.2.2.2.2 Isolation test When isolated, the first part of the sentence is unacceptable (319), while the second part of the sentence is weird when markers such as corned-down mouth and squinted eyes are present as in (320). However, with raised eyebrows, the complement alone is perfectly acceptable; this is the case for the complement of THINK-NOT in (321).

(319) * MARIE $\overline{\text{NOT-SURE}}^{\text{se}}$

(320) ? $\overline{\text{AGATHE GO CINEMA}}^{\text{cdm,se}}$

(321) ~~MARIE THINK NOT~~ $\overline{\text{AGATHE GO CINEMA}}^{\text{re}}$
'~~Marie think not~~ Agathe goes to the cinema.'

7.2.2.2.3 NP2 forcefully covert? Regarding the subject of the sentential complement (NP2 in our decision tree), propositional attitude predicates allow complements with either overt (see 318) or covert subjects in LSF.

7.2.2.2.4 Is 'VAVA' compatible with the predicate? The tense marker VAVA is always acceptable (illustrated with NOT-SURE in (322)). Therefore the sentential complement is finite.

(322) a. $\overline{\text{MARIE NOT-SURE GO CINEMA}}^{\text{se,cdm,ht}}$
'Marie is not sure that she goes to the cinema.'

b. $\overline{\text{MARIE NOT-SURE VAVA GO CINEMA}}^{\text{se,cdm,ht}}$
'Marie is not sure that she will go to the cinema.'

7.2.2.2.5 Shift in indexicals? Turning to the overt strategy, whenever the NP2 is the first-person pronominal IX-1, it refers to the signer, as shown in (323) with THINK.

(323) MARIE THINK^{woe} IX-1re GO CINEMA^{ht}
'Marie thinks that I go to the cinema.'

The absence of a shift in indexicals indicates that there is no role-shift here.

7.2.2.2.6 Questions on the second clause Regarding questions, it is possible to create direct questions with wh-signs targeting elements of the complement clause. This is shown in (324).

(324) a. MARIE THINK-NOT AGATHE GO WHERE^{wh}?
'Where does Marie does not think Agathe is going?'

b. MARIE BELIEVE WHO GO CINEMA^{wh}?
'Who does Marie believe that is going to the cinema?'

7.2.2.2.7 Questions on the first clause It is also possible to asymmetrically ask a direct wh-question on the matrix subject. This is illustrated in (325)).

(325) WHO FEEL^{le} AGATHE GO CINEMA^{ht}?
'Who has the feeling that Agathe is going to the cinema?'

7.2.2.2.8 Summary In light of these tests, it appears that the propositional verbs elicited all take subordinate finite clauses as their complements.

7.2.3 Pretence predicates

7.2.3.1 Main properties

The defining property of pretence predicates is to take propositions about the non-real world as complements. They carry no presupposition about the possible realization of the event in the real world. They can have either an agent (for predicates like 'imagine') or an experiencer (for predicates like 'make-believe') subject.

(326) Caterina imagines that Ada is five years old again.

(327) Charlotte makes Carlo believe that she finished her thesis.

Even if the propositional content of the sentential complement is interpreted as being irrealis, the use of indicative is attested even in languages distinguishing irrealis/realis through the opposition indicative/subjunctive. As an example, it requires the assertive mode in Spanish even though the language distinguishes between assertive and non-assertive content (cf. 328).

(328) Spanish
a. Aparentaron que vino
pretended.3pl comp came.3sg:indic
"They pretended that he came"

b. *Aparentaron que viniera
pretended.3pl comp came.3sg:sjnct
"They pretended that he came"

From Noonan, 2007: 127

7.2.3.2 LSF

An example of every predicate is presented in (329) and illustrated in Figure (78).

(329) Pretence predicates in LSF

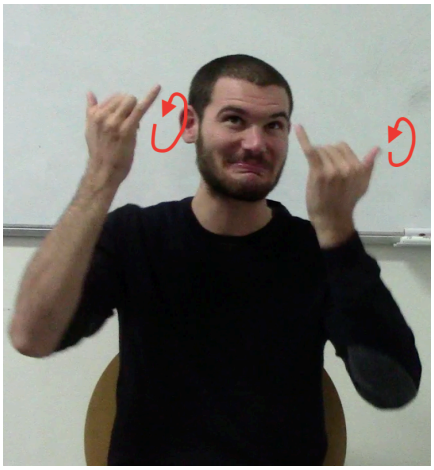
a. MARIE $\overline{\text{IMAGINE}}^{\text{urg}}$ AGATHE GO CINEMA
'Marie imagines that Agathe goes to the cinema.'

b. MARIE $\overline{\text{DREAM}}^{\text{urg}}$ AGATHE GO CINEMA
'Marie dreams that Agathe go to the cinema.'

c. MARIE $\overline{\text{DREAM-POPUP}}^{\text{urg}}$ AGATHE GO CINEMA
'Marie dreams that Agathe go to the cinema.'

d. MARIE $\overline{\text{THINK}_{pretence}}^{\text{urg}}$ GO CINEMA
'Marie thinks about going to the cinema.'

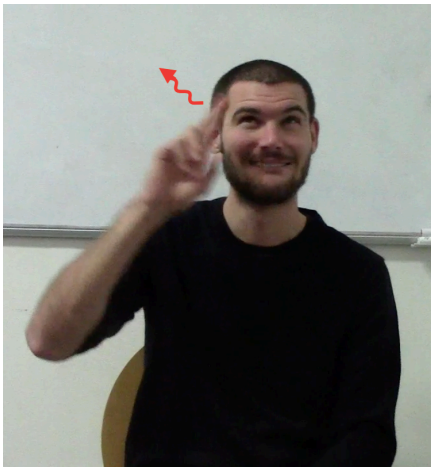
e. MARIE $\overline{\overline{\text{HAS-IDEA}}^{\text{urg}} \text{ AGATHE GO CINEMA}}^{\text{ht}}$
'Marie get the idea that Agathe goes to the cinema.'



(a) 'IMAGINE'.



(b) 'HAS-IDEA'.



(c) 'DREAM'.



(d) 'DREAM-popup'.



(e) 'THINK'.

Figure 78. Pretence predicates in LSF

7.2.3.2.1 Non-manual Markers In this class, verbs are all non-manually marked by the direction of the eye gaze, which points upwards (upward right gaze (urg) in the gloss). This non-manual marker spreads over the verb only and is crucial in deriving the irrealis interpretation. Indeed, 'THINK' can be used as a pretence predicate when marked through this NMMs (see Figure 78e). We present a minimal pair involving two versions of 'THINK', one with the upward right gaze and the other without, in (330)-(331). The semantic difference between the two uses is highlighted in the translation.

(330) MARIE $\overset{\text{urg}}{\overline{\text{THINK}}}$ AGATHE GO CINEMA
'Marie thinks about Agathe going to the cinema.'

(331) MARIE $\overset{\text{woe,cdm}}{\overline{\text{THINK AGATHE GO CINEMA}}}$
'Marie thinks that Agathe went to the cinema.'

In addition to the non-manual marking of the verb itself, pretence predicates are signed with the head turned towards one side. This marker spreads over the whole sentential complement.

Pretence verbs presented in (329) are all realized on the upper part of the head[9]. As for syntactic tests, all predicates behave alike through every step of our evaluation process.

[9]Note that this is the case for most signs referring to thoughts, like CONCEPT or PHILOSOPHY.

7.2.3.2.2 Isolation test Pretence predicates show that the main clause cannot appear isolated from its complement, while the sentential complement is fully acceptable alone, we illustrate the contrast in (332).

(332) a. *MARIE $\overline{\text{THINK}_{pretence}}^{\text{urg}}$
Int. 'Marie thinks about.'

b. AGATHE GO CINEMA
'Agathe goes to the cinema.'

7.2.3.2.3 NP2 forcefully covert? Regarding the subject of their sentential complements, the NP2, all verbs allow both covert (333) and overt (329) alternatives. When covert, NP2 is mandatorily interpreted as co-referring with NP1.

7.2.3.2.4 Is 'VAVA' compatible with the predicate? It is possible to have the tense marker VAVA both with overt and covert NP2, hence presenting a finite morphology.

(333) a. $\overline{\overline{\text{MARIE HAS-IDEA}}^{\text{re}} \text{ GO CINEMA}}^{\text{ht}}$
' Marie gets the idea to go to the cinema.'

b. $\overline{\overline{\text{MARIE HAS-IDEA}}^{\text{re}} \text{ VAVA GO CINEMA } \overline{\text{KING LION}}^{\text{re}}}^{\text{ht}}$
'Marie gets the idea that she will go to the cinema, for the lion king.'

7.2.3.2.5 Shift in indexicals? When the subject of the embedded verb is IX-1, it is interpreted as being the signer with no role-shift, as shown in (334), which is coherent with a subordinated analysis.

(334) MARIE $\overline{\text{IMAGINE}}^{\text{se}}$ $\overline{\text{IX-1}}^{\text{re,tl}}$ GO CINEMA [laugh]
'Haha, Marie imagines that I'm going to the cinema.'

7.2.3.2.6 Question on the second clause As seen in example (335), it is possible to create direct questions with wh-signs targeting elements of the complement clause of pretence predicates.

(335) a. $\overline{\text{MARIE } \overline{\text{HAS-IDEA}}^{\text{urg}} \text{ AGATHE BUY } \overline{\text{WHAT}}^{\text{lc}}}^{\text{wh}}$?
'What does Marie gets the idea that Agathe will buy?'

b. $\overline{\text{MARIE } \overline{\text{DREAM}}^{\text{urg}} \text{ AGATHE BUY } \overline{\text{WHAT}}^{\text{lc}}}^{\text{wh}}$?
'What does Marie dream that Agathe buys?'

The data are not compatible with a coordinated analysis.

7.2.3.2.7 Question on the first clause Along the same line, it is also possible to asymmetrically ask a direct wh-question on the matrix subject (336). Thus, the two clauses have to be subordinated.

(336) $\overline{\text{WHO } \overline{\text{DREAM-POPUP}}^{\text{urg}}}^{\text{le}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{bt}}$?
'Who imagines that Agathe goes to the cinema?'

7.2.3.2.8 Summary We analyze the pretence predicates found in LSF as taking subordinated, finite, sentential complements.

7.2.4 Commentative / factive predicates

7.2.4.1 Main properties

This class of predicates, named commentative by Noonan (1985) and Cristofaro (2003) or factive by Kempson (1975), provide an emotional evaluation of their complement proposition. They differ from propositional attitude predicates in that the comment they provide on their complement is either a judgment ('be strange') or a mental attitude towards it ('regret' or 'like'), as shown in example (337). Also, in contrast with propositional attitude predicates, the event described in the complement is presupposed to be true.

(337) Charlotte regrets that few politicians seem concerned about the climate change.

Similarly to propositional attitude predicates, their subject is the experiencer of the main verb. The complements can be either finite or infinitival and usually take an indicative form in languages that do not distinguish between assertive/non-assertive or indicative/subjunctive. In languages like French, the complement takes the subjunctive mode as in (338)-(339).

(338) Je regrette que tu ne saches pas parler français.
1st-sg regret that 2nd-sg neg-part know:subj neg-adv speak:inf French
'I regret that you do not speak French.'

(339) C'est formidable que tu viennes demain.
Expl great that 2nd-sg come:subj tomorrow
'It's great that you come tomorrow.'

Commentative predicates can also take infinitival complements like in (340).

(340) It's strange for Justine not to answer.

Additionally, the commentative complement is usually topic in nature, meaning that it has already been introduced in the discourse. According to Noonan (1985), many languages present only adjectives in this class.

7.2.4.2 LSF

All the predicates studied are presented in example (341). Within this class of predicates, we identified subcategories; therefore, we will provide the illustrations within each subpart.

(341) a. MARIE $\overset{\text{emo+}}{\overline{\text{LIKE}}}$ GO CINEMA
'Marie likes to go to the cinema.'

b. MARIE $\overset{\text{emo-}}{\overline{\text{DISLIKE}}}$ GO CINEMA
'Marie dislikes to go to the cinema.'

c. MARIE $\overset{\text{emo-}}{\overline{\text{SAD CANNOT GO CINEMA}}}$
'Marie is sad that she cannot go to the cinema.'

d. MARIE $\overset{\text{hs,emo-}}{\overline{\text{HATE}}}$ GO CINEMA
'Marie hates to go to the cinema.'

e. MARIE emo- DESPISE GO CINEMA
'Marie despises going to the cinema.'

f. MARIE emo- REGRET bt AGATHE GO CINEMA
'Marie regrets that Agathe goes to the cinema.'

g. MARIE emo RELIEVED bt AGATHE GO CINEMA
'Marie is relieved that Agathe goes to the cinema.'

h. MARIE SORRY IX-1 emo-,bt,rg hs CANNOT GO CINEMA
'Marie says that she's sorry that she cannot go to the cinema.'

In all commentative predicates presented in (341), the set of non-manual marking shares the peculiarity of displaying the emotion linked to the semantic content of the verb. For example, SAD (Figure 79c) is signed with a sad face (raising eyebrows and corner down mouth) while LIKE (Figure 79a) is signed with a smiling face (smile, raised eyebrows and wide-open eyes). Most of the time, the emotion-markers appear on the verb only, but they can also spread to the end of the sentence. We will see, however, that the constructions within this class present various patterns when confronted with the syntactic tests. Therefore, in what follows, we grouped the predicates that have similar behavior.

7.2.4.2.1 Non-manual Markers: LIKE, DISLIKE, HATE, DESPISE & SAD All the verbs within this group are non-directional and are preferably used with a covert NP2. We present the examples in (342), and illustrate the predicates in Figure (79).

(342) a. MARIE emo+ LIKE GO CINEMA
'Marie likes to go to the cinema.'

b. MARIE emo- DISLIKE GO CINEMA
'Marie dislikes to go to the cinema.'

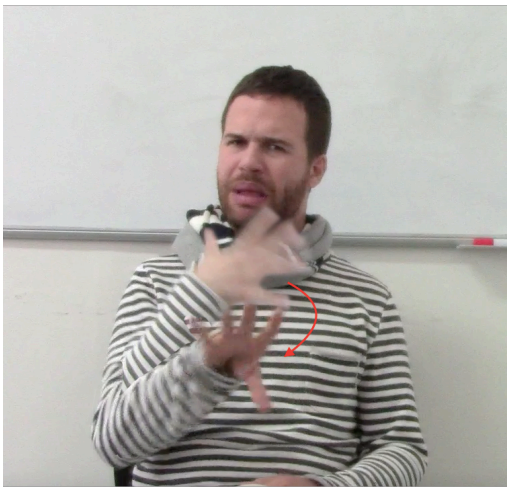
c. MARIE emo- SAD CANNOT GO CINEMA
'Marie is sad that she cannot go to the cinema.'

d. MARIE hs,emo- HATE GO CINEMA
'Marie hates to go to the cinema.'

e. MARIE emo- DESPISE GO CINEMA
'Marie despises going to the cinema.'



(a) ‘LIKE’.



(b) ‘DISLIKE’.



(c) ‘SAD’.



(d) ‘HATE’.



(e) ‘DESPISE’.

Figure 79. Commentative predicates I

7.2.4.2.2 Isolation test: LIKE, DISLIKE, HATE, DESPISE & SAD When isolated, all predicates but SAD are unacceptable without their complement (see 343). Crucially, when the sentential complement is presented alone, the sentence is unacceptable, due to the presence of the sign WHAT$_{comp}$ (cf. 344).

(343) a. *MARIE $\overset{\text{emo+}}{\overline{\text{LIKE}}}$
'Marie likes.'
b. MARIE $\overset{\text{emo-}}{\overline{\text{SAD}}}$
'Marie is sad.'

(344) $\overset{\text{wcomp}}{\overline{\text{WHAT}_{comp}}}\overset{\text{ht}}{\overline{\text{AGATHE GO CINEMA}}}$
'that Agathe goes to the cinema.'

We will argue that WHAT$_{comp}$ is a complementizer in the dedicated subsection later. For now on, we continue our syntactic tests since another strategy is available for these predicates: with a null NP2.

7.2.4.2.3 NP2 covert and presence of tense: LIKE, DISLIKE, HATE, DESPISE & SAD When NP2 is covert, the use of VAVA is unacceptable. This is shown in examples (345).

(345) *MARIE $\left\{\begin{array}{c}\text{LIKE}\\ \text{DISLIKE}\\ \text{HATE}\\ \text{DESPISE}\\ \text{SAD}\end{array}\right\}$ VAVA GO CINEMA
Lit. 'Marie likes/dislikes/hates/despises/is sad to will go to the cinema.'

Following our decision tree, since a) the NP2 is covert and refers to the experiencer of the main predicate, and, b) VAVA is not allowed, we analyze the sentences in (342) as commentative predicates taking infinitival sentential complements.

Interestingly, for all of them, the presence of WHAT$_{comp}$ licenses the use of the tense marker 'VAVA' even with a covert NP2, as illustrated with SAD in example (346).

(346) $\overset{\text{emo-}}{\overline{\text{MARIE SAD }\overset{\text{tl}}{\overline{\text{WHAT}_{comp}}}\ \overset{\text{ht}}{\overline{\text{VAVA GO CINEMA}}}}}$. MOVIE SUCK
'Marie is sad that she will go to the cinema. The movie sucks.'

Therefore we have a minimal distinction between the patterns with (345) and without (346) the presence of WHAT$_{comp}$: the first strategy is infinitival while the second is finite.

This is confirmed by the fact that WHAT$_{comp}$ surfaces everytime there is an overt NP2 in the complement (see example 347).

(347) $\overset{\text{bt}}{\overline{\text{MARIE }\overset{\text{emo+}}{\overline{\text{LIKE}}}\ \text{WHAT}_{comp}\ \overset{\text{hd,tl}}{\overline{\text{AGATHE GO CINEMA}}}}}$
'Marie likes that Agathe goes to the cinema.'

With respect to our decision tree, the isolation test has revealed that the finite strategy, introduced by 'WHAT$_{comp}$', is dependent on the main clause, hence subordinated. However, since this is the first time that, to the best of our knowledge, a complementizer is described in LSF, we continue our syntactic tests to complete our diagnostic.

7.2.4.2.4 Shift in indexicals?: LIKE, DISLIKE, HATE, DESPISE & SAD We collected sentences using IX-1 as the overt NP2. We see in (348) that it refers to the signer himself and not to the NP1 of the sentence.

(348) MARIE emo-HATE wcomp WHAT$_{comp}$ ht IX-1 GO CINEMA. IX-3 DUMB.
'Marie hates that I go to the cinema. She's dumb.'

This is coherent with a subordinated analysis.

7.2.4.2.5 Questions on the second clause: LIKE, DISLIKE, HATE, DESPISE & SAD It is possible to ask questions on arguments of the second clause, as shown by example (349).

(349) MARIE LIKE WHAT$_{comp}$ AGATHE GO wh WHERE lc?
'Where does Marie likes that Agathe goes?'

7.2.4.2.6 Question on the first clause: LIKE, DISLIKE, HATE, DESPISE & SAD It is also possible to have a question on participants of the main clause only, as shown by example (350).

(350) wh WHO SAD wcomp,le WHAT$_{comp}$ ht,le AGATHE GO CINEMA?
'Who is sad that Agathe goes to the cinema?'

7.2.4.2.7 Summary All in all, the further syntactic investigation of these predicates has confirmed the diagnostic from the isolation test: the sentential argument introduced by WHAT$_{comp}$ is finite and subordinated to the main predicates.

7.2.4.2.8 Non-manual markers: 'REGRET' & 'RELIEVED' The predicates REGRET and RELIEVED are also non-directional and differ from the first group of commentative predicates in that they do not require the presence of WHAT$_{comp}$. Additionally, the two predicates are mainly used with an overt NP2, while the first category presented a preference for covert NP2. We present the baseline in (351) and illustrations of the predicates in Figure (80).

(351) a. MARIE emo- REGRET bt AGATHE GO CINEMA
'Marie regrets that Agathe goes to the cinema.'

b. MARIE emo RELIEVED bt AGATHE GO CINEMA
'Marie is relieved that Agathe goes to the cinema.'



(a) 'REGRET'. **(b)** 'RELIEVED'.

Figure 80. Commentative predicates II.

7.2.4.2.9 Isolation test: 'REGRET' & 'RELIEVED' Regarding the behavior of REGRET and RELIEVED when taken in isolation, they pattern alike SAD in that they can appear alone (see 352). Due to the absence of overt complementizer, the second clause is also judged as correct in isolation, unless NMMs such as body turn are spreading over it, in which case the sentence is judged as weird (see 353).

(352) a. MARIE $\overline{\text{REGRET}}^{\text{emo-}}$
'Marie regrets.'

b. MARIE $\overline{\text{RELIEVED}}^{\text{emo}}$
'Marie is relieved.'

(353) a. $\overline{\text{AGATHE GO CINEMA}}^{\text{ht}}$
'Agathe goes to the cinema.'

b. # $\overline{\text{AGATHE GO CINEMA}}^{\text{bt}}$

7.2.4.2.10 Covert NP2 and use of tense: 'REGRET' & 'RELIEVED' It is also possible to have covert NP2 (see 354) in which case the use of the tense marker VAVA is still possible, as illustrated in (355).

(354) MARIE $\overline{\text{REGRET}}^{\text{emo-}}$ $\overline{\text{GO CINEMA}}^{\text{ht}}$
'Marie regrets to go to the cinema.'

(355) MARIE $\overline{\text{RELIEVED}}^{\text{emo}}$ $\overline{\overline{\text{VAVA}}^{\text{re}} \text{ GO CINEMA}}^{\text{ht}}$
'Marie is relieved that she will go to the cinema.'

This is a further distinction with the previous group of predicates since, without the complementizer, using both covert NP2 and VAVA was unacceptable.

7.2.4.2.11 Role-shift: 'REGRET' & 'RELIEVED' Whenever the NP2 is IX-1, the reference associated is the signer himself and not the subject of the verb (NP1), which is coherent with subordination (cf. 356).

(356) MARIE REGRET IX-1 GO CINEMA
'Marie regrets that I went to the cinema.'

7.2.4.2.12 Questions on the second clause: 'REGRET' & 'RELIEVED' It is possible to extract from the second clause only, as shown in example (357).

(357) WHAT MARIE REGRET AGATHE BUY _?
'What does Marie regrets that Agathe bought?'

7.2.4.2.13 Questions on the main clause: 'REGRET' & 'RELIEVED' It is also possible to ask a direct question on participants of the main clause only, as shown by example (358).

(358) WHO REGRET AGATHE GO CINEMA?
'Who regrets that Agathe goes to the cinema?'

7.2.4.2.14 Summary: 'REGRET' & 'RELIEVED' Similarly to the first cluster of verbs, the results of our syntactic analysis are in favor of a subordinated analysis. Both REGRET and RELIEVED take finite sentential complements.

7.2.4.2.15 Non-manual markers: 'SORRY' The only predicate within this group is non-directional and is preferably used with an overt NP2. It is illustrated in example (359) and Figure (81).

(359) a. MARIE SORRY IX-1 CANNOT GO CINEMA
'Marie says that she's sorry that she cannot go to the cinema.'



Figure 81. Commentative predicate III: SORRY

7.2.4.2.16 NP2 covert and presence of tense: 'SORRY' As foreshadowed by the clustering we provided, SORRY behaves differently from the two other groups of commentative predicates. It does not allow NP2 to be covert, with or without VAVA. This is shown by the unacceptability of the sentence in (360).

(360) *MARIE SORRY (VAVA) GO CINEMA
Int. 'Marie is sorry to go the cinema.'

7.2.4.2.17 Role-shift: 'SORRY' Crucially, when the NP2 is IX-1, the reference associated is Marie, the NP1, this is shown by the translation in (361).

(361) MARIE SORRY IX-1 $\overset{\text{hs}}{\overline{\text{CANNOT}}}$ GO CINEMA $\overline{\qquad\qquad\qquad\qquad\qquad\qquad}^{\text{emo-,bt,rg}}$
'Marie says: 'Sorry, I cannot go to the cinema.'

As explained before, this shift in reference is indicative of the presence of role-shift. Hence we have no clear indication of the presence of subordination in this predicate since we could not obtain an alternative without role-shift. The extraction pattern further enhances our diagnostic as it is impossible to extract from the main clause only (see 362). This is not compatible with either a subordinated analysis nor a coordinated analysis.

(362) *WHO SORRY AGATHE GO CINEMA
Lit. 'Who: 'sorry Agathe go to the cinema?'

Crucially, when asked to produce a question for which the answer would be 'Marie', the only possible strategy is to use the verb 'SAY' (see example 363).

(363) $\overset{\text{le}}{\overline{\text{WHO}}}$ $\overset{\text{re}}{\overline{\text{SAY}}}$ $\overline{\qquad\qquad\qquad\qquad\qquad\qquad\qquad}^{\text{tilt,le}}$
AGATHE SORRY GO CINEMA?
'Who says: "I'm sorry that Agathe goes to the cinema"'

7.2.4.2.18 Summary: 'SORRY' Whenever judging sentences containing 'SORRY', signers automatically analyze them as introducing direct speech. For all these reasons, we do not think that this predicate takes a subordinated sentential complement. The evidence provided by the context of use leads us to propose that they are evaluative adjectives which have to be uttered (as shown by the obligation for either role-shift or use of SAY) from an identifiable source.

7.2.4.2.19 General summary In the light of our analyses, the commentative predicates in LSF are RELIEVED, REGRET, LIKE, DISLIKE, HATE, DESPISE and SAD. They all require subordinated sentential complements and the majority of them requires the use of an overt complementizer.

7.2.5 Fear Predicates

7.2.5.1 Main properties

The class of fear predicates is semantically characterized by the fact that the main verb expresses a certain degree of concern/fear towards the (possible) realization of its complement. An example is given in (364).

(364) Nicolas is afraid to be rejected from his school.

Languages vary in how they express the probability of the complement proposition to happen (subjunctive vs. indicative) or with respect to the positive/negative evaluation of the event itself. Latin, for example, uses negation to express a positive evaluation (compare 365a and 365b).

(365) Latin

a. Vereor **ne** accidat
fear.1sg **neg** happen.3sg
'I fear that it may happen.' *Positive*

b. Vereor ut accidat
fear.1sg comp happen.3sg
'I fear that it may not happen.' *Negative*

From Greenough and Allen (1903)

The complement of fear predicates can also be finite.

(366) I am afraid that Marie will jump from the cliff. *Finite*

7.2.5.2 LSF

The fear predicates in LSF are illustrated in example (367) and Figure (82).

(367) a. MARIE $\overset{\text{emo-,woe}}{\overline{\text{STRESS}}}$ $\overset{\text{se}}{\overline{\text{GO CINEMA}}}$
'Marie is stressed to go to the cinema.'

b. MARIE $\overset{\text{emo-,woe}}{\overline{\text{AFRAID}}}$ $\overset{\text{woe,rg}}{\overline{\text{GO CINEMA}}}$
'Marie is afraid to go to the cinema.'

c. MARIE $\overset{\text{se,gt}}{\overline{\text{HESITATE}}}$ AGATHE GO CINEMA
'Marie hesitates whether Agathe will go to the cinema.'

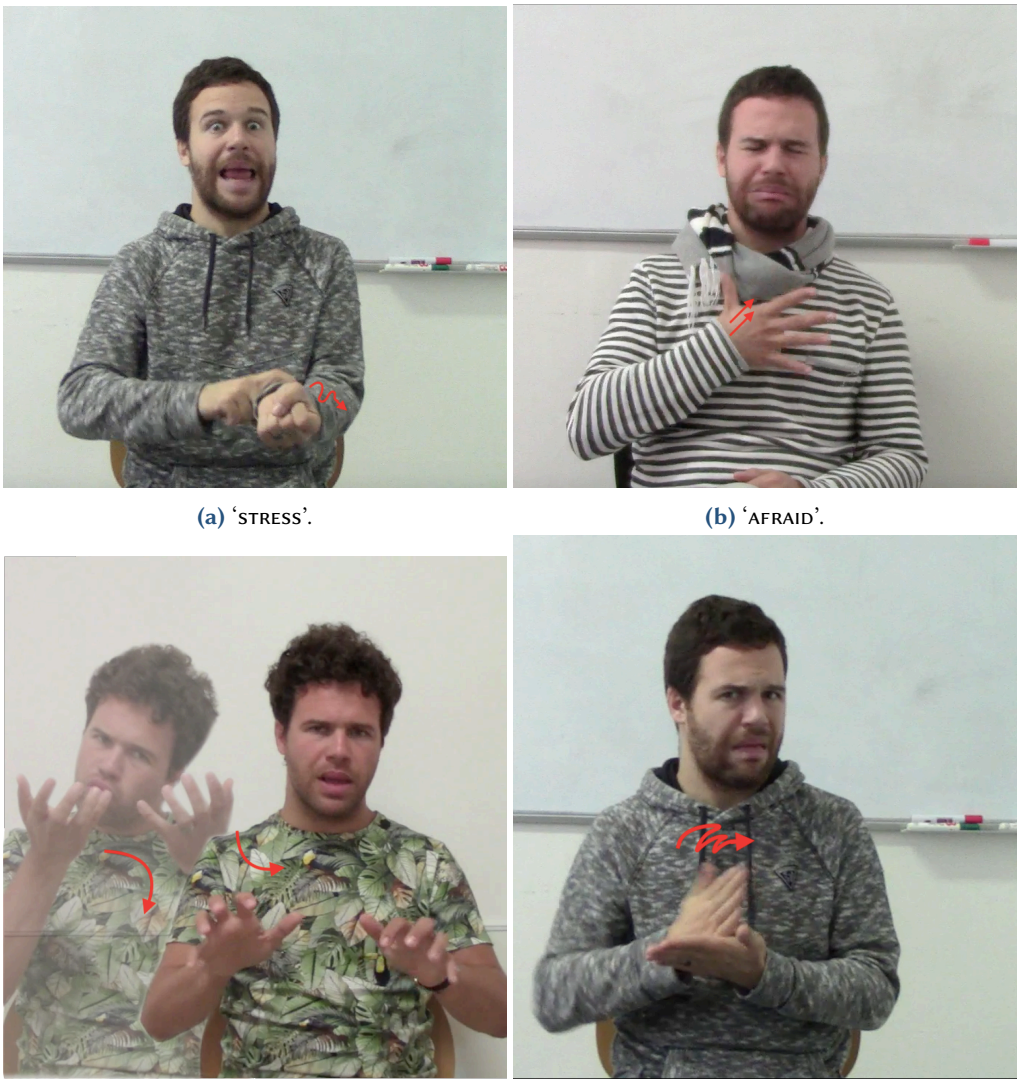
d. $\overset{\text{emo-}}{\overline{\text{AGATHE } \overset{\text{hs}}{\overline{\text{NOT-WANT}}} \text{ GO CINEMA TONIGHT}}}$
'Agathe does not want to go to the cinema tonight.'

7.2.5.2.1 Non-manual Markers Similarly to commentative predicates, fear predicates share the property of presenting an emotion-marker spreading over the verb only and being non-directional.

7.2.5.2.2 Isolation test Regarding isolation, for 'STRESS', 'AFRAID' and 'HESITATE' it is fully acceptable to have the first clause standing alone (368). This is not possible for 'NOT-WANT' (see 369).

(368) MARIE $\overset{\text{emo,gt}}{\overline{\left\{\begin{array}{c}\text{STRESS}\\ \text{AFRAID}\\ \text{HESITATE}\end{array}\right\}}}$
'Marie hesitates/is stressed/is afraid.'

(369) *MARIE $\overset{\text{le}}{\overline{\overset{\text{hs}}{\overline{\text{NOT-WANT}}}}}$
Lit. 'Marie does not want.'



(a) 'STRESS'. **(b)** 'AFRAID'.

(c) 'NOT-WANT'. **(d)** 'HESITATE'.

Figure 82. Fear predicates in LSF

When isolated, their complements are judged as strange due to the non-manual markers, but they are still acceptable (see 370).

(370) ~~MARIE NOT-WANT~~ $\overline{\text{AGATHE GO CINEMA}}^{\text{ht}}$
'Agathe goes to the cinema.'

7.2.5.2.3 NP2 covert and use of tense. Fear predicates in LSF allow both overt (371) and covert (367) NP2. In this last case, the tense marker VAVA can be used (373), indicating that the sentence is finite.

(371) $\overline{\text{MARIE}}^{\text{le}}$ $\overline{\text{NOT-WANT}}^{\text{hs}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{ht}}$
'Marie does not want Agathe to go to the cinema.'

(372) $\overline{\text{MARIE AFRAID.}}^{\text{re}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{ht}}$
'Marie is afraid. Agathe goes to the cinema.'

(373) MARIE **HESITATE** VAVA GO CINEMA
'Marie hesitates whether she will go to the cinema.'

7.2.5.2.4 Shift in indexicals? As their is no shift in the reference of IX-1, role-shift is not instantiated in this case (374).

(374) MARIE AFRAID. IX-1 GO CINEMA
'Marie is afraid that I'll go to the cinema.'

7.2.5.2.5 Questions on the second clause It is possible to ask a question on arguments of the second clause only of every fear predicates, as shown in (375).

(375) MARIE NOT-WANT AGATHE BUY WHAT?
'What does Marie do not want Agathe to buy?'

This piece of data prevents a coordinated analysis.

7.2.5.2.6 Questions on the first clause Additionally, it is possible to create questions about arguments of the main clause only, as displayed in (376).

(376) a. WHO AFRAID AGATHE GO CINEMA?
'Who's afraid that Agathe goes to the cinema.'

b. WHO NOT-WANT AGATHE GO CINEMA?
'Who does not want that Agathe goes to the cinema?'

7.2.5.2.7 Summary In the light of the tests, the fear predicates in LSF all take finite subordinated sentential complements.

7.2.6 Desiderative predicates

7.2.6.1 Main properties

In the class of desiderative predicates Noonan (2007) and Cristofaro (2003) integrate all verbs expressing explicitly a desire for the sentential complement to happen. The desiderative class resembles that of the fear predicates since we find the subject of the main verb again as the experiencer. Also, the complement is the event wished for. Among others, predicates such as 'want', 'hope' or 'desire' belong to this category. We present an example in (377).

(377) Timothée hopes to become the best baker.

The literature divides desiderative predicates into three semantic classes: the ones which express hopes, the others expressing wishes, and the 'want'-class. They are primarily differentiated because of the realization of their complement and the presupposition about it. Regarding past tense, the 'hope' class gives no presupposition about the actual realization of the event while the 'wish' class presupposes that the event will not happen/had not happened. 'Want' class, on the other hand, cannot take past complements referring to an event which did not happen, as shown by the ungrammaticality of (380).

(378) I hope Marie has won the game.
⇝ I have no idea whether she won or not.

(379) I wish Marie had won the game.
⇝ Marie did not win the game.

(380) *I want Marie to have won the quiz.

Both subjunctives and indicatives forms can be used, depending on languages and, similarly, we find infinitives and finite clauses cross-linguistically. As for the main predicate, multiple languages use the subjunctive as a way to add a desiderative value to a main verb, as shown in the Catalan example (381).

(381) Que tinguin bon viatge
comp have.2pl:sjnct good journey
'Have a good trip' (literal: 'I hope you have a good trip')
From Yates, 1975:

7.2.6.2 LSF

An example of every verb is presented in (382) and illustrated in (83).

(382) Desiderative predicates in LSF

a. AGATHE $\overline{\text{DESIRE}}^{\text{woe,re}}$ GO CINEMA
'Agathe strongly desires to go to the cinema.'

b. ASHRAF $\overline{\text{WANT}}^{\text{woe}}$ MARIE MARRY JEAN
$\overline{\phantom{\text{WANT}}}^{\text{re}}$
'Ashraf wants that Marie marry Jean.'

7.2.6.2.1 Non-manual Markers In this category, the desiderative predicate is marked by a non-manual marker intensifying the desire felt (illustrated in Figure 83). This marking only spreads on the main verb.



(a) 'DESIRE'. **(b)** 'WANT'.

Figure 83. Desiderative predicates in LSF

7.2.6.2.2 Isolation test Neither predicate can stand alone while their sentential complement can (see 383).

(383) a. * AGATHE $\overline{\text{DESIRE}}^{\text{woe}}$
b. * AGATHE $\overline{\text{WANT}}^{\text{woe}}$
c. $\overline{\text{MARIE MARRY JEAN}}^{\text{ht}}$

7.2.6.2.3 NP2 covert and 'VAVA' tense There are two strategies with respect to desiderative predicates. When the NP2 is covert as in (384), the tense marker VAVA is not accepted (see 385).

(384) a. AGATHE $\overline{\text{DESIRE}}^{\text{woe}}$ GO CINEMA
'Agathe strongly desires to go to the cinema.'
b. $\overline{\text{AGATHE WANT GO CINEMA}}^{\text{woe}}$
'Agathe strongly wants to go to the cinema.'

(385) * AGATHE DESIRE VAVA GO CINEMA
Lit. 'Agathe desires will go to the cinema.'

In this case, following our decision tree, we consider the sentential complement to be infinitival and thus subordinated to the main verb.

Another strategy is possible with an overt NP2, as presented in example (386).

(386) MARIE $\overline{\text{DESIRES}}^{\text{woe}}$ AGATHE GO CINEMA
'Marie desires that Agathe goes to the cinema.'

We continue our syntactic investigation of this strategy only.

7.2.6.2.4 Shift in indexicals? Whenever IX-1 is used, it refers to the signer thus it is not considered as presenting role-shift (see 387).

(387) AGATHE $\overline{\text{DESIRE}}^{\text{woe}}$ $\overline{\text{IX-1 GO CINEMA WITH MARIE}}^{\text{ht}}$
'Agathe desires that I go to the cinema with her.'

7.2.6.2.5 Questions on the second clause It is possible to have a question on arguments of the second clause only, as shown by (388).

(388) MARIE $\overline{\text{DESIRE}}^{\text{woe}}$ AGATHE BUY $\overline{\text{WHAT}}^{\text{wh}}$?
'What does Marie desires Agathe to buy?'

With this piece of data, we can reject an analysis in terms of coordination.

7.2.6.2.6 Questions on the first clause Finally, for both WANT and DESIRE, it is possible to ask questions on the main clause only (see 389).

(389) $\overline{\text{WHO}}^{\text{ht}}$ $\overline{\text{WANT}}^{\text{woe}}$ AGATHE GO CINEMA?
'Who wants that Agathe goes to the cinema?'

7.2.6.2.7 Summary In the light of the properties we have seen so far, we conclude that the desiderative predicates of LSF can take two types of subordinated sentential complements: infinitival and finite clauses.

7.2.7 Modal predicates

7.2.7.1 Main properties

By modal class, we refer here to deontic modals that express an obligation ('have to') or permission ('can'). Noonan (2007) adds to this class the predicates expressing an ability such as 'be able' and removes epistemic modals, which express degrees of knowledge and shall be identified as part of the knowledge-class.

(390) Justine must try the fish and chips in Chicago.

(391) Angélique might get lost in San Diego.

The complements of modal predicates precise the restriction on the deontic domain expressed by the main verb, but they have a determined time reference. Indeed, they can refer either to events in the future or to potential ones. The vast majority of modal complements are subjunctives and/or infinitival across languages.

(392) Charlotte doit rendre sa thèse demain.
Charlotte must submit:INF poss-3sg dissertation tomorrow
'Charlotte must submit her thesis tomorrow.

In some languages, using a subjunctive on the main clause itself can provide a modal interpretation.

7.2.7.2 LSF

An example of all the verbs we found is presented in (393) and illustrated in Figure (84).

(393) Deontic modals predicates in LSF

a. AGATHE $\overset{\text{hn}}{\overline{\text{CAN}}}$ GO CINEMA
'Agathe can go to the cinema.'

b. MARIE $\overset{\text{woe,re}}{\overline{\text{HAVE-TO}}}$ GO CINEMA
'Marie has to go to the cinema.'

c. MARIE $\overset{\text{re}}{\overline{\text{MUST}}}$ GO CINEMA
'Marie must go to the cinema'

7.2.7.2.1 Non-manual and manual Markers The predicates in (393) are non-directional; they are signed with NMMs intensifying the degree of the obligation. For example, 'HAVE-TO' in Figure (84b), is signed with wide-opened eyes and raised eyebrows, to express a strong obligation. Interestingly, HAVE-TO and MUST are very similar, involving the movement of the index finger following a straight path towards the ground. MUST, however, is a single hand sign and HAVE-TO is two-handed (see Figures 84a-84b). The latter expresses a stronger obligation than the former[10]. Additionally, MUST can appear at the beginning of the sentence, before the subject, to express a general obligation.

[10] In fact depending on the orientation of the non-dominant hand, one can derive slightly different meanings. When the palm is facing the ceiling, as in Figure (84b), it expresses a strong obligation. When it faces the interlocutor, it is a compound of HAVE-TO and LAW, which pictures a legal obligation.



(a) 'MUST'.

(b) 'HAVE-TO'.



(c) 'CAN'.

Figure 84. Deonctic modals in LSF

7.2.7.2.2 NP2 covert For all three predicates, HAVE-TO, MUST and CAN, it is impossible to insert a subject in the sentential complement (see the unacceptability of 394).

(394) a. * MARIE CAN AGATHE GO CINEMA
Lit. 'Marie can Agathe go cinema.'

b. * MARIE MUST AGATHE GO CINEMA
Lit. 'Marie must Agathe go cinema.'

7.2.7.2.3 Summary Following our decision tree, these properties call for a subordinated non-finite analysis. Therefore we analyze them as modal predicates taking subordinated and infinitival sentential complements.

7.2.8 Achievement / implicative predicates

7.2.8.1 Main properties

Achievement predicates (whether positive or negative) take complements that share the same time reference as the main predicate. They refer to the manner or reason for the success (or

failure) of the achievement described by the sentential complement.

Among positive achievement predicates, we can cite verbs such as 'dare', 'remember to' or 'manage', see (395), for example.

(395) Nadia remembered to send the letter to her sister.

On the negative side, when the achievement was not reached, we find predicates such as 'try', 'forget' or 'fail to', as illustrated in (396).

(396) Corinne forgot to buy bread on the way home.

The complements are usually non-finite, especially in the case of negative predicates, as shown in (397).

(397) Jean-Christophe avoids talking about politics in the presence of his daughter.

7.2.8.2 LSF

An example of every verb is presented in (398) and illustrated in Figure (85).

(398) Achievement predicates in LSF

a. AGATHE $\overset{\overset{\text{bt}}{\overline{\qquad\qquad}}}{\overset{\text{emo-}}{\overline{\text{AVOID}}}}$ GO CINEMA
'Agathe avoid to go to the cinema.'

b. AGATHE $\overset{\text{emo+,re}}{\overline{\text{SUCCEED}}}$ GO CINEMA
'Agathe succeed to go to the cinema.'

c. AGATHE $\overset{\text{ht+,se}}{\overline{\text{TRY}}}$ GO CINEMA 'Agathe tries to go to the cinema.'

d. AGATHE $\overset{\overset{\text{re}}{\overline{\qquad\qquad}}}{\overset{\text{woe,cdm}}{\overline{\text{FORGET}}}}$ GO CINEMA
'Agathe forgot to go to the cinema.'

e. MARIE $\overset{\overset{\text{re}}{\overline{\qquad\qquad}}}{\overset{\text{se}}{\overline{\text{REMEMBER}}}}$ GO CINEMA
'Marie remembered to go to the cinema.'

Following the definition of achievement predicates, each predicate presented in (398) expresses the manner following which the event described by the sentential complement was realized. Verbs such as (399)-(400) are excluded from this category since the sentential complement refers to knowledge and not achievement. These examples will be treated in the relevant section.

(399) MARIE $\overset{\overset{\text{re}}{\overline{\qquad\qquad}}}{\overset{\text{woe,cdm}}{\overline{\text{FORGET}}}}$ AGATHE GO CINEMA
'Agathe forgot that Marie goes to the cinema.'

(400) MARIE $\overset{\overset{\text{le}}{\overline{\qquad\qquad}}}{\overset{\text{urg,se}}{\overline{\text{REMEMBER}}}}$ AGATHE GO CINEMA
'Marie remembered that Agathe goes to the cinema.'

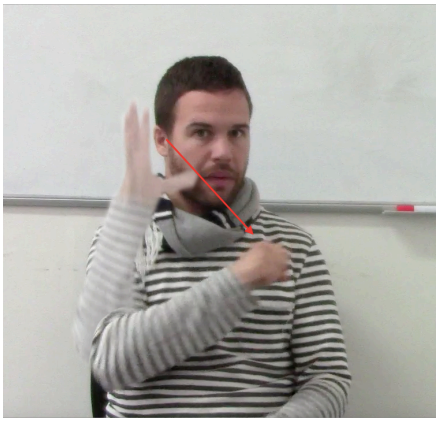
7.2.8.2.1 Non-manual Markers All predicates are non-directional and marked by an emotion marker, which emphasizes the meaning of the verb (see Figure 85).



(a) 'AVOID'.



(b) 'SUCCEED'.



(c) 'FORGET'.



(d) 'REMEMBER'.



(e) 'TRY'.

Figure 85. Achievement predicates in LSF

7.2.8.2.2 Isolation test The achievement predicates in LSF cannot stand in isolation as shown in (401). Their complements cannot either as illustrated in (402).

(401) *AGATHE $\overset{\overset{\text{bt}}{\overline{}}}{\overset{\text{emo-}}{\overline{\text{AVOID}}}}$
'Agathe avoids'

(402) *$\overset{\text{bt}}{\overline{\text{GO CINEMA}}}$
'go to the cinema.

Following our decision tree, this is indicative of the interdependence of the two clauses. The NP2 pattern further confirms this.

7.2.8.2.3 NP2 forcefully covert? For AVOID, TRY and SUCCEED, it is impossible to have an overt NP2 as seen by the unacceptability of (403). In the achievement reading, it is also unacceptable for REMEMBER and FORGET.

(403) a. *MARIE TRY AGATHE GO CINEMA
Int. 'Marie tried to make Agathe go to the cinema.'

b. *MARIE AVOID AGATHE GO CINEMA
Int. 'Marie avoid to make Agathe go to the cinema.'

c. *MARIE SUCCEED AGATHE GO CINEMA
Int. 'Marie succeeded to make Agathe go to the cinema.'

d. *MARIE FORGET AGATHE GO CINEMA
Int. 'Marie forgot to make Agathe go to the cinema.'

e. *MARIE REMEMBER AGATHE GO CINEMA
Int. 'Marie remembered to make Agathe go to the cinema.'

7.2.8.2.4 Summary Following our methodology, the results presented so far indicate that the achievement predicates in LSF are control predicates.

7.2.9 Knowledge / semi factive predicates

7.2.9.1 Main properties

In the class of knowledge/semi factive predicates, we find verbs expressing knowledge ('know', 'be acquainted', '...) and its acquisition ('learn', 'discover'...). Their complement expresses the content of this knowledge and is presupposed to be true (cf. 404).

(404) Sofiane knows [that Charlotte will also come to London].

Most verbs of this class also express the manner through which the knowledge is acquired. This is the case of predicates like 'be surprised' or 'to realize'. The complement does not need to be topical in nature and most often presents new information not previously introduced in the discourse.

In this category, we also find some perceptive verbs which are diverted from their original 'direct perception' meaning (405).

(405) I see that Justine left.
⇝ I notice...

In some languages, we find various strategies to indicate if the perceptual predicate is used as a knowledge predicate or to describe an actual perception. For example, Kouwenberg (1994) observes the use of an additional complementizer 'dati' when the verb 'to see' is used in the knowledge interpretation in Berbice Dutch Creole (example 406).

(406) Berbice Dutch Creole

a. en kik di kal wɛt man
3pl see the small white man
'They saw the little white man.' *Perception*

b. o luru lur lur tuto kikitɛ dato ma pako
3sg look look look until=3sg see-PF **that** IRR come-out
'He looked (and) looked (and) looked until he saw that he would (be able to) escape.'
I.e. 'He found a way to escape' *Knowledge*

From Kouwenberg (1994):130

7.2.9.2 LSF

An example of every verb is presented in (407) and illustrated in Figure (86).

(407) Knowledge predicates in LSF

a. ASHRAF $\overline{\text{UNDERSTAND}}^{\text{re}}$ $\overline{\text{JEAN MARRY MARIE}}^{\text{woe,re,lg}}$
'Ashraf understood that Jean marries Marie.'

b. ASHRAF $\overline{\text{KNOW}}^{\text{hs}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{bt}}$
'Ashraf knows that Marie will marry Jean.'

c. MARIE $\overline{\text{IGNORE}}^{\text{ic,woe}}$ AGATHE GO CINEMA
'Marie ignores that Agathe goes to the cinema.'

d. MARIE $\overline{\text{OBSERVE}}^{\text{se}}$ AGATHE GO CINEMA OFTEN
'Marie observes that Agathe often goes to the cinema.'

e. MARIE $\overline{\text{DISCOVER}}^{\text{se,le}}$ $\overline{\text{WHAT}}^{\text{wcomp}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{re}}$
'Marie discovers that Agathe goes to the cinema.'

f. MARIE $\overline{\text{FIND-OUT AGATHE GO CINEMA}}^{\text{se}}$
'Marie finds out that Agathe goes to the cinema.'

g. MARIE $\overline{\text{SURPRISE}}^{\text{woe}}$ AGATHE GO CINEMA
'Marie learned by surprise that Agathe go to the cinema.'

h. MARIE $\overline{\text{FORGET}}^{\text{woe,cdm}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{re}}$
'Agathe forgot that Marie goes to the cinema.'

i. MARIE $\overline{\text{REMEMBER}}^{\text{urg,se}}$ $\overline{\text{AGATHE GO CINEMA}}^{\text{le}}$
'Marie remembered that Agathe goes to the cinema.'

7.2.9.2.1 Non-manual markers Regarding non-manual markers, knowledge predicates in LSF are primarily accompanied by a non-manual emphasise expressing the degree of knowledge. For example, 'IGNORE'(Figure 86f is signed with a negative headshake and inflated cheeks, which is also a gesture used in French to express the absence of knowledge. For knowledge acquired in a surprising way('SURPRISE', Figure 86d, or 'FIND-OUT', Figure 86g) the non-manual markers reflect this aspect through wide-open eyes and raised eyebrows. All these examples are illustrated in Figure (86). Here again, all the predicates are non-directional.



(a) 'UNDERSTAND'.



(b) 'KNOW'.



(c) 'DISCOVER'.



(d) 'SURPRISE'.



(e) 'OBSERVE'.



(f) 'IGNORE'.

, 

(g) 'FIND-OUT'.

Figure 86. Knowledge predicates in LSF

7.2.9.2.2 Isolation test While knowledge predicates cannot stand in isolation (see 408), their complements can (409).

(408) * MARIE $\overset{\text{se}}{\overline{\text{FIND-OUT}}}$
Lit. 'Marie finds out'

(409) $\overset{\text{se}}{\overline{\text{AGATHE GO CINEMA}}}$
'Agathe goes to the cinema.'

As shown in example (407e), the complementizer WHAT$_{comp}$ can optionally surface, in which case the complement cannot stand in isolation (see 410).

(410) *$\overset{\text{wcomp}}{\overline{\text{WHAT}}}$ $\overset{\text{re}}{\overline{\text{AGATHE GO CINEMA}}}$
'that Agathe goes to the cinema.'

7.2.9.2.3 NP2 forcefully covert and presence of tense All knowledge predicates have a preferred overt NP2 strategy. It is still possible to have a covert NP2, as seen in (411).

(411) MARIE $\overset{\text{se}}{\overline{\text{KNOW}}}$ $\overset{\text{re}}{\overline{\text{TONIGHT}}}$ EAT $\overset{\text{re}}{\overline{\text{CHICKEN}}}$
'Marie knows that tonight (she will/we) eat chicken.'

Whether the NP2 is overt or covert, it is possible to use the tense marker 'VAVA' as shown in (412).

(412) MARIE $\overset{\text{se}}{\overline{\text{KNOW}}}$ $\overset{\text{re}}{\overline{\text{TONIGHT}}}$ VAVA EAT $\overset{\text{re}}{\overline{\text{CHICKEN}}}$
'Marie has understood that (she/we) will be eating crepes tonight.'

7.2.9.2.4 Shift in indexicals? With overt NP2 (see examples 407), it is possible to have a first-person pronoun as the subject of the sentential complement, in which case it refers to the signer. This is illustrated by example (413) and rules out the possibility for it to be direct speech.

(413) MARIE $\overset{\text{bt}}{\overline{\overset{\text{hn,se}}{\overline{\text{KNOW}}}\ \overset{\text{re}}{\overline{\text{IX-1}}}\ \text{GO CINEMA TONIGHT}}}$
'Marie knows that I go to the cinema tonight.'

Therefore, the sentence does not present role-shift and is most likely subordinated.

7.2.9.2.5 Questions on the second clause Regarding the question pattern, it is possible to create one about arguments of the second clause only, as illustrated with UNDERSTAND in (414).

(414) MARIE $\overline{\text{UNDERSTAND}}^{\text{woe}}$ $\overline{\text{WHAT}_{comp} \text{ TONIGHT EAT WHAT}}^{\text{wh}}$?
'What did Marie understood that she/we will eat tonight?'

This piece of data goes against a coordinated analysis.

7.2.9.2.6 Questions on the first clause It is also possible to ask questions on an argument of the main clause only as in (415).

(415) a. $\overline{\text{WHO KNOW}}^{\text{le}}$ $\overline{\text{AGATHE GO CINEMA TONIGHT}}^{\text{ht}}$?
'Who knows Agathe goes to the cinema tonight?'

b. $\overline{\text{WHO}}^{\text{le}}$ $\overline{\text{DISCOVER}}^{\text{woe}}$ $\overline{\text{WHAT}_{c}\text{OMP}}^{\text{re}}$ $\overline{\text{AGATHE GO CINEMA TONIGHT}}^{\text{ht}}$?
'Who discovered that Agathe goes to the cinema tonight?'

7.2.9.2.7 Summary In the light of our syntactic tests, knowledge predicates in LSF all take subordinated finite sentential complements.

7.2.10 Manipulative predicates

7.2.10.1 Main properties

Manipulative predicates entail causation, with either an agent as their subject or a situation as a cause. This is the case of predicates like 'make *someone do something*' and 'force' as well as more indirect cases such as 'ask' and 'require'.

(416) Angélique made Charlotte buy a computer. *Finite*

(417) Charlotte forced Angélique to pay her back. *Infinitive*

(418) Angélique hitting Charlotte$_i$ made her$_i$ call the police. *Situation as subject*

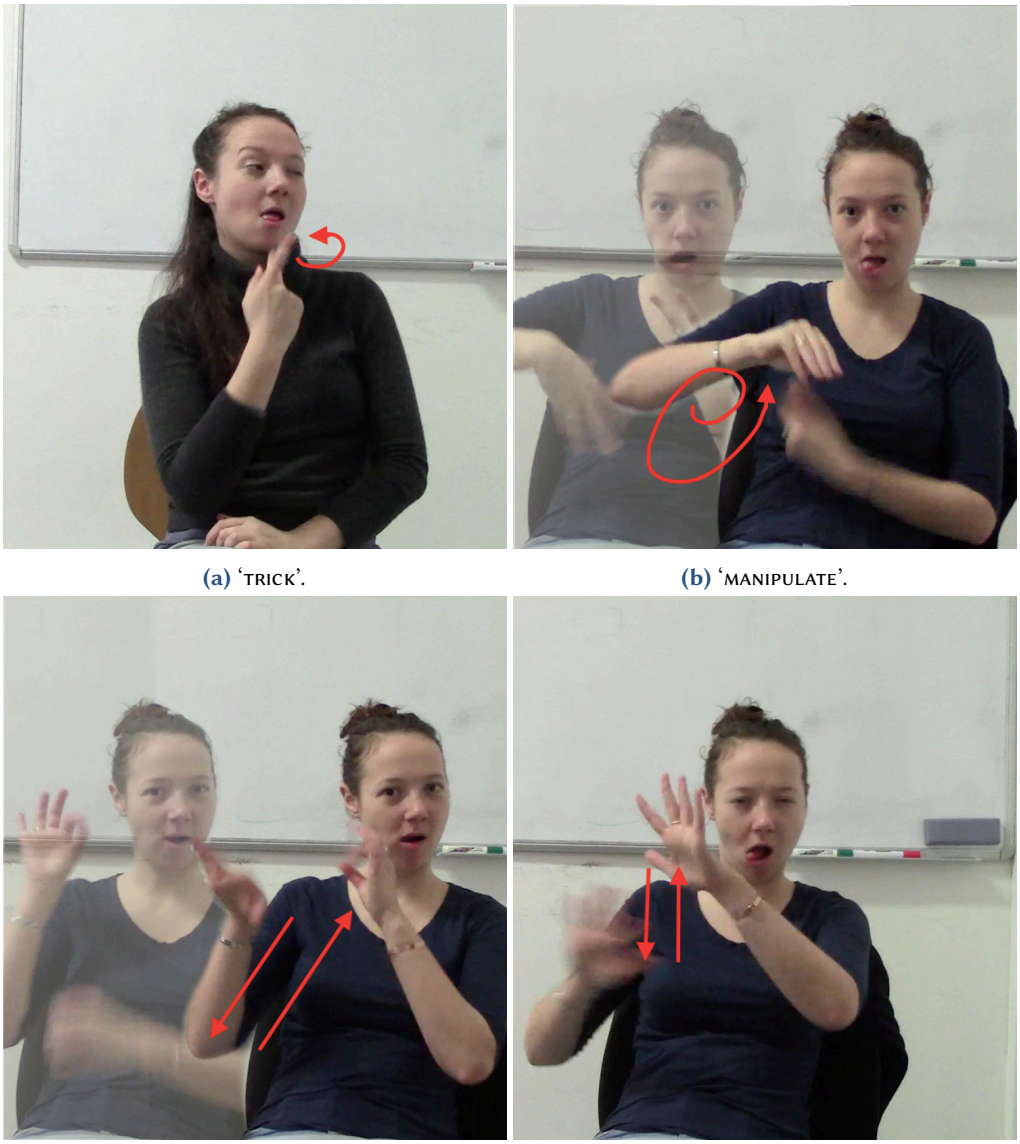
These verbs are usually object control predicates. Indeed, the agent of the subordinated verb is the affectee of the manipulative predicate. In (416), the affectee, Charlotte, is the one buying a computer, not the manipulative Angélique. We see through (419), that the complement of the verb is indeed the whole clause and not the second NP.

(419) *Angélique made Charlotte.

Manipulative verbs are often mistaken for utterance verbs due to their semantic proximity; in both cases, speech is involved. We talk about illocutionary acts (Austin 1975) when the manipulation is permitted through an utterance, as with 'ask' in English (cf. 420).

(420) Marie asks Agathe to do the laundry.
⇝ Marie speaks to Agathe to ask her this.

Whether the resulting situation is indeed realized can be expressed across languages through different means like subjunctive/indicative or subordination/parataxis.



(a) 'TRICK'. (b) 'MANIPULATE'.

(c) 'MANIPULATE II'. (d) 'CONFUSE'.

Figure 87. Manipulative predicates in LSF

7.2.10.2 LSF

There is a group of verbs that directly involve an act of manipulation. They are all marked through a specific non-manual marker (the tongue moving inside of the jaw), which indicates that the agent is willingly manipulating the affectee (see Figure 87).

They present a different word order from the predicates we found so far, as seen in examples (421).

(421) a. $\overset{\text{top}}{\overline{\text{MARIE}}}$ AGATHE $\overset{\text{tongue}}{\overline{\text{MANIPULE}}}$ GO CINEMA
'Agathe manipulates Marie (so that she can) go to the cinema.'

b. $\overset{\text{top}}{\overline{\text{MARIE}}}$ AGATHE $\overset{\text{tongue}}{\overline{\text{TRICK}}}$ GO CINEMA
'Agathe tricks Marie (so that she can) go to the cinema.'

However, upon closer inspection, these sentences do not qualify as predicates taking a

sentential complement. Indeed, in the description we provided, manipulative predicates are object control meaning that they presented an agent, an affectee, and a resultative situation of which, crucially, the affectee is the subject. In (421), the person going to the cinema is, in fact, the agent of the verb, Agathe. Through this, we see that verbs such as 'MANIPULATE' or 'TRICK' take Agathe as their subject and Marie as their complement. This is made salient by the word order and the topic NMMs marker which spread over the complement.

The resulting situation, 'to go to the cinema', is instead an adjunct. Since we are focusing on sentential complements (and not adjuncts), we will leave them out of our present study.

Another group of verbs is suitable. They are presented in (422) and illustrated in Figure (87).

(422)
a. MARIE COMMAND AGATHE^{re} GO CINEMA^{rg,bt}
'Marie commands Agathe to go to the cinema.'

b. MARIE ENCOURAGE^{rg,bt} AGATHE^{re} GO CINEMA^{rg,bt}
'Marie encourages Agathe to go to the cinema.'

c. MARIE PUSH^{rg} AGATHE GO CINEMA^{bt}
'Marie pushes Agathe to go to the cinema.'

d. MARIE CONVINCE^{rg} AGATHE GO CINEMA^{bt}
'Marie convinces Agathe to go to the cinema.'

e. MARIE ADVISE^{rg,bt} AGATHE GO CINEMA
'Marie advises Agathe to go to the cinema.'

f. MARIE ALLOW^{rg} AGATHE GO CINEMA^{bt}
'Marie allows Agathe to go to the cinema.'

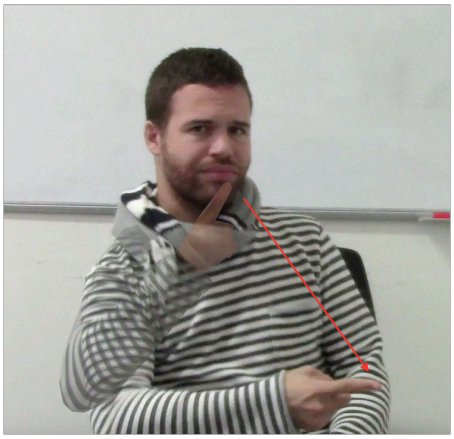
g. MARIE LET^{bt,rg} AGATHE GO CINEMA^{ht}
'Marie lets Agathe going to the cinema.'

h. MARIE PROPOSE^{rg} AGATHE GO CINEMA^{bt}
'Marie proposes to Agathe to go to the cinema.'

Here, as described in the previous section, the subject of the main clause manipulate the affectee into doing something. The impossibility, most of the time, to have only the affectee as a complement, supports the fact that the whole sentence is the complement, as in (423).

(423) *MARIE COMMAND AGATHE
'Marie commands Agathe.'

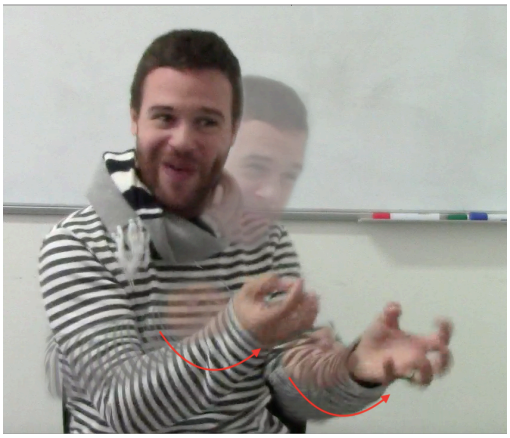
7.2.10.2.1 Non-manual markers The manipulative predicates in LSF are marked through non-manual markers similar to those used for utterance predicates: the body of the signer is oriented towards the affectee location, and this spreads over the whole sentential predicate. Regarding eye gaze direction, however, it is also directed towards the affectee (see Figure 88) while it was directed towards the agent in utterance predicates. In this category, the verbs are partially directional (only the object of the verb is expressed as the endpoint of the movement) and pattern alike throughout all the syntactic tests.



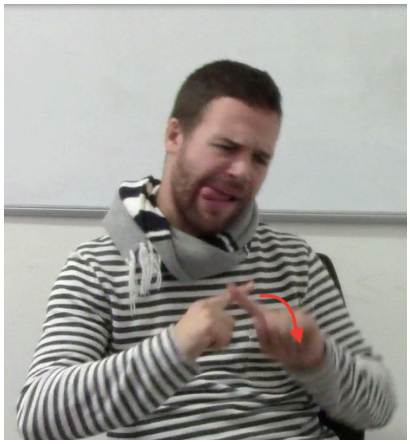
(a) 'COMMAND'.



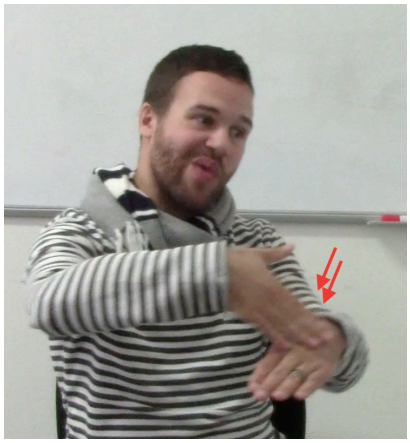
(b) 'ENCOURAGE'.



(c) 'PUSH'.



(d) 'CONVINCE'.



(e) 'ADVISE'.



(f) 'ALLOW'.



(g) 'LET'. **(h)** 'PROPOSE'.

Figure 88. (Actual) manipulative predicates in LSF

7.2.10.2.2 Isolation test In general, the main clause cannot appear in isolation (424). Similarly, the presence of the body turn leads informants to judge the sentential complements as being questionable (see 425).

(424) * $\overline{\text{MARIE PROPOSE}}^{\text{bt,rg}}$
Lit. 'Marie propose.'

(425) # $\overline{\text{AGATHE GO CINEMA}}^{\text{bt}}$
Lit. 'Agathe going to the cinema.'

There is no strong unacceptability of the isolated sentential complement. Hence we continue our syntactic tests.

7.2.10.2.3 Covert NP2 and use of tense As expected from their semantics, the presence of the affectee is obligatory, which means that the NP2 cannot be covert with or without the tense marker VAVA (see 426).

(426) a. * MARIE COMMAND GO CINEMA
Int. 'Marie commands to go to the cinema.'

b. * MARIE COMMAND VAVA GO CINEMA
Lit. 'Marie commands will go to the cinema.'

7.2.10.2.4 Indexical shift? Whenever the NP2 is 'IX-1', it refers to the signer. Notice that this is expected since one usually does not push or convince oneself. Nevertheless, this property rules out the possibility for the sentential complement to be role-shift.

(427) MARIE $\overline{\text{PROPOSE}}^{\text{woe}}$ IX-1 GO CINEMA
'Marie proposes me to go to the cinema.'

7.2.10.2.5 Questions on the second clause Regarding the question pattern, it is possible to have questions about the second clause only, as illustrated in example (428).

(428) MARIE COMMAND AGATHE BUY WHAT?
'What does Marie command Agathe to buy?'

Hence the two clauses cannot be coordinated.

7.2.10.2.6 Questions on the first clause It is also possible for the manipulative predicates to have questions on the main clause only, as in (429).

(429) WHO PUSH AGATHE GO CINEMA?
'Who pushes Agathe to go to the cinema?'

7.2.10.2.7 Summary In the light of our investigations, it appears that the verbs we presented in this category are all manipulative predicates taking subordinated finite sentential complements.

7.2.11 Phasal / aspectual predicates

7.2.11.1 Main properties

Also called 'aspectual' (Newmeyer 1969), these predicates refer to inception, continuation, iteration, or termination of an action that the sentential complement describes. The main verb expresses the phase at which the subject (an agent) is, and puts it in relation to the action described by the dependent verb (430).

(430) Sofiane continues to write his thesis.

Cristofaro (2003) argues that this property of putting an explicit relation between two predicates distinguishes them from ordinary aspectual markers such as 'now' or the perfect/imperfect contrast (cf. example 431).

(431) Sofiane is writing his thesis.
→ One predicate

In (431), we have no indications of whether the subject is at the beginning, end, or middle of his action.

Across languages, strategies differ on whether the phasal predicates take a sentential complement (TP or CP), an infinitival complement, or expresse the phase through an adverbial clause. Regarding sentential forms, they are generally infinitival. Apart from complementation, phasal notions can be expressed through verbal morphology (affixes, particles, or reduplication).

7.2.11.2 LSF

Aspectual information, as well as the phasal status of verbs, are often directly encoded in the morphology of the verb itself through reduplication or modulations of the movement path (Kuhn and Aristodemo 2017). Nevertheless, few predicates correspond to the description provided by Noonan (2007), an example of each is presented in (432). Some illustrations are presented in Figure (89).

(432) Phasal predicates in LSF

a. MARIE BEGIN GO CINEMA
'Marie begins to go to the cinema.'

b. AGATHE $\overset{\text{hn}}{\overline{\text{CONTINUE}}}$ GO CINEMA
'Agathe continues to go to the cinema.'

c. $\overset{\text{re}}{\overline{\text{MARIE}}}$ $\overset{\text{hs,emo-}}{\overline{\text{STOP}}}$ GO CINEMA
'Marie stops going to the cinema'



(a) 'BEGIN'. (b) 'STOP'.

(c) 'CONTINUE'.

Figure 89. Phasal predicates in LSF

7.2.11.2.1 Non-manual markers Regarding non-manual markers, we observe a slight marking emphasizing the meaning of the verb. For example, STOP (Figure 89b) is signed with a frowned face and a headshake while CONTINUE (Figure 89c) is marked by an assertive head nod which can spread over the whole complement. Both STOP and BEGIN (Figure 89a) can be used with a different word order, preceding the subject, as illustrated in (433).

(433) a. $\overset{\text{hn,dg}}{\overline{\text{BEGIN}}}$ AGATHE GO CINEMA
'Agathe begins to go the cinema.'

b. $\overset{\text{hs,emo-}}{\overline{\text{STOP}}}$ AGATHE GO CINEMA
'Agathe stops to go to the cinema.'

This change in word order does not appear to affect the non-manual markers used nor the meaning derived from the sentence.

7.2.11.2.2 NP2 forcefully covert? All three predicates take sentential complements presenting covert NP2 only. The unacceptability of (434) shows this.

(434) *MARIE BEGIN AGATHE GO CINEMA
Int. 'Marie begins to make Agathe go to the cinema.'

In that respect, they are either control or raising predicates.

7.2.11.2.3 Is 'VAVA' compatible with the predicate? Additionally, it is not possible to insert VAVA after the main verb, while it is perfectly acceptable before (see 435).

(435) a. $\overline{\text{MARIE}}^{\text{re}}$ $\overline{\text{VAVA}}^{\text{re}}$ $\overline{\text{STOP}}^{\text{hs,emo-}}$ GO CINEMA
'Marie will stop going to the cinema'

b. $\overline{\text{VAVA}}^{\text{re}}$ $\overline{\text{STOP}}^{\text{hs,emo-}}$ MARIE GO CINEMA
'Marie will stop going to the cinema'

c. *MARIE $\overline{\text{STOP}}^{\text{hs,emo-}}$ $\overline{\text{VAVA}}^{\text{re}}$ GO CINEMA
Lit. 'Marie stop will go to the cinema'

7.2.11.2.4 Summary In the light of these results, the sentential complement appears to be infinitival, hence subordinated to the phasal predicates.

7.2.12 Perceptive predicates

7.2.12.1 Main properties

The perceptive class contains verbs referring to the sensory mode through which an event is perceived. This is the case of predicates like 'see', 'smell', 'hear' or 'watch'[11]. Their complements describe the event perceived and are often realized through participial clauses (cf. 436).

(436) John saw the pilot drowning.

With perceptive predicates, the subject of the complement sentence is the direct object of the main verb. In addition to participial, complements can be infinitival or finite, as in example (437).

(437) a. Marie entend la voiture démarrant dans l'allée.
Marie hear:pst the car start:PARTpst in the alley

b. Marie entend la voiture qui démarre dans l'allée.
Marie hear:pst the car which start:FIN in the alley

c. Marie entend la voiture démarrer dans l'allée.
Marie hear:pst the car start:INF in the alley.
'Marie hears the car starting in the alley.

[11] Noonan (1985) also classes predicates such as 'imagine' in this category despite having previously associated it to the pretence-class. While we agree with the rationale, we prefer to keep together real-world perception verbs and leave 'imagine' as a pretence verb.

It is essential here to remark that the sentence in (437b) is a pseudo-relative. This means that, while it looks like a relative clause, semantically, it is the whole event that serves as the complement of the main verb. This is so, despite the NP acting *prima facie* as its direct object. Indeed, in (438), 'Justine' is not hearing 'Charlotte' but the whole event corresponding to her playing piano.

(438) Justine hears Charlotte playing piano.

7.2.12.2 LSF

An example of every verb is presented in (439) and illustrated in Figure (90).

(439) Perceptive predicates in LSF

a. MARIE SEE$^{\text{bt,rg}}$ AGATHE GO CINEMA
'Marie saw Agathe going to the cinema.'

b. MARIE CATCH-EYE$^{\text{bt,rg}}$ AGATHE GO CINEMA$^{\text{ht,re}}$.
'Marie caught Agathe going to the cinema.'

c. MARIE HEAR$^{\text{ht,le}}$ AGATHE PIANO-PLAY$^{\text{re,tl}}$
'Marie heard Agathe playing piano.'

d. MARIE SEE-NOT$^{\text{hs}}$ AGATHE GO CINEMA.
'Marie did not see Agathe going to the cinema.'

7.2.12.2.1 Non-manual markers Regarding the non-manual markers, almost all perceptive predicates are signed with the body leaning towards the perceived situation. The eyegaze being also directed towards it (see Figures 90d, 90a and 90b). These non-manual markers spread from the main predicate to the end of the sentence.
Interestingly, the only predicate which goes whithout this NMMs is 'SEE-NOT' (Figure 90c), where there is nothing to be perceived. In this respect, the body lean and eyegaze could be interpreted as a marker of evidentiality.



(a) 'CATCH-EYE'.



(b) 'HEAR'.



(c) 'SEE-NOT'. (d) 'SEE'.

Figure 90. Perception predicates in LSF

7.2.12.2.2 Isolation test The main verb cannot stand alone, as shown by the unacceptability of (440). The second clause, on the other hand, is judged acceptable (441).

(440) * $\overset{\text{bt,rg}}{\overline{\text{MARIE SEE}}}$
Lit. 'Marie sees.'

(441) AGATHE GO CINEMA
'Agathe goes to the cinema.'

7.2.12.2.3 NP2 forcefully covert? To qualify as a complex sentence, the NP2 of the sentential complement has to be overt. If it is covert, it is interpreted as absent, in which case the sentence is interpreted as being mono-clausal as shown in (442).

(442) $\overset{\text{le,ht}}{\overline{\text{MARIE HEAR PIANO-PLAY}}}$
'Marie hears piano.'

7.2.12.2.4 Is the predicate compatible with tense markers? Arguments of perceptive predicates are finite, as seen by the acceptability of (443). In this case, however, we used the tense marker 'DONE' (following Millet and Verlaine (2017)) as the future tense was not compatible with the perceptive act.

(443) MARIE $\overset{\text{lg,le,ht}}{\overline{\text{HEAR}}}$ NEIGHBOUR ARGUE DONE
'Marie heard that the neighbor have been arguing.'

7.2.12.2.5 Shift in indexicals? There is no role-shift in complements of perceptive predicates, as seen by the reference associated with 'IX-1' in (444).

(444) $\overset{\text{bt}}{\overline{\text{IX-1 GO CINEMA}}}$ MARIE $\overset{\text{rg}}{\overline{\text{CATCH-EYE}}}$[12]
'Marie caught me going to the cinema.'

[12]Recall from the Introduction that both SVO and SOV are attested word orders in LSF. The position of the sentential complement depends on our informants' preferred word order. The two alternatives are however equivalent.

7.2.12.2.6 Questions on the second clause Regarding questions, it is possible to create one about the arguments of the second clause, as shown in (445).

(445) WHAT MARIE $\overset{\text{rg,ht}}{\overline{\text{HEAR}}}$ NEIGHBOR $\overset{\text{wh}}{\underline{\quad\quad}}$
'What did Marie hear the neighbor (doing)?'

7.2.12.2.7 Questions on the first clause Similarly, it is possible to create a question on the main clause only, as seen in example (446).

(446) $\overset{\text{wh}}{\overline{\text{WHO}}}$ $\overset{\text{bt,rg}}{\overline{\text{SEE NEIGHBOR ARGUE}}}$
'Who saw the neighbors arguing?'

7.2.12.2.8 Summary Perceptive predicates in LSF take subordinated finite sentential complements.

7.2.13 Complementizer in LSF

In this subsection, we want to explain in more significant detail the reasons which lead us to analyze WHAT$_{comp}$ as a complementizer. This is the fourth use we propose for the sign 'WHAT'; hence we need to explain a) why it is not the interrogative wh-word, b) why it is not the wh-word used in QAP and c) why it is not the wh-word used in free-choice relatives.

7.2.13.1 WHAT*comp* does not introduce questions

WHAT$_{comp}$ is not interpreted as being interrogative by any of our informants. It is also associated with different morpho-phonological features.

The interrogative 'WHAT' is co-articulated with a mouthing component [kwa], corresponding to the French interrogative word 'quoi'. It also has to be signed with frowned/low eyebrows (see Figure 91).



Figure 91. Interrogative 'WHAT'

On the other hand, WHAT$_{comp}$ is signed with tensed lips (Figure 92a), raised eyebrows and with a shorter movement, both in time and in 'hands', as the sign can also be realized single-handedly (Figure 92b).



(a) Two-handed 'WHAT$_{comp}$'



(b) WHAT$_{comp}$ realized with one hand.

Figure 92. Complementizer 'WHAT*comp*'

Additionally, recall from examples (349) or (414), repeated here after as (447) and (448), that WHAT$_{comp}$ can be used within questions, along with other interrogative words.

(447) MARIE LIKE WHAT$_{comp}$ AGATHE GO WHERE$^{\text{wh/lc}}$?
'Where does Marie likes that Agathe goes?'

(448) MARIE UNDERSTAND$^{\text{woe}}$ WHAT$_{comp}$ TONIGHT EAT WHAT$^{\text{wh}}$?
'What did Marie understood that she/we will eat tonight?'

In this respect, WHAT$_{comp}$ is clearly not an interrogative.

7.2.13.2 WHAT*comp* is not a focalization strategy

Now, one might wonder what differentiates WHAT$_{comp}$ from the 'WHAT' that we find in the construction described in Chapter II.6.

The main difference is functional: LSF QAP, being specificational pseudoclefts, are focalization structures. In this respect, they are optional and the wh-word used is adapted to the focalized constituent. Example (217a) is repeated hereafter as (449).

(449) BOY$_i$ FLOWER OFFER **WHO**$^{\text{br}}$ POSS-3$_i$ LOVER GIRL *QAP*
'The person to whom the boy offers flowers is his girl fiancee.'

On the other hand, WHAT$_{comp}$ is obligatory to introduce the sentential complements of LIKE, SAD,DISLIKE, HATE and SAD.

Additionally, the introduction of WHAT$_{comp}$ licenses the tense-marker 'VAVA' in the covert NP2 alternatives (compare again 345 and 346, repeated here as 450 and 451).

(450) *MARIE { LIKE / DISLIKE / HATE / DESPISE / SAD } VAVA GO CINEMA
Lit. 'Marie likes/dislikes/hates/despises/is sad to will go to the cinema.'

(451) MARIE SAD WHAT$_{comp}$ VAVA GO CINEMA. MOVIE SUCK
(tl: WHAT$_{comp}$; emo-ht: VAVA GO CINEMA.)
'Marie is sad that she will go to the cinema. The movie sucks.'

In the light of these properties, we are thus facing two different functions for two different strategies; the pseudo-cleft strategy is used for focalization, it is optional and can present different wh-words. The complementizer strategy has to be 'WHAT', and it is obligatory to introduce finite sentential complements with some verbs.

7.2.13.3 WHAT*comp* does not introduce a free-choice relative

We have seen in Chapter II.6 that there are free-choice relative clauses in LSF introduced by WHAT, as illustrated in (231) repeated here as (452).

(452) IX-2 CAN EAT WHAT PREFER
(br: WHAT)
'You can eat whatever (you) prefer.'

It is quite clear that the sentence in (451) cannot receive a free-relative interpretation: neither the main clause nor the subordinated one can be interpreted as nominal in this context.

Finally, when we asked our informants to explain the use of the 'WHAT$_{comp}$' strategy, they said that it creates a link between the verb and what follows. We would not have better described the function of complementizers.

7.3 Discussion

7.3.1 On non-manual marking

Regarding the non-manual markings, we have identified several non-manual markers that are systematically associated with some predicates and semantic content.

Indeed, we saw that the presence of a corned-down mouth was indicative of a hypothetical proposition (see Figure 93), while inflated cheeks indicated the absence of knowledge (Figure 94).



Figure 93. Corned-down mouth or 'doubt-mouth' in LSF.



Figure 94. Inflated cheeks indicate the absence of knowledge in LSF.

The presence of wide-open eyes involved asserted knowledge, as shown in Figure (95a) or intensity, in the case of modals (Figure 95b).



(a) Asserted knowledge **(b)** Intensity marker

Figure 95. Wide open eyes in LSF.

On the other hand, squinted eyes indicated non-asserted knowledge, coming from guesses (see Figure 96).



Figure 96. Squinted eyes in LSF

As for pretence predicates, they were all marked through an upward right gaze, indicative of non-real worlds (see Figure 97).



Figure 97. Upward right gaze in LSF

It is interesting to notice the shared behavior between manipulative, utterance, and perceptive predicates; they are all realized with a body or head turn, spreading over the main verb and the sentential complement. Additionally, the verb is marked with eye gaze directed at the event, as shown in Table (21).

According to Noonan's repartition of semantic roles across realis and irrealis modalities (Figure 98), utterance and perceptive predicates are realis while manipulative predicates are irrealis.

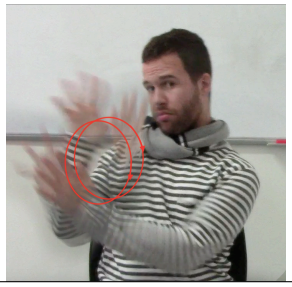
Type of predicate	LSF predicates	NMMs	Spreading	Illustration
Utterance	SAY, INFORM, SIGN	body turn, raised eyebrows and right gaze	$\overset{\overset{\text{bt}}{\overline{\text{re,rg}}}}{\text{main verb} \rightarrow \text{end}}$	
Manipulative	COMMAND, ENCOURAGE, PUSH, CONVINCE, ADVISE, ALLOW, LET, PROPOSE	body turn and right gaze	$\overset{\text{bt,rg}}{\overline{\text{main verb} \rightarrow \text{the end}}}$	
Perceptive	SEE, HEAR, CATCH-EYE	body/head turn and right gaze	$\overset{\text{bt,rg}}{\overline{\text{(NP1) main verb } (\rightarrow \text{ the end})}}$	

Table 21. List of predicates marked by a body/head turn and right gaze in LSF .



(a) SEE non-manual marking **(b)** SEE-NOT non-manual marking

Figure 99. Comparison of non-manual markers for SEE and SEE-NOT

COMPLEMENT ROLE	
REALIS	assertion
	report of assertion
	positive propositional attitude
	background (factive)
IRREALIS	negative propositional attitude
	hypothetical proposition
	DTR (commands, requests, intentions, desires, etc.)

Figure 98. Semantic roles of complements *From Noonan (1985):140*

This is shown by the fact that complements of utterance predicates have an independent time reference and that perceptive predicates' complements are factive. Manipulative predicates' complements, on the other hand, have a determined time reference, leaving them in the other category. What justifies the shared NMMs then?

If this question will need more in-depth investigation the minimal pair given by SEE (in which the set of NMMs is present, see Figure 99a) and SEE-NOT (in which it is absent, Figure 99b) could offer insights on the link between evidentiality (the fact that the situation has to be witnessed/take place) and a change in the whole body orientation.

To conclude our remarks on NMMs, we have also noticed that most predicates' meaning were emphasized through 'intensifier' markers. They could represent emotions as for commentative, fear, or achievement predicates but could also represent the act referred by the verb (as for modal predicates, for example). These markers were spreading over the verb only and did not appear to help the syntactic process. A possible interpretation could be to consider them as adverbs, following Millet and Verlaine (2017). More work on this topic is needed.

7.3.2 On complementizers

Now, our investigations have also led us to notice the use of a complementizer without which some commentative predicates could not take finite sentential complements. Glossed as WHAT$_{comp}$, its position within the sentence, its non-manual marking (raised eyebrows) as well as its clear wh-element origin are all strikingly similar to the wh-word used in QAP described in Chapter II.6. While the two are primarily differentiated by their purpose (the latter being a focalization strategy, the former introducing sentential complements), we believe that their resemblance

is no coincidence. Indeed, we have seen throughout the cross-linguistic comparison of sign languages in Chapter II.6 that the QAP is getting more and more nominalized. In this context, WHAT$_{comp}$ seems to be in the complementizer position, hence heading the CP projection instead of sitting in its specifier like the former 'WHAT' wh-word. In this respect, LSF might provide interesting insights into the wh-morphology of many spoken language's complementizers.

While we mainly described the obligatory presence of WHAT$_{comp}$ for possibly ambiguous predicates such as LIKE or DESPISE, we have already seen that its use can be wider. Indeed, the sentence in (314), repeated here as (453), presents a single-handedly signed WHAT$_{comp}$ introducing its sentential complement. WHAT$_{comp}$ can also be used to introduce the sentential complement of 'DISCOVER', as shown by example (454).

(453) $\overline{\text{MARIE SAY}_x}^{\text{re}}\ \overline{\text{WHAT}_{comp}}^{\text{wcomp}}\ \overline{\text{IX-1}}^{\overline{\text{re,woe}}^{\text{bt}}}\ \text{GO CINEMA}$
'Marie says that I go to the cinema.'

(454) $\overline{\text{WHO}}^{\text{wh}}\ \overline{\text{DISCOVER}}^{\text{woe,re}}\ \overline{\text{WHAT}_{comp}}^{\text{wcomp}}\ \overline{\text{AGATHE GO CINEMA}}^{\overline{\text{re}}^{\text{ht}}}$?
'Who discovered that Agathe went to the cinema?'

In this respect, WHAT$_{comp}$ might be at the beginning of its use as a complementizer.

To conclude, our investigations have confirmed that semantic complementation is indeed a very favorable environment for syntactic subordination since the vast majority of predicates we identified take subordinated sentential complements. We provide a summary of our results in Table (22).

Type of predicate	LSF verbs	Isolation?	NP2 covert?	Tense?	R-S?	Extr.sub clause	Extr. 1st clause	Type of complement
Utterance	SAY, INFORM, SIGN	✓	optional	yes	optional	yes	yes	role-shift or finite sub. sentential comp. with either overt or covert NP2.
Propositional Attitude	BELIEVE, THINK, FEEL, FEEL POSSIBLE, FEEL SURE, NOT-SURE, THINK-NOT	✓	optional	yes	no	yes	yes	finite sub. sentential comp. with either overt or covert NP2.
Pretence	IMAGINE, DREAM, DREAM-POP-UP, THINK, HAS-IDEA	✓	optional	yes	no	yes	yes	finite sub. sentential comp. with either overt or covert NP2.
Commentat--ive / Factive	LIKE, DISLIKE, SAD, HATE, DESPISE + **comp.**	X	optional	yes	no	yes	yes	finite sub. sentential comp. with either overt or covert NP2.
	LIKE, DISLIKE, SAD, HATE, DESPISE - **comp.**	✓	yes	no				infinitival sub. complement.
	RELIEVED, REGRET	✓	optional	yes	no	yes	yes	finite sub. sentential comp. with either overt or covert NP2.
	SORRY	—	no	yes	yes			role-shift
Fear	STRESS, AFRAID, HESITATE, NOT-WANT	✓	optional	yes	no	yes	yes	finite sub. sentential comp. with either overt or covert NP2.

Table 22. Predicates and their complements in LSF.

Type of predicate	LSF verbs	Isolation?	NP2 covert?	Tense?	R-S?	Extr.sub clause	Extr. 1st clause	Type of complement
Desiderative	DESIRE, WANT	—	yes	no				infinitival sub. complement.
	DESIRE, WANT	✓	no	yes	no	yes	yes	finite sub. sentential comp. with overt NP2
Modal	CAN, HAVE-TO, MUST	—	Forced					Control or raising predicate
Achievement	SUCCEED, AVOID, FORGET, REMEMBER, TRY	—	Forced					Control or raising predicate
Knowledge/ Semi-factive	UNDERSTAND, KNOW, IGNORE, OBSERVE, DISCOVER, FIND-OUT, SURPRISE, FORGET, REMEMBER	✓	optional	yes	no	yes	yes	finite sub. sentential comp. with either overt or covert NP2.
Manipulative	COMMAND, ENCOURAGE, PUSH, CONVINCE, ADVISE, ALLOW, LET, PROPOSE	✓	no	yes	no	yes	yes	finite sub. sentential comp. with forcefully overt NP2.
Phasal/ Aspect	BEGIN, CONTINUE, STOP	—	Forced					Control or raising predicate
Perspective	SEE, CATCH-EYE, HEAR, SEE-NOT	✓	no	yes	no	yes	yes	finite sub. sentential comp. with preferably overt NP2.

Table 22. Predicates and their complements in LSF (continuation).

Conclusion Part II

With the investigation of temporal clauses, question-answer pairs, and sentential complements in LSF, we have seen that the study of sign language grammar can shed light on fine-grained typological variations within signed languages, on general linguistic categories and the language investigated itself.

Through the comparison of LIS and LSF temporal clauses, we highlighted that the two signed languages present two different underlying structures. Despite a *prima facie* resemblance, LIS temporal clauses are subordinated while LSF ones are coordinated. These results were made visible through syntactic and semantic tests, which we then applied to the investigation of QAP in LSF.

In the Chapter II.6, we showed that LSF QAP exhibit Type A specificational pseudoclefts properties and analyzed them as involving a topic-comment structure (following Den Dikken, Meinunger, and Wilder 2000). Moreover, we showed that the study of this particular construction in sign languages could inform general linguistic analyses as the fine-grained differences we found between ASL/NGT, LSF and LIS lead us to propose a grammaticalization process taking question/answer as its starting point and referential free-relatives as its ending point. In doing so, we contributed to the debate on the question origin of both specificational pseudoclefts and free-relatives.

Finally, we investigated Sentential complements in LSF using the same syntactic tests, which prove to be very useful throughout this dissertation. Along our path, we saw that LSF displays syntactically various sentential complements from finite and non-finite subordinated complements to role-shift complements. Additionally, we showed that LSF has a productive use of a complementizer as well as some specific NMMs marking subordination.

Conclusion

When we started our investigation of French Sign Language syntax, we had in mind two fundamental questions: is this language allowing recursive embedding, and does it display dependent, subordinated clauses? With the study of relative clauses in LSF, we have answered positively to both questions. The broad impact of these findings concerns the status of language in the visual modality as we demonstrate the presence of genuine embedding at the nominal level. Hence, the debates revolving around the idea that the core component of human language is the recursive property should not threaten SL status. In a more specific perspective, our work provide an important contribution to the empirical documentation of LSF.

In fact, we have shown that LSF has a sophisticated, fine-grained system that displays externally/internally headed relative clauses, headed by constituents varying both in animacy (human, non-human and inanimate) and in nature (from subject/object to the whole event). Through isolation and extraction tests, we have confirmed that relative clauses were subordinated to the main clause and that they were islands. We also showed that the relative marker introducing the relative clause affected its semantic interpretation. In that line, the mirror properties of PI-relatives and PERSON-CL-relatives lead us to propose two different analyses. Since PI-relatives can stack and be recursively embedded within each other, they are restrictive. They can additionally introduce amount relatives as long as a classifier for quantity is present (whether realized as an independent sign or within the morphology of the head noun). As PERSON-CL-relatives can modify proper names, cannot stack or be recursively embedded, and require the head noun to carry some specificity traits, they are appositive. The non-manual marking strategy requires more investigation but appears to be at least compatible with appositive and maximalizing interpretations. Our research showed that highly abstract constraints on language structure (e.g., amount relatives) interacts with iconic properties of the language like the classifier system, showing that both formal and iconic principles are not in contradiction with each other but rather "conspire" to shape the grammar of SL.

In answering the main questions, other important issues emerged that were contingent on the particular findings about LSF. Specifically, the fact that LSF has both object and subject externally headed relative clauses allowed us to make concrete predictions about the processing of these constructions. Attached to this empirical question, other issues emerged on the most appropriate methodology to test the predictions. Standard research techniques could not immediately be exported to SL. An intensive work of adaptation to languages in the visual modality was needed. Since our work represents the first attempt at addressing this aspect by transforming an audio-visual protocol into a visual-only display, we carefully validated it through a first experiment carried on French. In this language, the presence of a subject advantage has been demonstrated through several methods (Labelle 1990, Fragman 2000 or Guasti and Cardinaletti 2003), including the (audio-) VWP (Pozniak 2018). The fact that we replicated this effect with our visual-only display proves that the protocol we created is reliable. Using it to investigate LSF, we discovered the presence of a subject advantage, making the processing of subject relative clauses easier (and faster, and more accurate) than for object relative clauses. This experimental approach also allowed us to include a broader and more diverse population of LSF signers, hence allowing us to generalize our previously-made conclusions about LSF relative clauses.

While the first part of the dissertation was more oriented to address big theoretical questions with empirical data coming from LSF, the second part of the dissertation fullfills the second main aspect of our research, namely language documentation. In this part we provided a wide study on sentential complementation in LSF and two detailed studies on two specific constructions:

one are Question-Answer constructions, as these are quite common both in LSF and in other SL. The other are temporal constructions, as an individual case study on adjunct subordination. Although this part was more empirically oriented, the findings led me to provide concrete answers to other theoretical and typological questions that were open in SL linguistics and beyond.

For temporal clauses, we compared LSF AFTER/BEFORE/SAME-TIME clauses to their LIS counterparts. Regarding LIS, the impossibility for the temporal clause to stand alone or to be inverted, the asymmetric and symmetric extraction pattern and the non-manual marking of the clauses were clear indicators of subordination. However, LSF presented the opposite pattern on every test just mentioned: the temporal clause can stand alone, its inversion with the other clause leads to a change in meaning, questions can only be formed on both clauses at the same time and the set of NMMs, namely the left/right localization of the two clauses, is typical of coordination. There are many more temporal constructions that still need to be analyzed in LSF; still, our study shows that sign languages display fine-grained typological variations which, crucially, are captured by the theoretical tests described in the literature.

This relationship between sign languages and previously established literature is mutually informative, as we have shown through the study of QAP in LSF. Indeed, in this chapter, we have shown that the 1970s old debate about the question-nature of free-relatives and specificational pseudoclefts is still relevant and can be answered through the study of sign language data. Our arguments root on the fine-grained differences between QAP in ASL and NGT, LSF, and LIS, but also on other constructions described in the spoken language literature. In ASL and NGT, the authors argued that the QAP involves an embedded question and an embedded answer, which form a syntactic constituent (Davidson, Caponigro, and Mayberry 2008b, Caponigro and Davidson 2011 or Kimmelman and Vink 2017). This analysis is based on the syntactic and semantic properties of the question-constituent (absence of doubling, range of wh-words available, cannot be inverted nor questioned ...) and of the answer-constituent (can be a full clause or an indirect answer, has to be exhaustive, cannot be negated ...). LSF QAP, on the other hand, can be negated, present an obligatory movement of the wh-word to the right edge of the wh-constituent and allow questions on the whole clause. We showed that this was incompatible with an analysis in terms of embedded questions and argued in favor of a Type A specificational pseudocleft analysis based on their shared pattern in terms of preventing inversion of the two clauses and predicating over the wh-constituent. Additionally, the presence of free-choice free-relatives in LSF (but not in ASL) and the absence of referential free-relatives in this language (but not in LIS), led us to consider that specificational pseudoclefts, free-choice free-relatives, and referential free-relatives are three different steps of the grammaticalization process we support. Along these lines, we considered QAP instantiated in the different sign languages as different steps leading from question/answer to referential free-relatives.

Finally, we turned our attention to sentential complementation as, due to the robust semantic link between main predicates and their complements, it represents a likely environment for subordination to appear (Noonan 1985 or Quer et al. 2017b). In this chapter, the problem remained the same: how are linked the two clauses of these complex constructions, on a structural level? To answer this question, we used the syntactic and semantic tests which were proven useful throughout this thesis, in a systematic and applied approach. We provided an extensive review of the different sentential complements and strategies found in LSF and found that all sentential complements (but one, SORRY) were subordinated to the main predicate they completed. Nevertheless, sentential complements varied on other aspects such as finiteness, or the forced control of their reference by the (raising or control) main predicate, as summarized in the table we provided at the end of the chapter. Strikingly, we identified a wh-like complementizer, WHAT$_{comp}$, mandatory to introduce some finite sentential complements and optional for others.

After comparing it to the wh-word introducing questions, QAP, and free-choice free-relatives, we concluded that it was yet another, different, use of WHAT$_{comp}$, to be considered on its own. This discovery goes directly against the commonly accepted claim that sign languages do not present complementizers. If tested carefully and systematically, instances of complementizers could surface in other SL as well.

Through all the investigations we carried in this dissertation, we have shown that the study of LSF goes beyond the interest of the language itself; it informs us on a broader level about human languages and their possibilities. With the study of relative clauses, we have shown that the whole event can be taken as the head of the relative, hence extending the Accessibility Hierarchy (Comrie 1989) to a step beyond adjuncts. Through the investigation of QAP we provided new arguments in favor of concealed question approaches to specificational pseudoclefts (Schlenker 2003, Den Dikken 2001 or Iwasaki 2012). We also helped the debate about the similarity between free-relatives and questions, extending the grammaticalization process defended in Kimmelman and Vink (2017). On a more basic level, we also made progress in the typological description of variations across both signed and spoken languages by integrating LSF to the pool of data available regarding temporal clauses and sentential complements.

From a methodological perspective, we have shown that most tools used to investigate spoken languages can also be informative and relevant to study signed languages. Juxtaposition, coordination, or subordination can be reliably identified through several semantic and syntactic tests. Psycholinguistic methods can be adapted to fit the visual-only display needed to investigate signed languages (Chapter I.4). We have shown that this adaptation needs to be controlled carefully, however, through an experiment on an already studied language. With the same caution, we hope that our review of the claims about QAP 'do and don't' (Chapter II.6), which we summarized through a table, will be useful to scholars interested in this topic.

To conclude, we hope that our dissertation will contribute to attracting more and more researchers towards the study of sign languages and LSF and that it will help future sign language researchers with the practical toolbox we tried to elaborate on along with our work.

Résumé substantiel

Lorsque nous avons commencé notre enquête sur la syntaxe de la langue des signes française, nous avions à l'esprit deux questions fondamentales : cette langue présente-t-elle des structures complexes sous la forme de phrases subordonnées et ces dernières peuvent-elles s'enchâsser les unes dans les autres, de manière récursive ? En étudiant les propositions relatives en LSF, nous avons répondu positivement aux deux aspects de ces questions. Au travers de ces résultats, nous démontrons la présence de subordination et de récursivité au niveau nominal, confirmant ainsi que les langues visuelles démontrent la même complexité syntaxique que les langues orales. Par conséquent, les débats tournant autour de l'idée que l'élément central du langage humain est la propriété récursive ne devraient pas menacer le statut des langues signées. Dans une perspective plus spécifique, nos travaux apportent une contribution importante à la documentation empirique de la grammaire de LSF.

De fait, nous avons montré que la LSF présente un système sophistiqué, variant finement dans sa sémantique et dans sa syntaxe. En effet, on trouve en LSF des propositions relatives à tête externe ou interne, qui peuvent modifier des constituants variant à la fois en nature sémantique (humains, non humains et inanimés) et en nature syntaxique (du sujet/objet à l'événement entier). Grâce au test syntaxique de l'isolation, nous avons confirmé que les propositions relatives en LSF étaient subordonnées, et donc dépendantes, de la proposition principale. Par le test syntaxique de l'extraction, nous avons aussi montré que les propositions relatives en LSF sont, comme leur équivalent dans les langues orales, des îlots pour les questions malgré l'absence d'extraction à la forme phonologique. Par ailleurs, nous avons également montré que le pronom relatif introduisant la proposition relative affectait son interprétation sémantique. Ainsi, les propositions relatives introduites par PI et celles introduites par PERSON-CL reçoivent deux analyses différentes. Les propositions introduites par PI sont enchâssables de manière récursive et peuvent aussi modifier plusieurs fois la même tête, elles sont donc restrictives. Elle peuvent en outre introduire des relatives de quantité si un classifieur de quantité est présent (qu'il soit réalisé comme un signe indépendant ou dans la morphologie du signe modifié, la tête). Inversement, les propositions relatives introduites par PERSON-CL peuvent modifier des noms propres, ne peuvent pas s'enchâsser ou modifier plusieurs fois la même tête, et requièrent que la tête de la relative porte certains traits sémantiques de spécificité, ces propositions sont donc appositives. Enfin, la stratégie consistant à marquer les propositions relatives seulement avec des marqueurs non-manuels nécessite plus de recherches, mais elle semble au moins compatible avec une analyse appositive et maximale/de quantité. Notre recherche a ainsi montré que les contraintes très abstraites liées à la structure de la langue (par exemple, l'opération de maximalisation) interagissent avec les propriétés iconiques telles que le système de classifieurs, montrant que les principes formels et iconiques ne sont pas en contradiction les uns avec les autres mais, au contraire, intéragissent pour former la grammaire des langues signées.

Alors que nous répondions aux questions principales, d'autres questions importantes sont apparues, du fait des conclusions propres à la LSF. En particulier, le fait que la LSF présente à la fois des propositions relatives objet et sujet nous a permis de faire des prédictions concrètes quant au traitement de ces constructions. Dans la littérature psycholinguistique, il a en effet été montré à travers de nombreuses langues orales qu'il existe une asymétrie entre ces relatives ; les propositions relatives sujet sont comprises plus facilement et plus rapidement que les propositions relatives objet. Il n'existe cependant aucune étude en la matière pour les langues signées, notamment du fait que les techniques de recherche standard sont souvent audio-visuelles et donc, de prime-abord, inadapté à l'étude des langues signées. C'est pourquoi il était nécessaire de

nous interroger avant tout sur la méthodologie la plus appropriée pour tester nos prédictions en LSF. Après avoir adapté le protocole dit du Monde Visuel (VWP) à une présentation uniquement visuelle, nous avons pris soin de mettre à l'épreuve notre nouveau design en étudiant d'abord le français. En effet, dans cette langue, la présence d'un avantage en faveurs des propositions relatives sujet a été démontrée au moyen de plusieurs méthodes (Labelle 1990, Fragman 2000 ou Guasti and Cardinaletti 2003), y compris via la version audio-visuelle du Monde Visuel (Pozniak 2018). Nous disposions ainsi d'une paire minimale nous permettant de comparer les résultats obtenus pas Pozniak (2018) avec la version audio-visuelle et nos propres résultats obtenus avec la version visuelle du même protocole. De fait, nous avons effectivement reproduit l'avantage du sujet décrit par Pozniak (2018), montrant ainsi la validité et la fiabilité de notre version du protocole. À la lumière de ces résultats, nous avons pû l'utiliser pour étudier la LSF, nous permettant de découvrir la présence d'un avantage sujet dans cette langue également, rendant le traitement des propositions relatives sujet plus facile (et plus rapide et plus précis) que pour les relatives objet. Plus largement, cette approche expérimentale nous a permis d'inclure une population plus représentative (en nombre et en variation des conditions d'acquistion) de Sourds signant la LSF, ce qui nous a permis de généraliser nos conclusions antérieures sur les propositions relatives en LSF.

Alors que la première partie de cette thèse cherchait à adresser les grandes questions théoriques grâce aux données expérimentales et empiriques de la LSF, la seconde partie de cette thèse s'intéresse au deuxième aspect principal de notre recherche, la documentation linguistique. Dans cette partie, nous avons fourni une vaste étude sur la complémentation clausale en LSF et deux études détaillées sur deux constructions spécifiques : les fausses questions (ou QAP) d'une part, car elles sont assez courantes tant en LSF que dans les autres langues signées et les constructions temporelles d'autre part, qui représentent une étude de cas de la subordination adjointe. Bien que cette seconde partie soit plus descriptive, les résultats m'ont amené à apporter des réponses concrètes à d'autres questions théoriques et typologiques qui restaient ouvertes en linguistique des langues signées et au-delà.

Pour les clauses temporelles, nous avons comparé les propositions temporelles intégrant les signes AFTER/BEFORE/SAME-TIME en LSF à leur équivalent en LIS. En ce qui concerne la LIS, l'impossibilité pour la clause temporelle d'être autonome ou inversée avec la principale, le schéma d'extraction asymétrique et symétrique et le marquage non manuel des clauses étaient des indicateurs clairs de subordination. Cependant, la LSF a présenté le schéma inverse pour chacun des tests mentionnés ci-dessus : la clause temporelle peut apparaître de manière autonome, son inversion avec l'autre clause entraîne un changement de sens, les questions ne peuvent être formées que sur les deux clauses en même temps et l'ensemble des NMMs, à savoir la localisation gauche / droite des deux clauses, est typique de la coordination. Il y a encore beaucoup d'autres constructions temporelles à analyser en LSF ; cependant, notre étude montre que les langues des signes présentent de fines variations typologiques qui, de manière cruciale, sont identifiables par les tests théoriques décrits dans la littérature.

Cette relation entre les langues des signes et la littérature pré-existante est mutuellement informative, comme nous l'avons montré par l'étude des QAP en LSF. En effet, dans ce chapitre, nous avons montré que le débat datant des années 1970 quant à la nature des questions, des propositions relatives libres et des clivées est toujours d'actualité et peut être adressé par l'étude des langues des signes. Nos arguments s'appuient sur les fines variations entre les QAP présentes en ASL et NGT, en LSF et en LIS, mais aussi sur d'autres constructions décrites dans la littérature à propos des langues orales. En ASL et en NGT, les auteurs soutiennent que les QAP impliquent une question et une réponse enchâssées sous une proposition principale, formant ainsi un constituant syntaxique (Davidson, Caponigro, and Mayberry 2008b, Caponigro and Davidson 2011 ou Kimmelman and Vink 2017). Cette analyse est basée sur les propriétés syntaxiques et

sémantiques du constituant-question (absence de doublement, étendue des mots wh- disponibles, non réversibilité et absence de marqueurs de négation…) et du constituant-réponse (peut être une phrase complète ou une réponse indirecte, doit être exhaustif…). En revanche, en étudiant les QAP en LSF, on remarque que le schéma n'est pas exactement le même. En effet, les QAP peuvent être niées, présentent un mouvement obligatoire du mot wh à la droite du constituant-question et peuvent même être questionnées. Nous avons montré que cela était incompatible avec une analyse en termes de questions enchâssées et avons plaidé en faveur d'une analyse de structure pseudo-clivée spécificationelle de type A (Declerck 1988) sur la base des propriétés partagées par les deux structures. En outre, la présence d'un certain type de propositions relatives sans tête, dites à choix libre, en LSF (mais pas en ASL) et l'absence des relatives sans tête dites référentielles dans cette langue (mais pas en LIS), nous a amené à considérer que les pseudo-clivées spécificationalles, les relatives sans tête à choix libres et celles dites référentielles sont trois étapes différentes du processus de grammaticalisation que nous soutenons. Dans cette optique, nous avons considéré les QAP présentées dans les différentes langues signées étudiées jusqu'à présent comme différentes étapes de ce processus menant de la question/réponse à des propositions relatives sans têtes référentielles.

Enfin, nous nous sommes penchés sur la complémentation clausale car, en raison du lien sémantique solide entre les prédicats principaux et leurs compléments, elle représente un environnement favorable pour que la subordination apparaisse (Noonan 1985 ou Quer et al. 2017b). Dans ce chapitre, le problème est resté le même : comment sont liées les deux clauses de ces constructions complexes, au niveau structurel ? Pour répondre à cette question, nous avons utilisé les tests syntaxiques et sémantiques qui se sont avérés utiles tout au long de cette thèse, dans une approche systématique et appliquée. Nous avons fourni un examen approfondi des différents compléments et stratégies trouvés dans LSF et avons constaté que tous les compléments sententiels (sauf un, SORRY) étaient subordonnés au prédicat principal qu'ils complètent. Néanmoins, les compléments clausals variaient sur d'autres aspects tels que le caractère fini/non-fini ou le contrôle forcé de leur référence par le prédicat principal (par montée ou contrôle), tel que résumé dans le tableau que nous avons fourni à la fin de ce chapitre. Surprenamment, nous avons identifié un complémenteur de type wh, WHAT$_{comp}$, obligatoire pour introduire certains compléments finis et facultatif pour les autres. Après l'avoir comparé à l'élément wh introduisant les questions, les QAP, ou les propositions relatives sans tête, nous avons conclu qu'il s'agissait bien d'un complémenteur, dédié à introduire la subordination, à considérer isolément des autres cas. Cette découverte va directement à l'encontre de l'affirmation communément admise selon laquelle les langues des signes ne présentent pas de complémenteurs. Testés avec soin et systématiquement, des instances de complémenteurs pourraient également apparaître dans d'autres langues signées.

À travers toutes les recherches que nous avons menées dans cette thèse, nous avons montré que l'étude de la LSF va au-delà de l'intérêt de la langue elle-même ; elle nous informe à un niveau plus large sur les langues humaines et leurs possibilités. Avec l'étude des propositions relatives, nous avons montré que la proposition elle-même peut être considérée comme la tête de la relative, étendant ainsi la Hiérarchie proposée par Comrie (1989) au-delà des adjoints. Grâce à l'étude des QAP, nous avons fourni de nouveaux arguments en faveur d'approches arguant que les pseudo-clivées specificationnelles intègrent des questions cachées (Schlenker 2003, Den Dikken 2001 ou Iwasaki 2012). Nous avons également contribué au débat sur la similarité entre les relatives sans tête et les questions, en étendant le processus de grammaticalisation défendu dans Kimmelman and Vink (2017). Sur un plan plus fondamental, nous avons également progressé dans la description typologique des variations entre les langues des signes et les langues parlées en intégrant la LSF à l'ensemble des données disponibles concernant les clauses temporelles et les compléments sententiels.

D'un point de vue méthodologique, nous avons montré que la plupart des outils utilisés pour étudier les langues orales peuvent également être informatifs et pertinents pour étudier les langues des signes. La juxtaposition, la coordination ou la subordination peuvent être identifiées de manière fiable par plusieurs tests sémantiques et syntaxiques. Les méthodes psycholinguistiques peuvent être adaptées à un affichage uniquement visuel, nécessaire à l'étude des langues des signes (chapitre I.4). Nous avons montré que cette adaptation doit cependant être soigneusement contrôlée par une expérience sur une langue déjà étudiée. Avec la même prudence, nous espérons que notre examen des mythes au sujet des QAP (Chapitre II.6), que nous avons résumé dans un tableau, sera utile aux chercheurs intéressés par ce sujet.

En conclusion, nous espérons que notre thèse contribuera à attirer de plus en plus de chercheurs vers l'étude des langues des signes et des LSF et qu'elle aidera les futurs étudiants en langue des signes avec la boîte à outils pratique que nous avons essayé de développer en parallèle à nos travaux.

Communications

The studies carried out during this thesis gave rise to the following communications:

Articles:

Published or accepted

- Charlotte Hauser and Carlo Geraci (2017). "Relativization Strategies in LSF, some preliminary results." *Proceedings of the FEAST 2017 conference* 1, pp. 16–26
- Charlotte Hauser (2018). "Question-answer-pairs: the help of LSF.". *Proceedings of the FEAST 2018 conference* 2, pp. 44–55
- Valentina Aristodemo and Charlotte Hauser (To appear). "Similar but different: comparing LIS and LSF temporal clauses." *GLOSSA*

Submitted or to be submitted

- Charlotte Hauser and Céline Pozniak (In prep.). "Reconsidering the visual world paradigm to study signed languages: the Subject Advantage in LSF."

Conferences:

Oral presentation

- 'LSF and LIS temporal clauses: similar but different' , Nantes, TFL
- 'LSF temporal clauses in a typological perspective', Hangzhou, 8th ICFL
- 'When percolation takes time; the case of question-answer pairs', Hangzhou, 8th ICFL
- 'Les clauses temporelles en LIS et LSF: similaires mais pas identiques',Paris, IIIè Rencontres Interdisciplinaires franco-brésiliennes : Surdité, Singularité et Universalité
- 'Question-answer pairs in LSF', Florianópolis, 3rd EISSI
- 'Question-answer pairs, the help of sign languages', Venise, Formal and Experimental Advances in Sign Language Theory (FEAST)
- 'Pseudoclefts in LSF', Villejuif, Workshop on Clefts and related focus constructions.
- 'Relativization strategies in LSF: a typological perspective', Osaka, Spoken and Sign Languages Linguistics (SSLL) 2017
- 'Relative clauses in LSF: a preliminary study', Reykjavik, Formal and Experimental Advances in Sign Language Theory (FEAST)

Poster

- 'Eye-tracking investigation of LSF relative clauses', Moscow, 25th AmLAP (Architecture and Mechanisms of Language Processing).
- 'LSF and LIS temporal clauses: similar but different', Hamburg, 13th TISLR (Theoretical Issues in Sign Language Researches).

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Appendices

In this dissertation we have elicited data through fieldwork methods. To do so, we used LSF examples found on line or within corpora whenever possible, or we elicited the constructions we were interested in through drawings we realized. In this Appendix, we start by presenting the pictures which we used to elicit relativization strategies in LSF, when we had no idea whether they existed or not.
We then present the two pictures we used in the temporal clauses investigation.
Regarding the psycholinguistic experiment, we attached the ethical-committee validation of our project and then present the long list of material (stimulus and pictures) we used in our procedure. We also present the details of the statistical models we used to investigate accuracy and visual processing in the two populations we studied.

Appendix A

Relative clauses

A.1 Pictures used for the elicitation

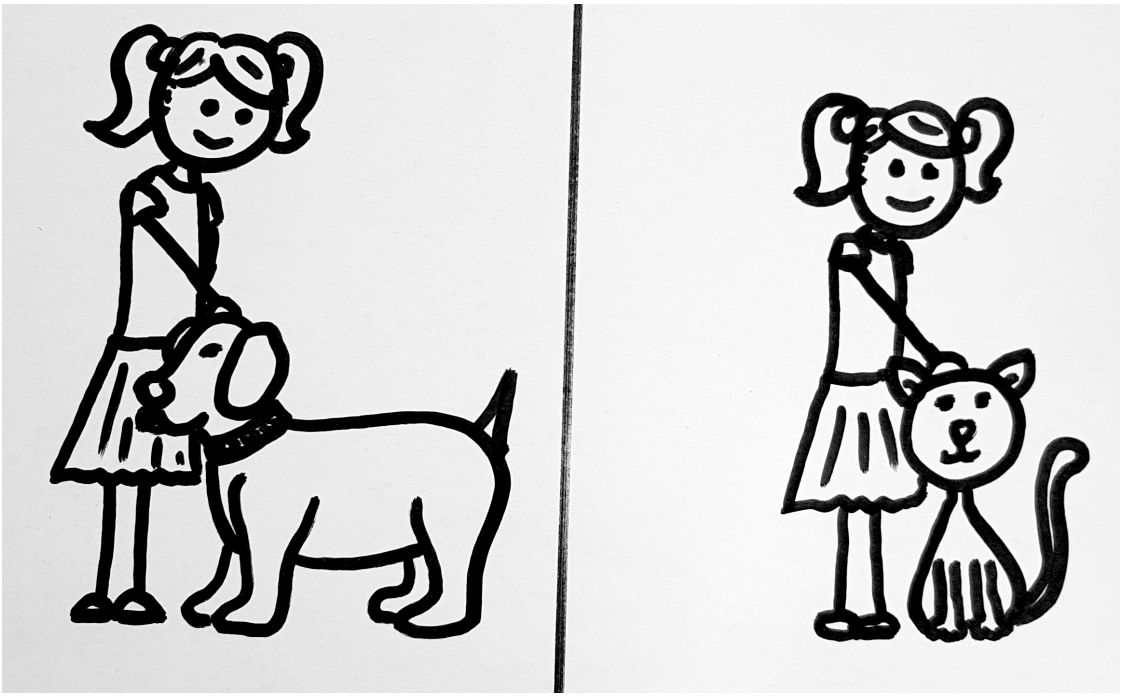


Figure 100. Picture used to elicit "IX-1 PREFER LITTLE GIRL PI PET DOG"

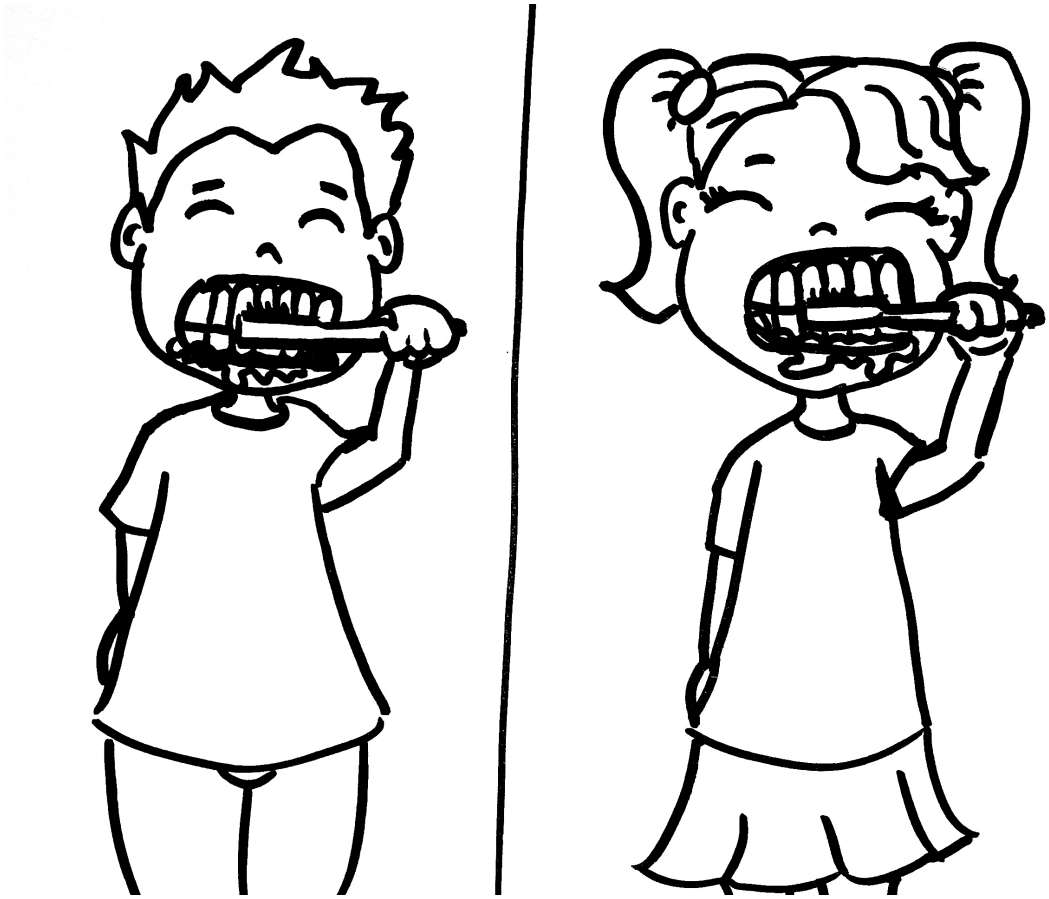


Figure 101. Picture used to elicit "IX-1 PREFER TOOTHBRUSH PI BOY USE"

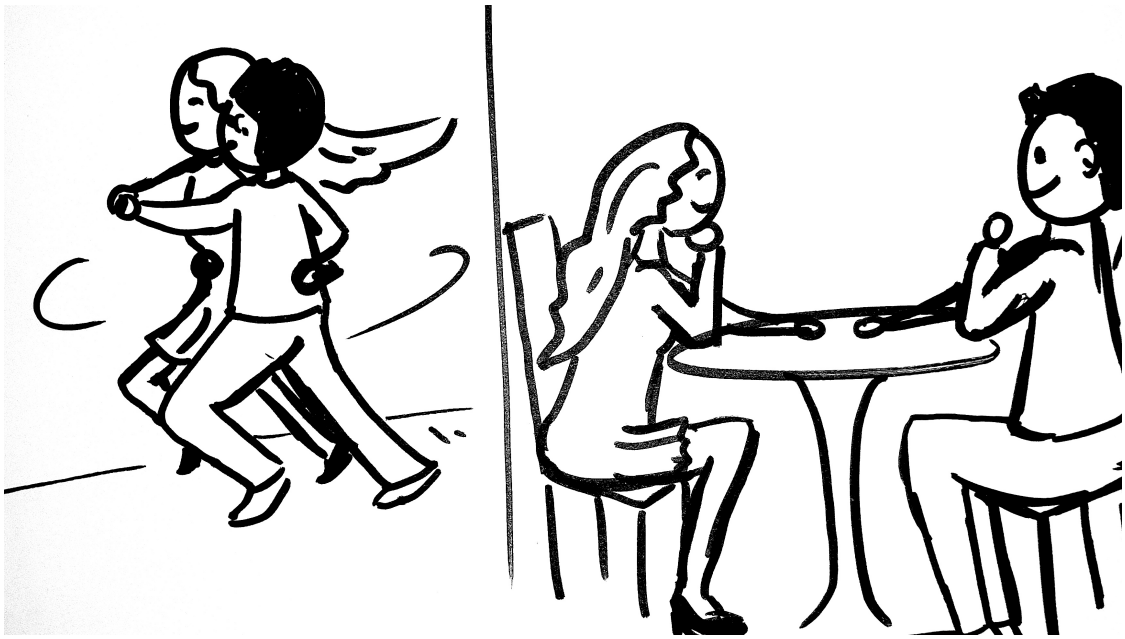


Figure 102. Picture used to elicit "IX-1 PREFER PI WOMAN DANCE WITH MAN"

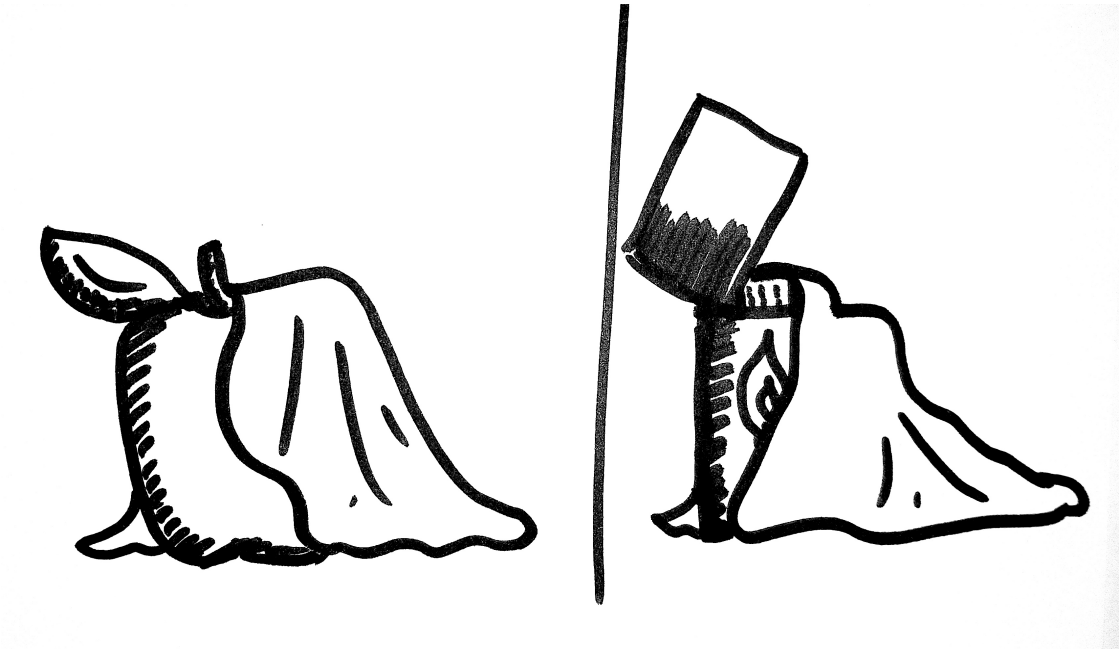


Figure 103. Picture used to elicit "IX-1 PREFER PI NAPKIN COVER LIGHTER"



Figure 104. Picture used to elicit "IX-1 PREFER TOOTHBRUSH PI GIRL PAINT"

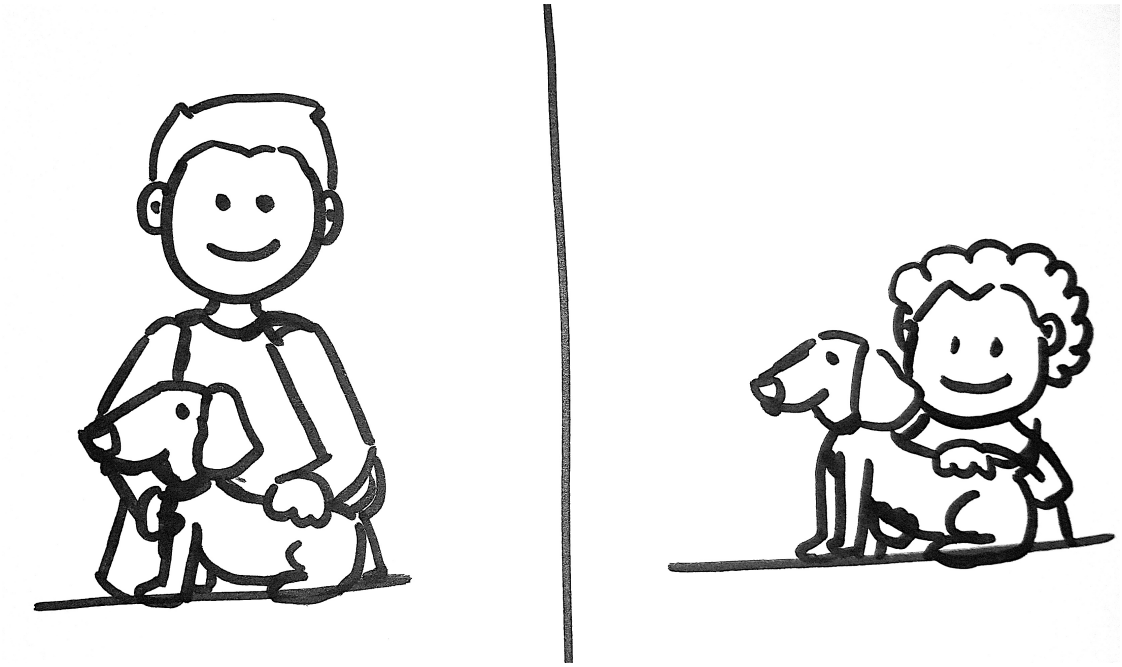


Figure 105. Picture used to elicit "IX-1 PREFER DOG PI MAN PET"

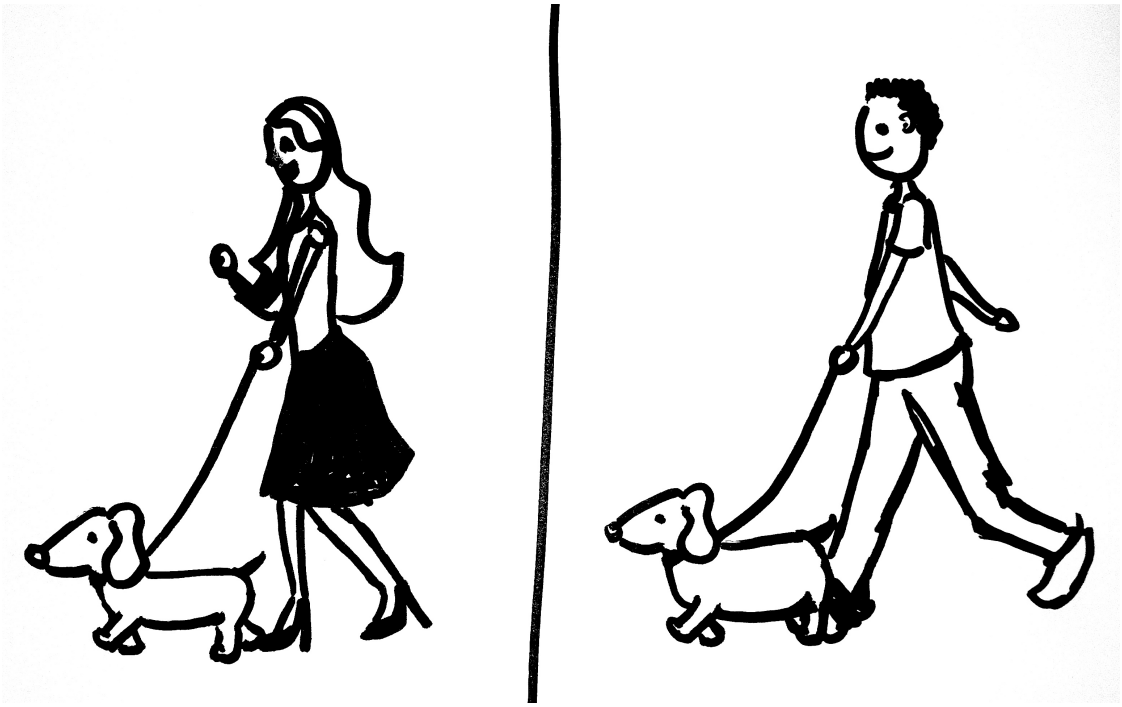


Figure 106. Picture used to elicit "IX-1 PREFER DOG WITH PI WOMAN WALK"

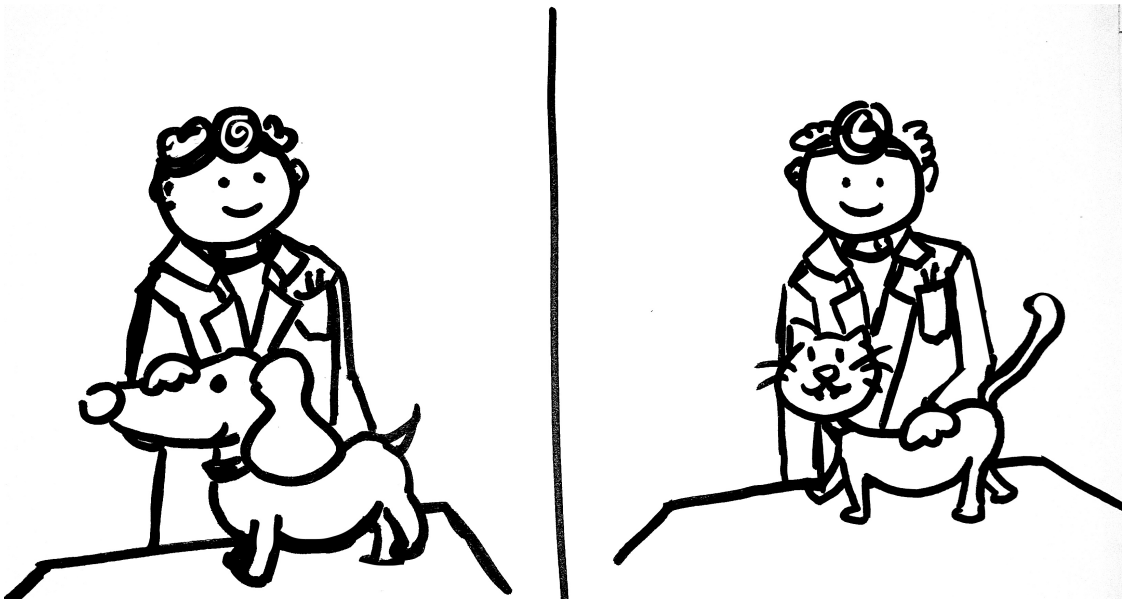


Figure 107. Picture used to elicit "IX-1 PREFER VET PI CURE DOG"

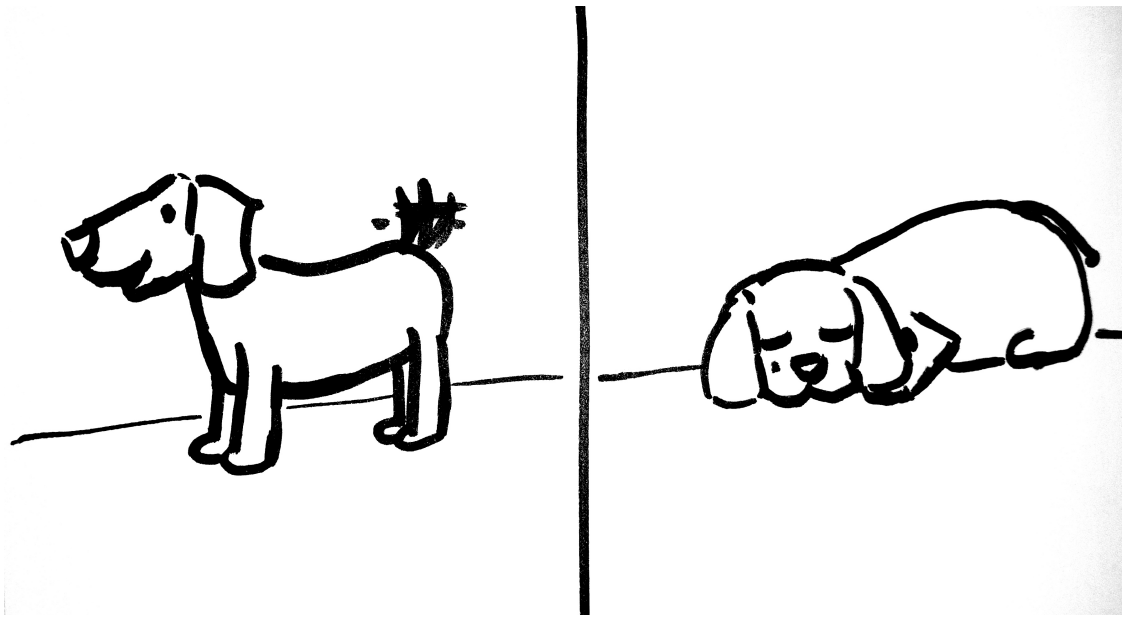


Figure 108. Picture used to elicit "IX-1 PREFER GOD PI SLEEP"

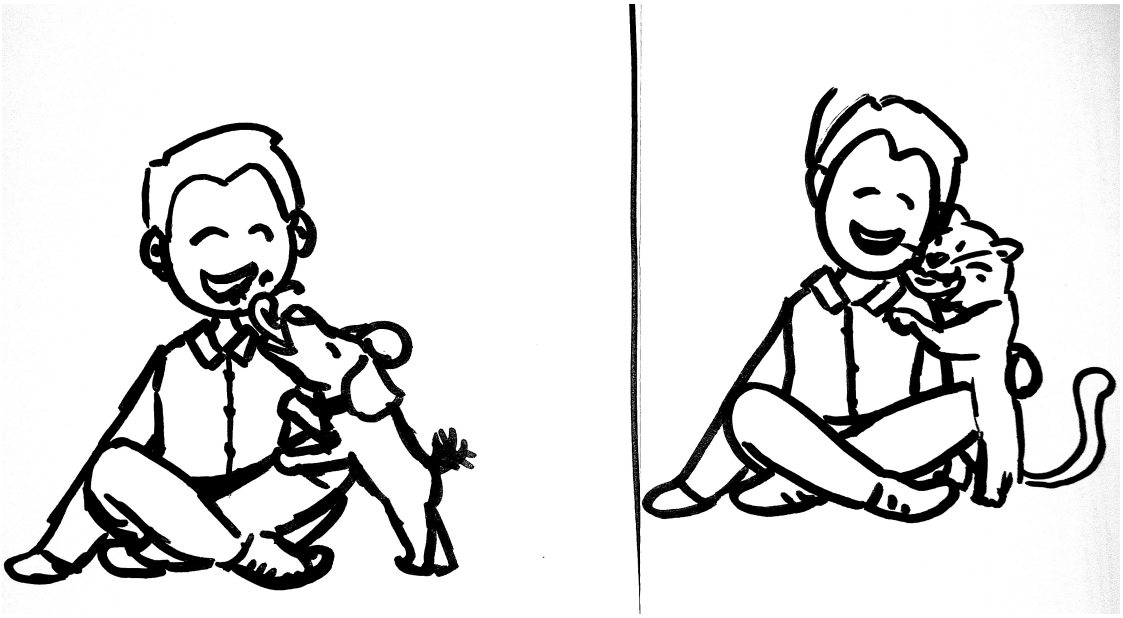


Figure 109. Picture used to elicit "IX-1 PREFER MAN PI DOG LICK"

Appendix B

Temporal clauses

B.1 Pictures used for the elicitation

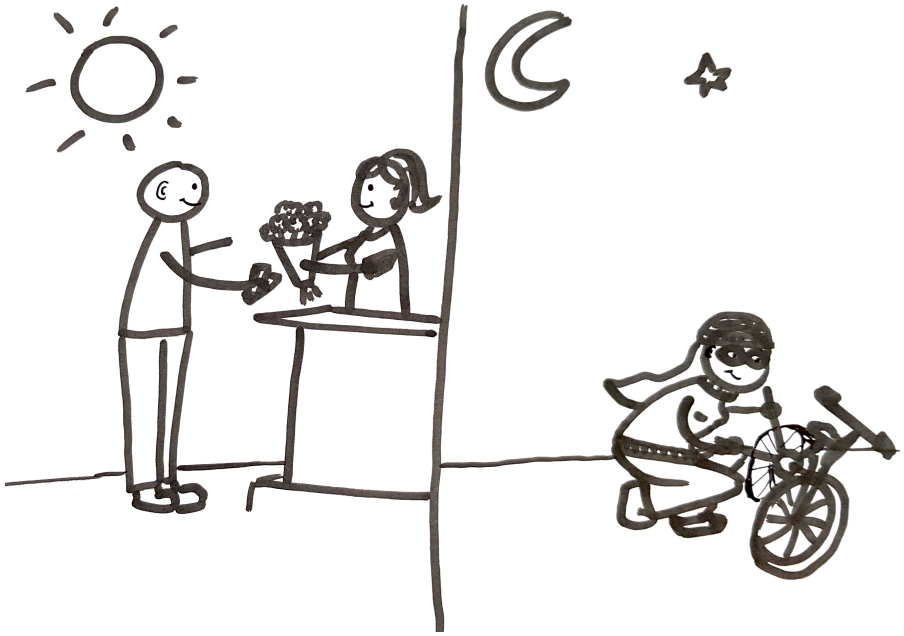


Figure 110. Picture used to elicit after/before/same time relations between the event 'Jean buys flowers' and 'Marie steals a bike'.



Figure 111. Picture used to elicit after/before/same time relations between the event 'Jean buys flowers' and 'Marie buys a vase'.

APPENDIX C

Psycholinguistic

C.1 Training

C.1.1 Contexts and stimuli

All the sentences are given in French, as it does not make much sense to put the equivalent glossed in LSF. The LSF stimuli are accessible at the following address: Folder-LSF [1].

Number	**Context** (code: FC_{number} in the LSF videos)	**Stimuli** (code: F_{number} in the LSF videos)
1	Voici deux images avec à chaque fois un voleur, un samurai et un prêtre.	Prière de trouver le prêtre correct, c'est-à-dire le prêtre bienveillant qui observe le samurai sur l'image.
2	Voici deux images avec à chaque fois un détective, un scientifique et une princesse.	Prière de trouver le détective correct, c'est-à-dire le détective attentif qui fixe le scientifique sur l'image.
3	Voici deux images avec à chaque fois une fillette, une guerrière et un espion.	Prière de trouver la guerrière correcte, c'est-à-dire la guerrière courageuse qui menace l'espion sur l'image.
4	Voici deux images avec à chaque fois une fée, un pompier et une enseignante.	Prière de trouver l'enseignante correcte, c'est-à-dire l'enseignante autoritaire qui surveille le pompier sur l'image.
5	Voici deux images avec à chaque fois un cosmonaute, une gymnaste et un menuisier.	Prière de trouver la gymnaste correcte, c'est-à-dire la gymnaste souple qui sanctionne le cosmonaute sur l'image.
6	Voici deux images avec une poule et une enveloppe.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une enveloppe.
7	Voici deux images avec une autruche et un pied.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une autruche.
8	Voici deux images avec une ferme et un crocodile.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un crocodile.

[1] Full link: https://drive.google.com/drive/folders/1eQaXqNBETr5mkyqW5VsskEvrWrGSsFR-?usp=sharing

Table 23. Contexts and stimuli used in the training phase.

C.1.2 Pictures



(a) Practice picture: F1



(b) Practice picture: F2



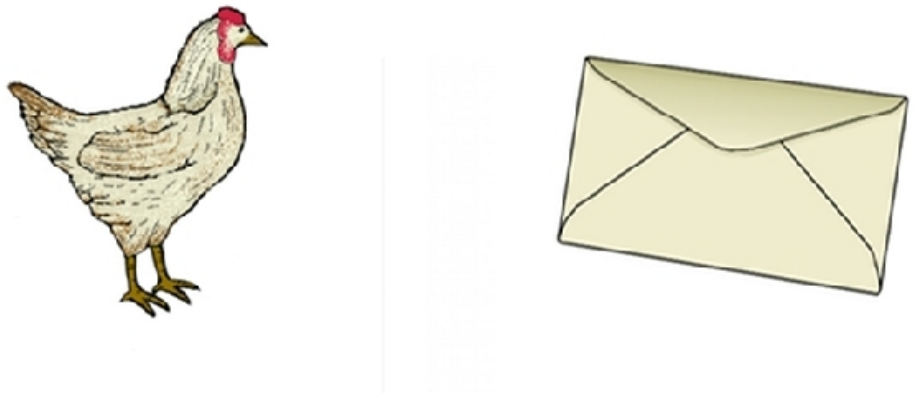
(c) Practice picture: F3



(d) Practice picture: F4



(e) Practice picture: F5



(f) Practice picture: F6





(g) Practice picture: F7





(h) Practice picture: F8

Figure 112. Practice pictures

C.2 Fillers

C.2.1 Contexts and stimuli

Number	**Context** (code: FC_{number} in the LSF videos)	**Stimuli** (code: F_{number} in the LSF videos)
9	Voici deux images avec une bouteille et un vélo.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une bouteille.
10	Voici deux images avec un pull et un chien.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un chien.
11	Voici deux images avec un pull et un sabre.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un pull.
12	Voici deux images avec un chien et une botte.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une botte.
13	Voici deux images avec une roue et une main.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une roue.
14	Voici deux images avec une botte et un sabre.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un sabre.

15	Voici deux images avec une noix et une roue.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une noix.
16	Voici deux images avec une main et un âne.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un âne.
17	Voici deux images avec un peigne et un bol.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un peigne.
18	Voici deux images avec une lampe et un bol.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un bol.
19	Voici deux images avec un bouc et une jambe.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un bouc.
20	Voici deux images avec un bouc et une scie.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre une scie.
21	Voici deux images avec un coeur et une jambe.	Prière de trouver l'image correcte, c'est-à-dire l'image qui montre un coeur.
22	Voici deux images avec un sac et un lit.	Merci de trouver la bonne image, donc l'image avec le lit.
23	Voici deux images avec un sac et un phare.	Merci de trouver la bonne image, donc l'image avec le sac.
24	Voici deux images avec un lit et une clé.	Merci de trouver la bonne image, donc l'image avec la clé.
25	Voici deux images avec un phare et une clé.	Merci de trouver la bonne image, donc l'image avec le phare.
26	Voici deux images avec une montre et une chaise.	Merci de trouver la bonne image, donc l'image avec la chaise.
27	Voici deux images avec une montre et un carton.	Merci de trouver la bonne image, donc l'image avec la montre.
28	Voici deux images avec une chaise et un train.	Merci de trouver la bonne image, donc l'image avec le train.
29	Voici deux images avec un carton et un train.	Merci de trouver la bonne image, donc l'image avec le carton.
30	Voici deux images avec un gant et un chat.	Merci de trouver la bonne image, donc l'image avec le chat.
31	Voici deux images avec un gant et un car.	Merci de trouver la bonne image, donc l'image avec le gant.
32	Voici deux images avec un chat et une brosse.	Merci de trouver la bonne image, donc l'image avec la brosse.
33	Voici deux images avec un bus et une brosse.	Merci de trouver la bonne image, donc l'image avec le car.
34	Voici deux images avec une luge et une fleur.	Merci de trouver la bonne image, donc l'image avec une fleur.
35	Voici deux images avec une luge et une flûte.	Merci de trouver la bonne image, donc l'image avec une luge.

Table 24. Contexts and stimuli used as Fillers.

C.2.2 Pictures





(a) Filler picture: F9





(b) Filler picture: F10

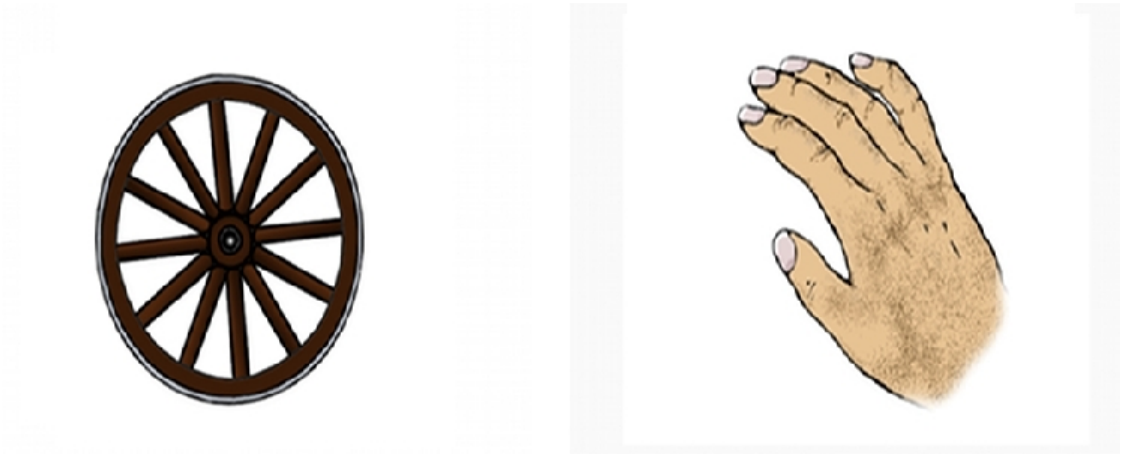




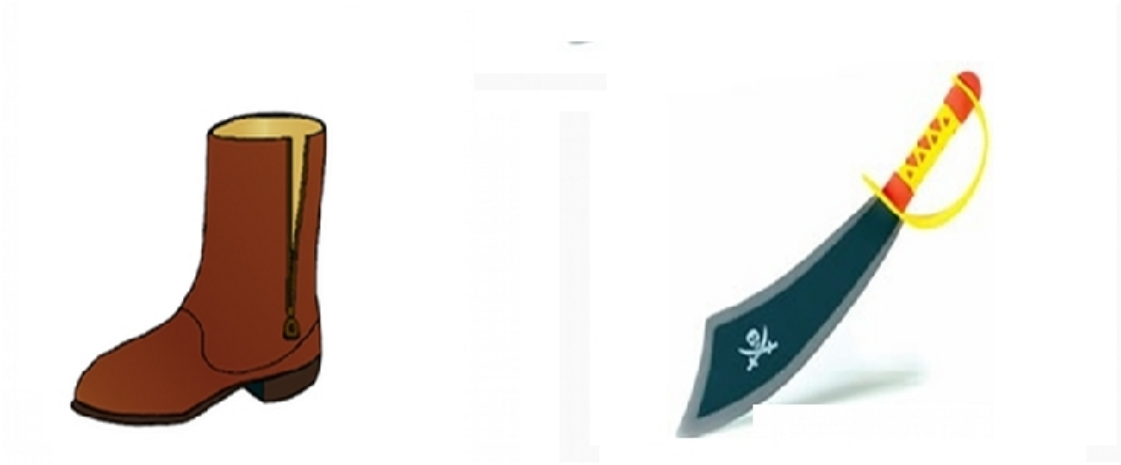
(c) Filler picture: F11



(d) Filler picture: F12



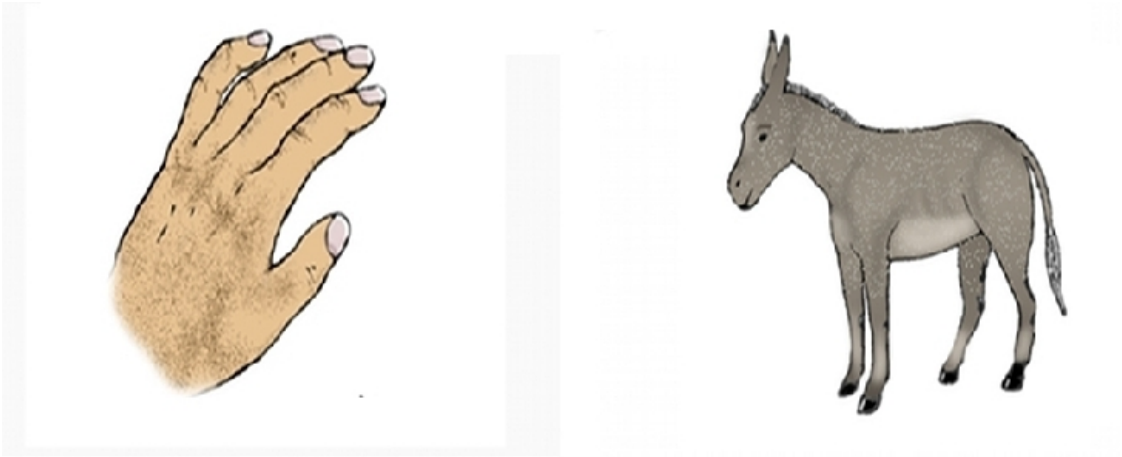
(e) Filler picture: F13



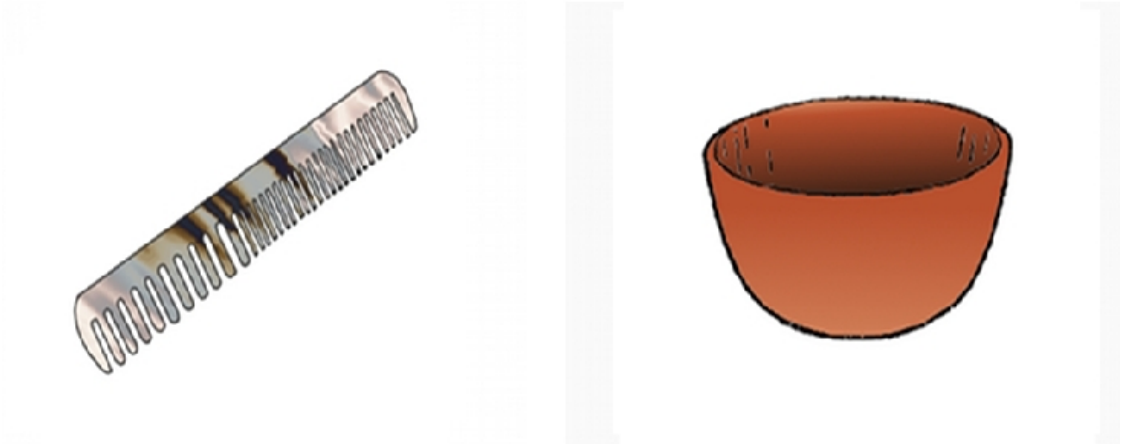
(f) Filler picture: F14



(g) Filler picture: F15



(h) Filler picture: F16



(i) Filler picture: F17





(j) Filler picture: F18





(k) Filler picture: F19

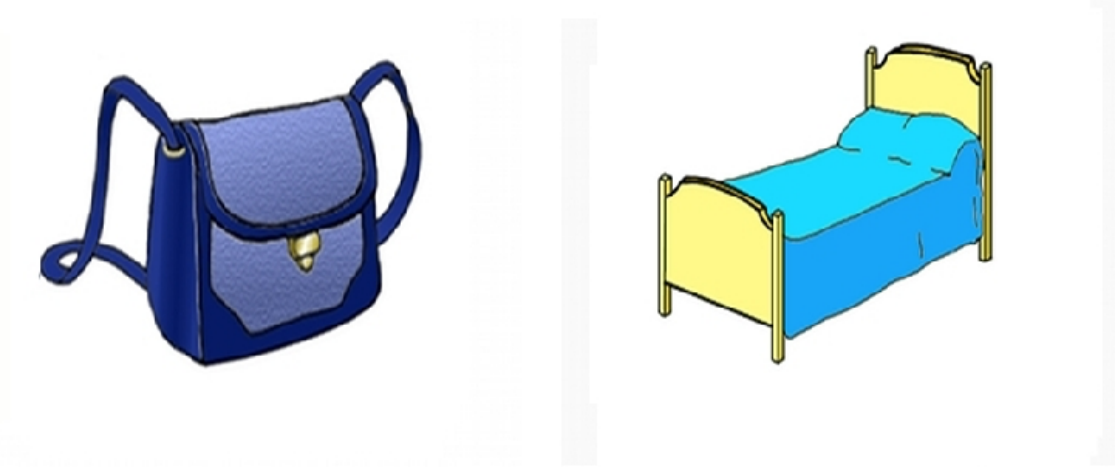




(l) Filler picture: F20



(m) Filler picture: F21



(n) Filler picture: F22



(o) Filler picture: F23




(p) Filler picture: F24




(q) Filler picture: F25




(r) Filler picture: F26



(s) Filler picture: F27



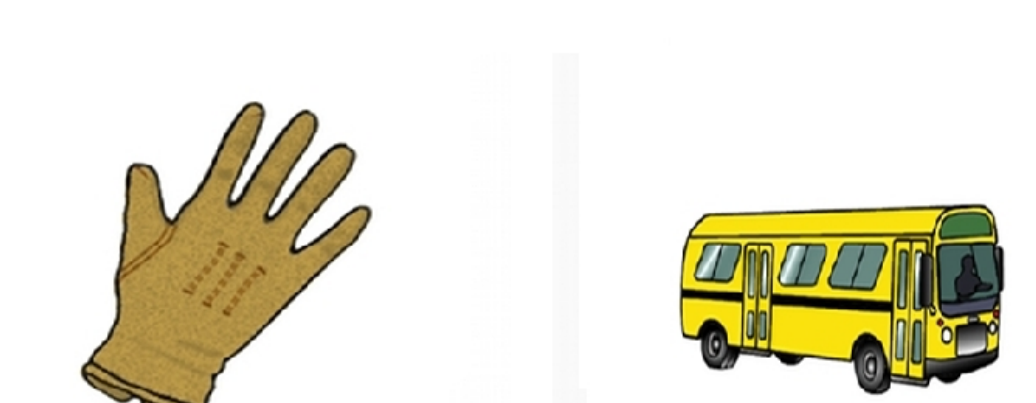
(t) Filler picture: F28



(u) Filler picture: F29



(v) Filler picture: F30



(w) Filler picture: F31



(x) Filler picture: F32





(y) Filler picture: F31





(z) Filler picture: F32





(aa) Filler picture: F33



(ab) Filler picture: F34



(ac) Filler picture: F35

Figure 113. Filler pictures

C.3 Items

C.3.1 Contexts and stimuli

For every context, the table contains all four variations corresponding to the four possible lists presented in the experiment.

Number	**Context** (code: IC_{number} in the LSF videos)	**Stimuli** (code: I_{number} in the LSF videos)
1	Voici deux images avec à chaque fois une patiente, un réceptionniste et une dame	1a. Merci de trouver la bonne patiente, donc la patiente affaiblie qui regarde le réceptionniste.
		1b. Merci de trouver la bonne patiente, donc la patiente affaiblie que le réceptionniste regarde.
		1d. Merci de trouver le bon réceptionniste, donc le jeune réceptionniste qui regarde la patiente.
		1e. Merci de trouver le bon réceptionniste, donc le jeune réceptionniste que la patiente regarde.
2	Voici deux images avec à chaque fois un facteur, un policier et un touriste.	2a. Merci de trouver le bon policier, donc le beau policier qui surveille le facteur.
		2b. Merci de trouver le bon policier, donc le beau policier que le facteur surveille
		2d. Merci de trouver le bon facteur, donc le facteur assidu qui surveille le policier
		1e. Merci de trouver le bon facteur, donc le facteur assidu que le policier surveille
3	Voici deux images avec à chaque fois un pirate, une princesse et un escrimeur.	3a. Merci de trouver la bonne princesse, donc la belle princesse qui dessine l'escrimeur
		3b. Merci de trouver la bonne princesse, donc la belle princesse que l'escrimeur dessine
		3d. Merci de trouver le bon escrimeur, donc le bel escrimeur qui dessine la princesse
		3e. Merci de trouver le bon escrimeur, donc le bel escrimeur que la princesse dessine
4	Voici deux images avec à chaque fois un garagiste, une amazone et un footballeur.	4a. Merci de trouver le bon footballeur, donc le beau footballeur qui tâche l'amazone
		4b. Merci de trouver le bon footballeur, donc le beau footballeur que l'amazone tâche
		4d. Merci de trouver la bonne amazone, donc l'amazone séduisante qui tâche le footballeur.
		4e. Merci de trouver la bonne amazone, donc l'amazone séduisante que le footballeur tâche

Number	**Context** (code: IC_{number} in the LSF videos)	**Stimuli** (code: I_{number} in the LSF videos)
5	Voici deux images avec à chaque fois un coureur, une infirmière et un prêtre.	5a. Merci de trouver le bon coureur, donc le coureur fort qui pousse l'infirmière
		5b. Merci de trouver le bon coureur, donc le coureur fort que l'infirmière pousse
		5d. Merci de trouver la bonne infirmière, donc la belle infirmière qui pousse le coureur.
		5e. Merci de trouver la bonne infirmière, donc la belle infirmière que le coureur pousse
6	Voici deux images avec à chaque fois un marin, une journaliste et un médecin.	6a. Merci de trouver la bonne journaliste, donc la jolie journaliste qui menotte le marin
		6b. Merci de trouver la bonne journaliste, donc la jolie journaliste que le marin menotte
		6d. Merci de trouver le bon marin, donc le jeune marin qui menotte la journaliste.
		6e. Merci de trouver le bon marin, donc le jeune marin que la journaliste menotte
7	Voici deux images avec à chaque fois un musicien, une ouvrière et un golfeur.	7a. Merci de trouver la bonne ouvrière, donc l'ouvrière séduisante qui questionne le golfeur
		7b. Merci de trouver la bonne ouvrière, donc l'ouvrière séduisante que le golfeur questionne
		7d. Merci de trouver le bon golfeur, donc le beau golfeur qui questionne l'ouvrière.
		7e. Merci de trouver le bon golfeur, donc le beau golfeur que l'ouvrière questionne.
8	Voici deux images avec à chaque fois un clown, une diablesse et un boulanger.	8a. Merci de trouver le bon boulanger, donc le boulanger bienveillant qui dessine la diablesse
		8b. Merci de trouver le bon boulanger, donc le boulanger bienveillant que la diablesse dessine
		8d. Merci de trouver la bonne diablesse, donc la méchante diablesse qui dessine le boulanger .
		8e. Merci de trouver la bonne diablesse, donc la méchante diablesse que le boulanger dessine.

Number	**Context** (code: IC_{number} in the LSF videos)	**Stimuli** (code: I_{number} in the LSF videos)
9	Voici deux images avec à chaque fois un serveur, une mécanicienne et un chevalier.	9a. Merci de trouver le bon serveur, donc le beau serveur bienveillant qui vise la mécanicienne
		9b. Merci de trouver le bon serveur, donc le beau serveur que la mécanicienne vise
		9d. Merci de trouver la bonne mécanicienne, donc la belle mécanicienne qui vise le serveur.
		9e. Merci de trouver la bonne mécanicienne, donc la belle mécanicienne que le serveur vise.
10	Voici deux images avec à chaque fois un détective, une patineuse et un enchanteur.	10a. Merci de trouver la bonne patineuse, donc la jolie patineuse qui pointe l'enchanteur
		10b. Merci de trouver la bonne patineuse, donc la jolie patineuse que l'enchanteur pointe
		10d. Merci de trouver le bon enchanteur, donc l'enchanteur adorable qui pointe la patineuse.
		10e. Merci de trouver le bon enchanteur, donc l'enchanteur adorable que la patineuse pointe.
11	Voici deux images avec à chaque fois un lutteur, une serveuse et un indien.	11a. Merci de trouver la bonne serveuse, donc la belle serveuse qui scotche l'indien
		11b. Merci de trouver la bonne serveuse, donc la belle serveuse que l'indien scotche
		11d. Merci de trouver le bon indien, donc l'indien adorable qui scotche la serveuse.
		11e. Merci de trouver le bon indien, donc l'indien adorable que la serveuse scotche.
12	Voici deux images avec à chaque fois un prisonnier, une sportive et un flutiste.	12a. Merci de trouver le bon flûtiste, donc le gentil flûtiste qui coiffe la sportive
		12b. Merci de trouver le bon flûtiste, donc le gentil flûtiste que la sportive coiffe
		12d. Merci de trouver la bonne sportive, donc la jolie sportive qui coiffe le flûtiste.
		12e. Merci de trouver la bonne sportive, donc la jolie sportive que le flûtiste coiffe.

Number	**Context** (code: IC_{number} in the LSF videos)	**Stimuli** (code: I_{number} in the LSF videos)
13	Voici deux images avec à chaque fois un lycéen, une sirène et un militaire.	13a. Merci de trouver le bon lycéen, donc le jeune lycéen qui couronne la sirène
		13b. Merci de trouver le bon lycéen, donc le jeune lycéen que la sirène couronne
		13d. Merci de trouver la bonne sirène, donc la belle sirène qui couronne le lycéen.
		13e. Merci de trouver la bonne sirène, donc la belle sirène que le lycéen couronne.
14	Voici deux images avec à chaque fois un ouvrier, une religieuse et un musicien.	14a. Merci de trouver la bonne religieuse, donc la jeune religieuse qui pique l'ouvrier
		14b. Merci de trouver la bonne religieuse, donc la jeune religieuse que l'ouvrier pique
		14d. Merci de trouver le bon ouvrier, donc le jeune ouvrier qui pique la religieuse.
		14e. Merci de trouver le bon ouvrier, donc le jeune ouvrier que la religieuse pique.
15	Voici deux images avec à chaque fois un cowboy, une grand-mère et un commerçant.	15a. Merci de trouver la bonne grand-mère, donc la gentille grand-mère qui filme le commerçant
		15b. Merci de trouver la bonne grand-mère, donc la gentille grand-mère que le commerçant filme
		15d. Merci de trouver le bon commerçant, donc le beau commerçant qui filme la grand-mère.
		15e. Merci de trouver le bon commerçant, donc le beau commerçant que la grand-mère filme.
16	Voici deux images avec à chaque fois un mafieux, une fée et un baigneur.	16a. Merci de trouver le bon baigneur, donc le beau baigneur qui éclabousse la fée
		16b. Merci de trouver le bon baigneur, donc le beau baigneur que la fée éclabousse
		16d. Merci de trouver la bonne fée, donc la fée mystérieuse qui éclabousse le baigneur.
		16e. Merci de trouver la bonne fée, donc la fée mystérieuse que le baigneur éclabousse.
17	Voici deux images avec à chaque fois un docteur, une athlète et un roi.	17a. Merci de trouver le bon docteur, donc le vieux docteur qui enchante l'athlète
		17b. Merci de trouver le bon docteur, donc le vieux docteur que l'athlète enchante
		17d. Merci de trouver la bonne athlète, donc la jolie athlète qui enchante le docteur.
		17e. Merci de trouver la bonne athlète, donc la jolie athlète que le docteur enchante.

Number	**Context** (code: IC_{number} in the LSF videos)	**Stimuli** (code: I_{number} in the LSF videos)
18	Voici deux images avec à chaque fois un réceptionniste, une danseuse et un pécheur.	18a. Merci de trouver la bonne danseuse, donc la danseuse désirable qui frappe le réceptionniste
		18b. Merci de trouver la bonne danseuse, donc la danseuse désirable que le réceptionniste tape
		18d. Merci de trouver le bon réceptionniste, donc le réceptionniste fort qui tape la danseuse.
		18e. Merci de trouver le bon réceptionniste, donc le réceptionniste fort que la danseuse tape.
19	Voici deux images avec à chaque fois un soldat, une mariée et un facteur.	19a. Merci de trouver la bonne mariée, donc la belle mariée qui arrose le facteur
		19b. Merci de trouver la bonne mariée, donc la belle mariée que le facteur arrose
		19d. Merci de trouver le bon facteur, donc le jeune facteur qui arrose la mariée.
		19e. Merci de trouver le bon facteur, donc le jeune facteur que la mariée arrose.
20	Voici deux images avec à chaque fois un marcheur, une hôtesse et un randonneur.	20a. Merci de trouver le bon randonneur, donc le randonneur fort qui convie l'hôtesse
		20b. Merci de trouver le bon randonneur, donc le randonneur fort que l'hôtesse convie
		20d. Merci de trouver la bonne hôtesse, donc la belle hôtesse qui convie le randonneur.
		20e. Merci de trouver la bonne hôtesse, donc la belle hôtesse que le randonneur convie.
21	Voici deux images avec à chaque fois un adolescent, une sorcière et un balayeur.	21a. Merci de trouver le bon adolescent, donc le bel adolescent qui éclaire la sorcière
		21b. Merci de trouver le bon adolescent, donc le bel adolescent que la sorcière éclaire
		21d. Merci de trouver la bonne sorcière, donc la sorcière mystèrieuse qui éclaire l'adolescent.
		21e. Merci de trouver la bonne sorcière, donc la sorcière mystèrieuse que l'adolescent éclaire.

Number	**Context** (code: IC_{number} in the LSF videos)	**Stimuli** (code: I_{number} in the LSF videos)
22	Voici deux images avec à chaque fois un cinéaste, une Japonaise et un gendarme.	22a. Merci de trouver la bonne Japonaise, donc la Japonaise étrange qui salit le cinéaste
		22b. Merci de trouver la bonne Japonaise, donc la Japonaise étrange que le cinéaste salit
		22d. Merci de trouver le bon cinéaste, donc le beau cinéaste qui salit la Japonaise.
		22e. Merci de trouver le bon cinéaste, donc le beau cinéaste que la Japonaise salit.
23	Voici deux images avec à chaque fois un arbitre, une malade et un Africain.	23a. Merci de trouver la bonne malade, donc la malade affaiblie qui paie l'Africain
		23b. Merci de trouver la bonne malade, donc la malade affaiblie que l'Africain paie
		23d. Merci de trouver le bon Africain, donc l'Africain mystérieux qui paie la malade.
		23e. Merci de trouver le bon Africain, donc l'Africain mystérieux que la malade paie.
24	Voici deux images avec à chaque fois un garagiste, une femme d'affaires et un apiculteur.	24a. Merci de trouver le bon apiculteur, donc le gentil apiculteur qui régale la femme d'affaire
		24b. Merci de trouver le bon apiculteur, donc le gentil apiculteur que la femme d'affaire régale
		24d. Merci de trouver la bonne femme d'affaires, donc la gentille femme d'affaires qui régale l'apiculteur.
		24e. Merci de trouver la bonne femme d'affaires, donc la gentille femme d'affaires que l'apiculteur régale.
25	Voici deux images avec à chaque fois un skieur, une nageuse et un mousquetaire	25a. Merci de trouver le bon skieur, donc le brave skieur qui masque la nageuse
		25b. Merci de trouver le bon skieur, donc le brave skieur que la nageuse masque
		25d. Merci de trouver la bonne nageuse, donc la nageuse courageuse qui masque le skieur.
		25e. Merci de trouver la bonne nageuse, donc la nageuse courageuse que le skieur masque.

Table 30. Contexts and stimuli used as Items.

C.3.2 Pictures



(a) Item picture: I1



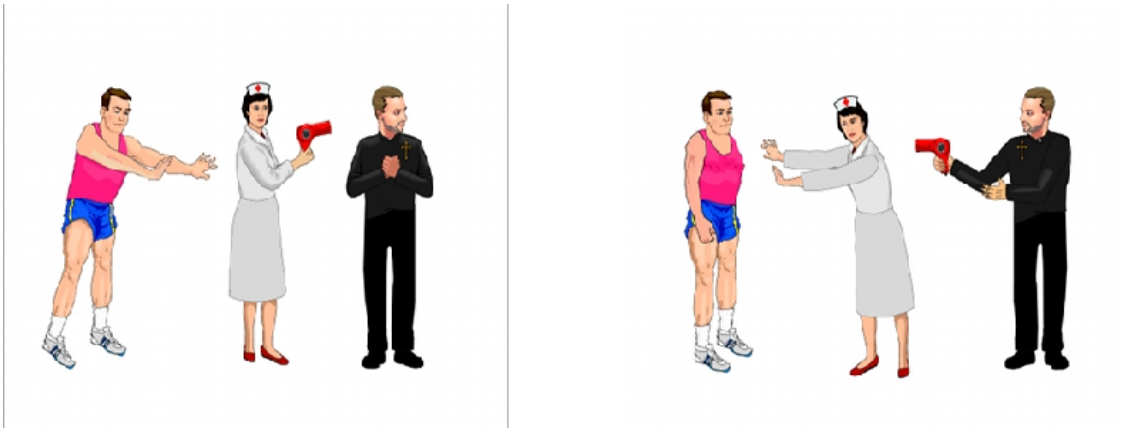
(b) Item picture: I2



(c) Item picture: I3



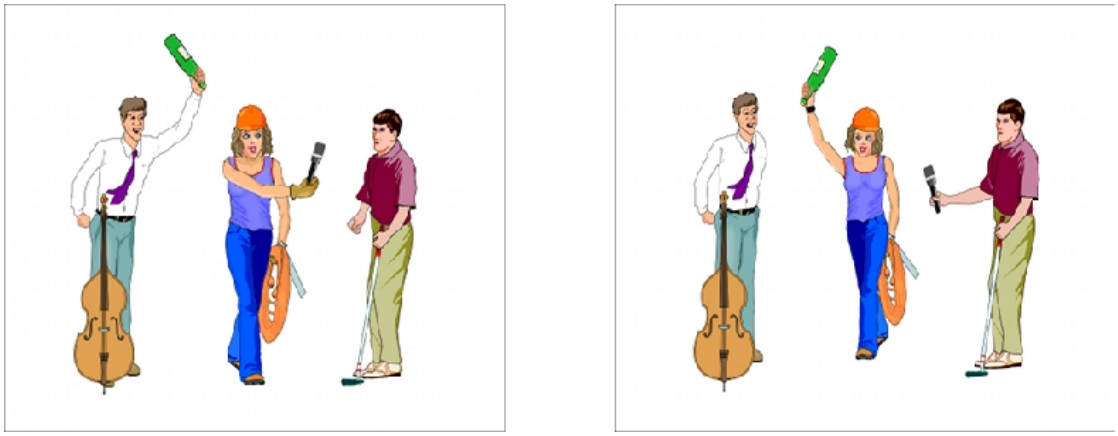
(d) Item picture: I4



(e) Item picture: I5



(f) Item picture: I6



(g) Item picture: I7



(h) Item picture: I8



(i) Item picture: I10



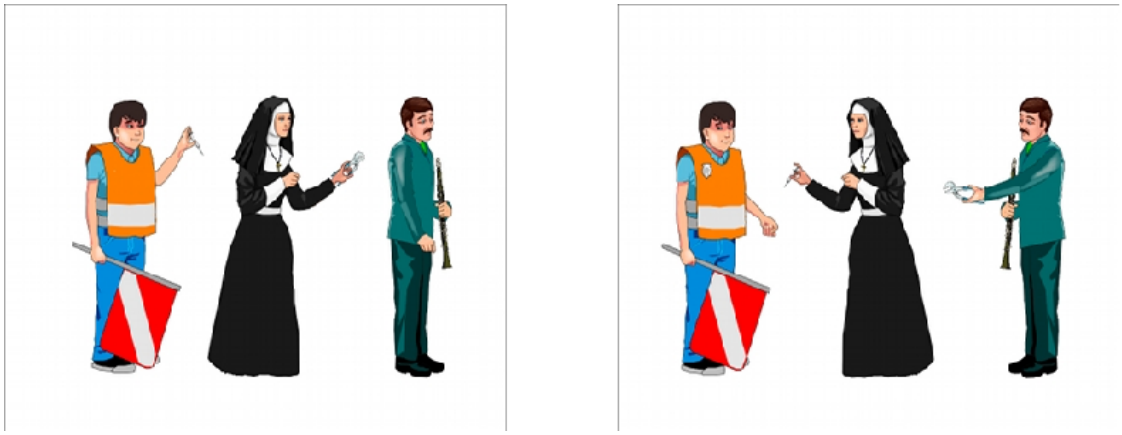
(j) Item picture: I11



(k) Item picture: I12



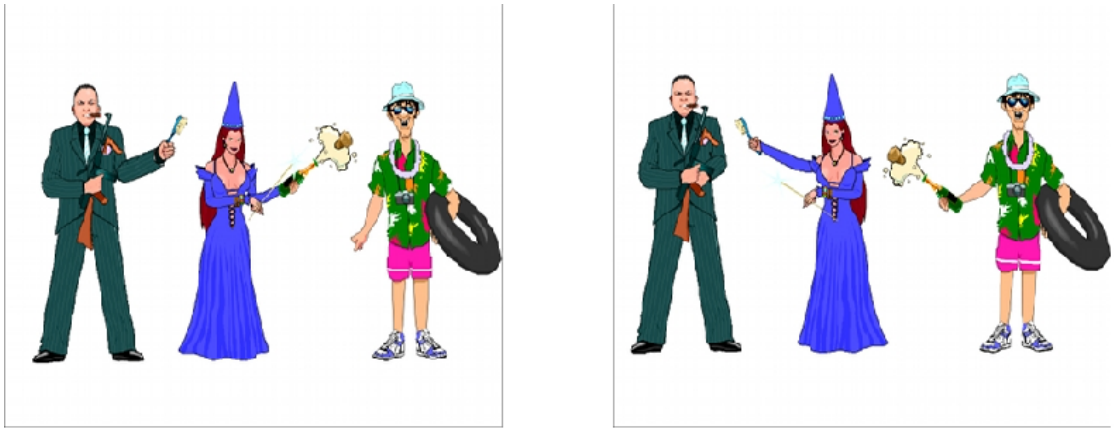
(l) Item picture: I13



(m) Item picture: I14



(n) Item picture: I15



(o) Item picture: I16



(p) Item picture: I17



(q) Item picture: I18



(r) Item picture: I19



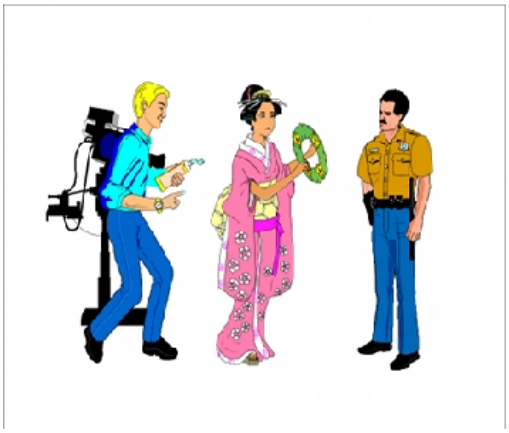


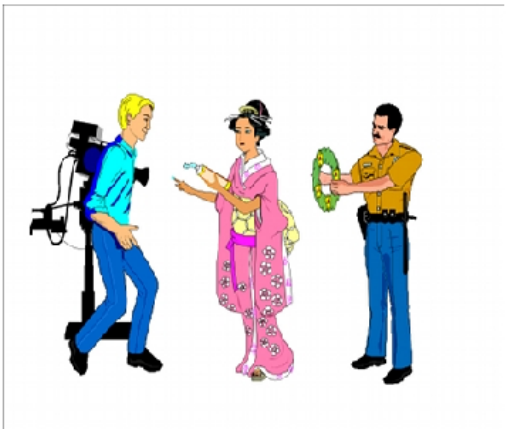
(s) Item picture: I20





(t) Item picture: I21





(u) Item picture: I22



(v) Item picture: I23



(w) Item picture: I24



(x) Item picture: I25

Figure 114. Item pictures. Item 9 was excluded from the analyses to obtain 24 items.

C.4 Analyses

C.4.1 French native speakers

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
 Family: binomial  ( logit )
Formula: BUTTON_ACCURACY ~ condition2 + (1 + condition2 || ID) + (1 +      condition2 || trial)
   Data: DON2
Control: glmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
   257.3    282.4   -122.7    245.3      472

Scaled residuals:
    Min      1Q  Median      3Q     Max
-5.2759  0.1158  0.1952  0.3110  1.2535

Random effects:
 Groups  Name        Variance Std.Dev.
 trial   condition2  1.1952   1.0933
 trial.1 (Intercept) 1.4127   1.1886
 ID      condition2  0.3122   0.5588
 ID.1    (Intercept) 0.0000   0.0000
Number of obs: 478, groups:  trial, 24; ID, 20

Fixed effects:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   3.2140     0.3487   9.216  < 2e-16 ***
condition2    1.7155     0.5412   3.170  0.00153 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
           (Intr)
condition2 0.359
```

Table 31. French native speakers accuracy: Laplace approximation model, fit by maximum likelihood.

```
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: elog ~ time_cent * rc + (1 | trial2)
   Data: stat
Weights: 1/wts
Control: lmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
 25219.7  25261.2 -12603.8  25207.7     7489

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.7533 -0.4810  0.5281  0.8728  3.3148

Random effects:
 Groups   Name        Variance Std.Dev.
 trial2   (Intercept)  0.1115  0.334
 Residual             12.8229  3.581
Number of obs: 7495, groups:  trial2, 24

Fixed effects:
               Estimate Std. Error         df t value Pr(>|t|)
(Intercept)   8.602e-01  6.890e-02  2.414e+01   12.48 5.05e-12 ***
time_cent     2.726e-01  4.348e-03  7.486e+03   62.70  < 2e-16 ***
rc           -4.072e-01  1.960e-02  7.483e+03  -20.78  < 2e-16 ***
time_cent:rc -9.665e-02  8.536e-03  7.476e+03  -11.32  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) tm_cnt rc
time_cent    0.021
rc          -0.023 -0.127
time_cnt:rc -0.019 -0.143  0.104
```

Table 32. French native speakers fixation proportions across items: the Satterwait's linear mixed model, fit by maximum likelihood

```
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: elog ~ time_cent * rc + (1 | RECORDING_SESSION_LABEL)
   Data: stat
Weights: 1/wts
Control: lmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
 20618.1  20658.9 -10303.1  20606.1     6534

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.3225 -0.5896  0.3347  0.8636  3.2788

Random effects:
 Groups                   Name        Variance Std.Dev.
 RECORDING_SESSION_LABEL (Intercept)  0.1334  0.3652
 Residual                             13.4154  3.6627
Number of obs: 6540, groups:  RECORDING_SESSION_LABEL, 21

Fixed effects:
              Estimate Std. Error        df t value Pr(>|t|)
(Intercept)  8.544e-01  8.032e-02 2.102e+01   10.64 6.44e-10 ***
time_cent    2.591e-01  4.395e-03 6.527e+03   58.95  < 2e-16 ***
rc           4.310e-01  2.016e-02 6.530e+03   21.39  < 2e-16 ***
time_cent:rc 5.270e-02  8.740e-03 6.526e+03    6.03 1.73e-09 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) tm_cnt rc
time_cent   0.016
rc          0.029  0.200
time_cnt:rc 0.022  0.225  0.139
```

Table 33. French native speakers fixation proportions across participants: the Satterwait's linear mixed model, fit by maximum likelihood

C.4.2 LSF signers

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
 Family: binomial  ( logit )
Formula: Score ~ condition2 + (1 + condition2 || RECORDING_SESSION_LABEL) +      (1 + condition2 || trial)
   Data: DON
Control: glmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
   659.3    685.8   -323.6    647.3      609

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.3470 -0.5744  0.3640  0.5332  1.5856

Random effects:
 Groups                   Name        Variance Std.Dev.
 RECORDING_SESSION_LABEL  (Intercept) 0.4859   0.6971
 RECORDING_SESSION_LABEL.1 condition2  0.3499   0.5915
 trial                    (Intercept) 0.5573   0.7466
 trial.1                  condition2  1.0239   1.0119
Number of obs: 615, groups:  RECORDING_SESSION_LABEL, 26; trial, 25

Fixed effects:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   1.3504     0.2295   5.885 3.98e-09 ***
condition2    0.8926     0.3171   2.815  0.00488 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Correlation of Fixed Effects:
           (Intr)
condition2 0.065
```

Table 34. LSF signers accuracy: Laplace approximation model, fit by maximum likelihood.

```
Generalized linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
 Family: binomial  ( logit )
Formula: Score ~ condition2 * AGE + (1 + condition2 || RECORDING_SESSION_LABEL) +
    (1 + condition2 * AGE || trial)
   Data: DON
Control: glmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
   663.8    708.0   -321.9    643.8      605

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.3276 -0.5435  0.3618  0.5256  1.6683

Random effects:
 Groups                   Name           Variance Std.Dev.
 RECORDING_SESSION_LABEL  (Intercept)    0.4116   0.6415
 RECORDING_SESSION_LABEL.1 condition2     0.3309   0.5753
 trial                    (Intercept)    0.5494   0.7412
 trial.1                  condition2     1.0101   1.0050
 trial.2                  AGE            0.0000   0.0000
 trial.3                  condition2:AGE 0.0000   0.0000
Number of obs: 615, groups:  RECORDING_SESSION_LABEL, 26; trial, 25

Fixed effects:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)   1.35048    0.22258   6.068  1.3e-09 ***
condition2    0.87632    0.31560   2.777  0.00549 **
AGE          -0.06425    0.03749  -1.714  0.08661 .
condition2:AGE  0.03631    0.05364   0.677  0.49847
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) cndtn2 AGE
condition2   0.064
AGE         -0.037 -0.007
condtn2:AGE -0.007 -0.057  0.113
```

Table 35. LSF signers accuracy: Age of acquisition vs. condition. (Laplace approximation model, fit by maximum likelihood.)

```
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: elog ~ time_cent * rc + (1 | trial2)
   Data: stat
Weights: 1/wts
Control: lmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
 25599.3  25641.5 -12793.6  25587.3     8367

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.4226 -0.7471  0.1622  0.8268  3.1037

Random effects:
 Groups   Name        Variance Std.Dev.
 trial2   (Intercept)  0.04335 0.2082
 Residual             13.50418 3.6748
Number of obs: 8373, groups:  trial2, 24

Fixed effects:
              Estimate Std. Error         df t value Pr(>|t|)
(Intercept)   2.743e-01  4.346e-02  2.438e+01   6.313 1.48e-06 ***
time_cent     9.236e-02  3.398e-03  8.366e+03  27.178  < 2e-16 ***
rc           -2.739e-01  1.806e-02  8.358e+03 -15.164  < 2e-16 ***
time_cent:rc -3.494e-02  6.762e-03  8.362e+03  -5.167 2.44e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) tm_cnt rc
time_cent   -0.088
rc          -0.004 -0.043
time_cnt:rc -0.011  0.051 -0.414
```

Table 36. LSF signers fixation proportions across items: the Satterwait's linear mixed model, fit by maximum likelihood

```
Linear mixed model fit by maximum likelihood . t-tests use Satterthwaite's method ['lmerModLmerTest']
Formula: elog ~ time_cent * rc + (1 | RECORDING_SESSION_LABEL)
   Data: stat
Weights: 1/wts
Control: lmerControl(optimizer = "optimx", calc.derivs = FALSE, optCtrl = list(method = "nlminb",
    starttests = FALSE, kkt = FALSE))

     AIC      BIC   logLik deviance df.resid
 30143.8  30186.6 -15065.9  30131.8     9305

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.0891 -0.7467  0.1728  0.8493  2.6975

Random effects:
 Groups                   Name        Variance Std.Dev.
 RECORDING_SESSION_LABEL (Intercept)  0.09412 0.3068
 Residual                             13.22876 3.6371
Number of obs: 9311, groups:  RECORDING_SESSION_LABEL, 26

Fixed effects:
              Estimate Std. Error        df t value Pr(>|t|)
(Intercept)  2.455e-01  6.088e-02 2.601e+01   4.033 0.000428 ***
time_cent    9.463e-02  3.555e-03 9.304e+03  26.615  < 2e-16 ***
rc           2.692e-01  1.803e-02 9.293e+03  14.932  < 2e-16 ***
time_cent:rc 5.875e-02  6.932e-03 9.289e+03   8.475  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
            (Intr) tm_cnt rc
time_cent   -0.055
rc           0.002  0.057
time_cnt:rc  0.007 -0.051 -0.375
```

Table 37. LSF signers fixation proportions across participants: the Satterwait's linear mixed model, fit by maximum likelihood

C.5 Validation from the Ethical committee - CER-PD

UNIVERSITÉ PARIS DESCARTES

CER-Paris Descartes

(**C**omité d'**É**thique de la **R**echerche)

Présidente: Jacqueline Fagard

N° 2019- 18 HAUSER-POZNIAC

PROTOCOLE : Étude expérimentale de la compréhension des phrases complexes en Langue des Signes Française.

Noms du/ des chercheur(s) : Charlotte Hauser, Céline Pozniak

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Labo/ Service: Laboratoire de Linguistique Formelle, Institut Jean Nicod, Université Paris-Diderot

Évalué à la séance du 07/05/2019

AVIS : Favorable

Les investigateurs faisant appel aux services du CER-Paris Descartes s'engagent à lui signaler tout événement non anticipé survenant en cours d'étude. Ces éléments seront utilisés aux fins d'amélioration des futurs services et conseils que le CER-Paris Descartes pourrait donner.

L'avis du CER-Paris Descartes n'exonère pas des formalités réglementaires. A cet égard, il vous appartient notamment, si vous traitez des données se rapportant à un individu directement ou indirectement identifiable, de vous conformer au règlement européen sur la protection des données (RGPD) en vigueur depuis 2018. Pour cela, vous pouvez solliciter les conseils du Correspondant informatique et libertés (CIL) ou du service juridique de votre université ou de votre organisme de recherche.

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