Ca' Foscari University of Venice

Master's Degree Programme

in Interpreting and Translation
for Publishing and for Special Purposes

Final Thesis

The Processing of Bimodal Inputs in CODAs

Observing bimodal bilinguals response to lexical and syntactic inputs in different modalities.

Supervisor
Ch.ma Prof.ssa Chiara Branchini

Assistant Supervisor
Ch.ma Prof.ssa Rita Sala

Graduand
Federica Loro
Matriculation Number 857747

Academic Year
2021 / 2022

Index

Abstract (EN)

Bilingualism is the condition of knowing two languages and having both their linguistic systems coexisting in the brain. Bimodal bilinguals are fluent in two languages expressed in different modalities: a Sign Language transmitted through the visual-gestural channel, and a Spoken Language transmitted through the acoustic-vocal channel. This particular kind of bilingualism offers the possibility of code-blended productions in which the two languages are expressed simultaneously. From a syntactic perspective, depending on the word order of the two languages involved, code-blends can be congruent (if the word order of the two languages matches, as in LSF-French linguistic pair) or incongruent (if there is a syntactic mismatch, as in LIS-Italian). This Thesis reports on the ongoing work of Jaber, Branchini, Geraci, Donati and Giustolisi (in preparation) on the linguistic processing of lexical and syntactic inputs from adult bimodal bilinguals. Inputs are presented in three different modalities: sign language only, spoken language only or code-blends. The response times and accuracy are then compared. The nature of simultaneity which is proper of code-blends allows to dig deeper inside the bilingual's simultaneous activation of different linguistic systems. More specifically, longer reaction times for bimodal utterances of language pairs with a syntactic mismatch in word order, as compared to bimodal utterances of language pairs exhibiting a syntactic match, may provide evidence for the simultaneous (more costly) activation of both syntactic structures in parallel, while, within the same language pair, lack of advantage in the reaction times for code blending utterances with respect to the spoken language only modality, but not with respect to the sign language only modality, may be due to unbalanced bilingualism of the research subjects.

Keywords:

Code-Blending, Bimodal Bilingualism, Sign Language, CODA, Word Order

Abstract (IT)

Il bilinguismo è la capacità di espressione linguistica in due lingue, le cui rappresentazioni mentali coesistono. I bilingui bimodali sono competenti in due lingue espresse in diverse modalità: una lingua dei segni che sfrutta il canale visivo-gestuale e una lingua vocale che sfrutta il canale acustico-vocale. Questo peculiare caso di bilinguismo rende possibile la produzione di code-blends, ovvero enunciati in cui le due lingue sono espresse simultaneamente. Dal punto di vista sintattico, a seconda dell'ordine lineare delle lingue coinvolte, un code-blend può essere congruente (se i due ordini coincidono, come nella coppia di lingue LSF-Francese), oppure incongruente (se gli ordini non coincidono, come nel caso LIS-Italiano). Questo elaborato presenta il lavoro in corso di Jaber, Branchini, Geraci, Donati and Giustolisi (in preparazione) sull'elaborazione linguistica di input lessicali e sintattici da parte di bilingui bimodali adulti. Tali input sono presentati in tre diverse modalità: solo in lingua dei segni, solo in lingua vocale o code-blends. I tempi di reazione e l'accuratezza sono in seguito messi a confronto. La natura di simultaneità che è propria dei code-blend permette di approfondire la ricerca sull'attivazione simultanea di diversi sistemi linguistici da parte dei bilingui. Nello specifico, tempi di reazione maggiori agli enunciati bimodali in coppie di lingue che presentano ordini lineari incongruenti, rispetto agli enunciati bimodali in coppie di lingue che presentano ordini lineari congruenti, potrebbero dimostrare una simultanea (e più costosa) attivazione di entrambe le strutture sintattiche in parallelo, mentre, nella stessa coppia di lingue, l'assenza di vantaggio nei tempi di reazione agli enunciati bimodali rispetto alla modalità unicamente vocale, ma non rispetto alla modalità unicamente segnata, potrebbe dipendere da una condizione di bilinguismo non equilibrata nei partecipanti alla ricerca.

Parole Chiave:

Code-Blending, Bilinguismo Bimodale, Lingua dei Segni, CODA, Ordine Lineare

List of Abbreviations

Sign Languages acronyms

ASL	American Sign Language
ISL	Indian Sign Language
Libras	Brazilian Sign Language
LIS	Italian Sign Language
LISt	Tactile Italian Sign Language
LSF	French Sign Language
LSQ	Québéc Sign Language
NGT	Sign Language of the Netherlands
TİD	Turkish Sign Language

Institutions acronyms

CNRS	National Center of Scientific Research (France)
IDBA	Indore Deaf Bilingual Academy (India)
iSLanDS	International Institute for Sign Languages and Deaf Studies (UK)

Linguistic abbreviations used in structures

AspP	Aspect Phrase
DP	Determiner Phrase
IP	Inflection Phrase
NegP	Negation Phrase
VP	Verb Phrase

Other abbreviations

BCM	Bilingual code-mixing
BL	Base language
CODA	(Hearing) Children Of Deaf Adults
DDCI	Deaf children from Deaf families with a Cochlear Implant

KODA	(Hearing) Kids Of Deaf Adults
L_A, L_B	Different mother tongues
L_1	First language , or mother tongue
L_2	Second language
MLF model	Matrix Language Frame model
NMMs	Non Manual Markers
PAR	Parallel utterances without any mismatch
RT	Response Time
SEM	Utterances presenting a semantic mismatch
Sim-Com	Simultaneous Communication
SYM	Utterances presenting a syntactic mismatch
TOT	tip-of-the-tongue

List of Annotations

SIGNS	signs are written in uppercase letters
words	spoken words are written in lowercase letters
‘translation’	apostrophes indicate that the sentence is a translation
[ ]	square brackets state the co-occurrence of signs with words
.	used to link a word with its aspects of genre, number, and tense
- or _	used when more than one word is necessary to provide the meaning of one sign

List of abbreviations used in annotations

neg	non manual markers for negation
wh	non manual markers for wh- questions
y/n	non manual markers
IX	pointing
1/2/3, A/B	indicate the person or referent, can be written in subscript
SG/PL	singular / plural
CL	classifier
FUT	future
PRS	person
PAST	past
PTCP	participle

Introduction

"It is evident that if a person has learned Sign as a primary language, his brain/mind will retain this, and use it, for the rest of that person's life, even though hearing and speech be freely available and unimpaired."

Oliver Sacks (1989)

This quote by Dr. Oliver Sacks can be read in his book *Seeing Voices*, a journey into the world of the Deaf. It gives value to sign languages as a primary form of communication by stating that acquiring them in early childhood will have a lifelong impact on a person's life. I found this quote particularly interesting when talking about CODAs (hearing Children Of Deaf Adults) as it perfectly describes their peculiar reality, which only in recent years has been taken into account in the field of linguistic research.

Bilingualism is the ability to know more than one language, and psycholinguists have been trying to better describe this phenomenon by investigating the mental representation and processing of the two languages in the bilingual brain. This work focuses its attention on bimodal bilingualism, a peculiar kind of bilingualism which involves two languages expressed through different independent channels: a spoken language transmitted through the acoustic-vocal channel, and a sign language transmitted through the visuo-gestural channel. The study on bimodal bilingualism allows for a deeper investigation on the parallel activation of the two languages thanks to its unique characteristic of simultaneity. In fact, knowing two languages which can be expressed independently allows for their simultaneous production, in a linguistic condition defined as code-blending (Emmorey et al., 2005).

CODAs represent a case of native bimodal bilinguals as they develop both a sign language and a spoken language naturally during their childhood, thanks to a domestic exposure to signs and an unavoidable exposure to the spoken language in the hearing society. For their condition, they have been the primary subjects of investigation on bimodal bilingualism. Following Sacks' statement, the acquisition of signs as a primary language in childhood will forever impact CODAs communication, even when the absence of any impairment of hearing and speech will allow them to freely access oral communication in the spoken language.

This thesis presents an ongoing research conducted by Jaber, Branchini, Donati, Geraci, and Giustolisi (in preparation) on the processing of unimodal and bimodal linguistic input by CODAs. The study focuses on verifying whether the advantage for code-blend processing found by Emmorey et al. (2012a) at the lexical level in the language pair ASL-English is confirmed in other pairs of languages (specifically in LIS-Italian and LSF-French), and if the same advantage can be also found at the clausal level.

This thesis is organised as follows.

Chapter 1 introduces and defines bilingualism, by describing different kinds of bilingualism and by outlining some of its main characteristics. Some cognitive aspects are presented together with the process of acquisition of two languages, and the benefits bilingualism can provide. I then offer a brief description of the phenomena of multilingual expressions, and the possible ways in which more than one language can be used to form a linguistic expression. Finally, the chapter concludes with the description of bimodal bilingualism and the ways in which bimodal bilinguals can express themselves in multilingual productions.

Chapter 2 presents previous studies conducted on bimodal bilingualism so far, starting with the pionieristic works on ASL-English bilingualism (Emmorey et al., 2005 et seq.) with the definition of code-blend. It later presents the study by Emmorey et al. (2012a), of which Jaber et al.'s (in prep.) work (presented in chapter 4 of this thesis) is a partial replication. It then provides evidence from some studies conducted on bimodal bilingualism in different language pairs, during the MULTISIGN project (Zeshan and Webster, 2020). Finally, it presents the situation of the research on bimodal bilingualism in Italy.

Chapter 3 provides a grammatical comparison between Italian and LIS, with the aim of making the results of the study conducted by Jaber, Branchini, Donati, Geraci, and Giustolisi (in preparation) presented in chapter 4 more accessible to the reader without any linguistic background, or specific knowledge of these languages. First the differences in phonology, alias the different modalities used by the two languages are presented. Then the differences at the lexical level and finally at the syntactic level are described, providing some information about the internal structures of each of the two languages.

Finally, in chapter 4 the ongoing study conducted by Jaber, Branchini, Donati, Geraci, and Giustolisi (in preparation) is presented: the aims of the research, how it has been structured, and the recording session for both experiments. Some information about the participants is provided together with the collected data. The results of the experiments are analysed and discussed, and some perspectives for future research are also presented in the conclusions.

At the end of this work some attachments containing the lexical and syntactic stimuli used in Jaber et al.'s (in prep.) experiment can be found.

Chapter I. Bilingualism

In a world where international connections are part of human life and of our everyday experience, there is a strong focus on the linguistic aspect of communication. The vast majority of people can speak English, whether because it is the mother tongue of the country (s)he grew up in, or because (s)he learnt it at school. In any case, nowadays exposure to the English language begins at a very young age, for almost every human being. Due to this phenomenon, the World counts a copious amount of bilinguals and polyglots, and therefore these terms have been spreading and gaining value in the last decades. The European Commission states that 54% of the European population can fluently speak two languages, and about 25% can speak at least two additional languages other than their mother tongue (Garaffa et al., 2020). Bilingualism is the ability to use more than one language to communicate, despite how their acquisition took place. This Thesis focuses on a specific kind of bilinguals: CODAs (Children Of Deaf Adults) who had a native or early exposure, and therefore acquisition, to two languages expressed through different modalities (a spoken and a sign language). The first chapter presents an overview of bilingualism. This chapter is organised in four sections: § 1.1 provides a definition of bilingualism and some characteristics; § 1.2 focuses on some cognitive aspects of double language acquisition and its benefits; in § 1.3 are presented some cases of multilingual expressions in which two languages are used to express one idea; finally § 1.4 describes bimodal bilingualism and the population who is born and raised in this peculiar bilingual condition.

1.1 Defining Bilingualism

According to the Oxford English Dictionary (www.oed.com), "Bilingualism" is the "ability to speak two languages; the habitual use of two languages colloquially[1]", therefore, this term is inclusive regardless of how the acquisition of the two languages took place. Looking at some early approaches on this definition, different perspectives can be found. Bloomfield (1935:56) focused his definition on "perfect bilinguals", in other words, exclusively those who possess a "native-like control of two languages". Macnamara (1967), instead, had a more inclusive approach considering anyone who possesses a competence, even minimal, in at least one of the four language skills (listening comprehension, speaking, reading and writing) of a second language different from their mother tongue. These definitions are placed at two opposite extremes and set the boundaries between which we can find a broad variety of different perspectives on the subject, which swing from a native-like competence in both languages to a minimal proficiency in a second language. Titone (1972:11) defines bilingualism as "the individual's capacity to speak a second language while following the concepts and structures of that language rather than paraphrasing in his or her mother tongue", thus including non-native speakers, but not limiting the language knowledge to minimal abilities in communicative situations. Other than the confusion that the significant divergence found in the literature can cause, it must be noted that, in these examples, only the linguistic dimension is considered with only very few early definitions having a multidimensional approach. Weinreich (1953) and Mackey (1962) described bilingualism as the alternate use of two languages by the same individual, although "use" is not considered to be a dimension, but rather a manifestation of competence. One language could be used more frequently than the other, and perhaps it may not be a matter of competence, but of dominance. Dodson (1981) talks about *preferred language* referring to the language of choice in a particular situation. Hamers and Blanc (1989) analysed six different relevant dimensions of what

---

[1] https://www.oed.com/view/Entry/18968

they called “bilinguality”: relative competence, cognitive organisation, age of acquisition, exogeneity, social cultural status and cultural identity, which they summarised in table 1 presented below.

Dimensions			**Comments**
A	According to competence in both languages	1. balanced bilinguality 2. dominant bilinguality	$L_{A/1}$ competence = $L_{B/2}$ competence $L_{A/1}$ competence > or < $L_{B/2}$ competence
B	According to cognitive organization	1. compound bilinguality 2. coordinate bilinguality	$L_{A/1}$ unit equivalent to$L_{B/2}$ unit = one conceptual unit $L_{A/1}$ unit = conceptual unit 1 $L_{B/2}$ equivalent = conceptual unit 2
C	According to age of acquisition	1. childhood bilinguality (a) simultaneous (b) consecutive 2. adolescent bilinguality 3. adult bilinguality	$L_{B/2}$ acquired before age 10/11 L_A and L_B = mother tongues L_1 = mother tongue; L_2 acquired before 11 L_2 acquired between 11 and 17 L_2 acquires after 17
D	According to presence of L_2 community in environment	1. endogenous bilinguality 2. exogenous bilinguality	presence of L_2 community absence of L_2 community
E	According to the relative status of the two languages	1. additive bilinguality 2. subtractive bilinguality	$L_{A/1}$ and $L_{B/2}$ socially valorized → cognitive advantage L_2 valorized at expense L_1 → cognitive disadvantage

Dimensions			Comments
F	According to group membership and cultural identity	1. Bicultural bilinguality	double membership and bicultural identity
		2. L_1 monocultural bilinguality	$L_{A/1}$ membership and cultural identity
		3. L_2 acculturated bilinguality	$L_{B/2}$ membership and cultural identity
		4. Deculturated bilinguality	ambiguous membership and anomic identity

Table 1 *Summary table of psychological dimensions of bilinguality (Hamers & Blanc, 1989:9)[2].*

1.1.1 Relative competence

Relative competence means that both the linguistic competence in each of the two languages of a bilingual individual and the relationship between the two are considered. This relationship according to Lambert (1955) can be an equivalence, resulting in a so-called *balanced bilingual*, or it could present a significant difference with one of the two languages (considered the mother tongue) overcoming the other and resulting in what he defines a *dominant bilingual*. It is important to note that, in this dimension, the degree of competence in each language is not as important as the relationship between the two. In addition, it must be stated that an overall equivalent competence does not mean having an equal ability in both languages, but rather having an equal competence that could be differently distributed among domains and functions of each language for every bilingual person.

[2] L_A , L_B : two different mother tongues
L_1 : first language / mother tongue
L_2 : second language

1.1.2 Cognitive organisation

The cognitive representation of the two languages may vary depending on several factors such as age and context of acquisition, and although there is no strict correspondence between each of these factors with the linguistic competence outcome, some differences can be noticeable. Ervin and Osgood (1954) defined two different kinds of linguistic systems depending on the cognitive representation of the two languages in the bilingual brain. As shown in Figure 1, they distinguished a *compound system* in which two different linguistic representations in the two languages are associated with a single concept and meaning, from a *coordinate system* where each linguistic representation has its own equivalent concept. It is important to understand that a distinction between compound and coordinate cognitive representations of bilinguality is not absolute, as a bilingual person can have different cognitive representations, and therefore different forms of bilinguality, for different words and concepts.

Compound bilinguality

L_1 'family'

\

single concept:

FAMILY/FAMILLE

/

L_2 'famille'

Coordinate bilinguality

L_1 'family' → concept FAMILY

L_2 'famille' → concept FAMILLE

Figure 1 *Schematic representation of the compound-coordinate distinction (Hamers and Blanc, 1989:8, adapted from Ervin and Osgood, 1954).*

1.1.3 Age of acquisition

The variation in bilinguality forms due to a different age of acquisition often intertwines with other aspects of each personal language biography, such as context of acquisition and use of the two languages. Hamers and Blanc (1989) at first distinguish *childhood bilinguality* in which the bilingual development occurs together with the child growth, from *adolescent bilinguality* and *adult bilinguality*, in which there can be an influence from external factors, as some development components have already reached maturity. In the case of a bilinguality development taking place during childhood two different situations could occur. The first case is *simultaneous early* or *infant bilinguality*, when the child is exposed to both languages in the same language onset (this is the case for example of mixed-lingual family contexts), and therefore acquires two mother tongues (L_A and L_B) concurrently. The second case is *consecutive childhood bilinguality*, when the child first acquires the linguistic basis of a mother tongue (L_1) and then, still during early childhood, acquires a second language (L_2), too. Language learning in simultaneous early bilinguality is unintentional, while consecutive childhood bilinguality could be either informal or intentional, for example as an outcome of bilingual educational programs.

1.1.4 Exogeneity

Bilingual learning acquisition is also influenced by the surrounding environment. If the second language (L_2) is spoken as a mother tongue by the community, the bilinguality will be *endogenous*, while if the second language (L_2) is not spoken by the community in the surrounding environment but only used as an official, institutionalised language, the bilinguality will be *exogenous*.

1.1.5 Socio-cultural status

The socio-cultural status of the two languages in the community and surrounding environment can as well affect the type of bilinguality. Lambert (1974) distinguishes two forms of bilinguality according to the sociocultural impact the environment has in the cognitive development of the child's bilingual identity. An *additive bilinguality* takes place in an environment where the two languages are equally valued, this could lead the bilingual child to gain several benefits and a greater cognitive flexibility. Whereas *subtractive bilinguality* occurs when the socio-cultural status of the mother tongue is undervalued and in the worst cases this environment could result in a delay of the child's cognitive development.

1.1.6 Cultural identity

Bilingual people can also be *bicultural* if they not only are fluent in two different languages, but also identify positively and are welcomed by the cultural groups who speak those languages. A bicultural identity can develop in an additive environment where the two cultures and languages are fully integrated. Balanced biculturalism can co-occur with balanced bilinguality but it is not the only case, nor is it a necessary requirement. There are also *monocultural* bilinguals, individuals who identify with only one cultural group of the two languages they speak. Furthermore, a cultural identity could also change and be lost during bilingual development, because one person could renounce the birth cultural identity associated with their mother tongue, and adopt the cultural identity of their second language. Berry (1980) defines these people *acculturated bilinguals*, and *deculturated bilinguals* those individuals who after this process of birth cultural identity loss, fail to identify with the cultural group of their second language.

1.2 Learning two languages

The bilingual brain is able to operate with two or more linguistic systems simultaneously. This ability helps individuals to develop a better linguistic competence in each language, but also to instil in them a better understanding of the concept of language itself. Research on bilinguals has shown that bilingualism affects the brain in a physiological way and can even encourage higher cognitive performances, thanks to the continuous exercise of shifting from one language to the other, according to the communicative circumstances (Baum and Titone, 2004). As explained by Garraffa et al. (2020), in the last two decades studies on bilingual cognition have focused on what has been defined as “executive control”, or active language use, unveiling relevant differences between monolingual and bilingual individuals. These differences become more pronounced in the developmental stages of children or in the decline stages of elderly people. Bilingualism seems to be a supportive tool in developing a child’s brain, but especially in preventing mental deterioration and decline that could occur in third age, essentially the bilingual brain seems to age better.

1.2.1 Bilingual cognition skills

When activating its linguistic functions, the human brain is constantly requested to make choices upon which word or expression can better describe a certain event or situation and elide all less appropriate possibilities. A bilingual brain faces this challenge together with the incessant need to neglect any possible formulation in the other known language, as both linguistic systems are activated at all times. This constant practice of inhibiting what is not relevant in a given circumstance seems to be a workout gym that benefits the human cognitive system.

Language acquisition is one of the most extraordinary abilities of the human brain. This process begins while the baby is still in the mother’s womb and in just a few years’ time a child can master a mother tongue without any specific effort, instruction or correction, just as a natural phenomenon. Instead, language learning as part of an education system, comes as a set of rules and notions, without any proper immersion in the cultural group speaking that language, and therefore may never be mastered at the same degree of a mother tongue. This process is longer and requires strong efforts and continuous feedback. Bilingual children activate the process of language acquisition for two languages at the same time. This happens because the human brain, especially in the early stages of life, is perfectly capable of elaborating two different languages simultaneously without suffering from any particular confusion. It is important to understand that in order to become bilingual, a biological inclination is not sufficient if not paired with an appropriate immersion in a specific linguistically rich environment.

One of the most discussed topics in bilingual linguistic research has been whether two independent linguistic systems coexist in the bilingual brain or not. If so, it would be possible to affirm that the human brain has the innate ability to acquire two or more languages at the same time and thus become bilingual, otherwise, second language acquisition would most likely lead to a delay in cognitive development. According to the "Unitary Linguistic System Hypothesis" published by Volterra and Taeschner (1978), one of the earliest approaches to this topic, the bilingual individual seems to develop a single linguistic system at first, in which the lexicon of the two different languages coexists. In the following stage, the two sets of lexical equipment are split into different domains, one for each language, but keep following the syntactic rules of the dominant language. Finally, around the third year of life, two separate grammatical systems are fully developed resulting in a set of different mental representations, one for each language. As Garraffa et al. (2020) explain, this hypothesis has been proven wrong as bilingual children already start developing two different linguistic systems from the early stages. Any mixed utterance that may lead to thinking of a confused representation of the two languages and linguistic systems in the bilingual child's brain, proves nothing else than an existing connection between the two linguistic systems which can influence each other. The process of selection and distribution of linguistic elements begins in the first month of life, long before the first spoken utterances make their appearance. Figure 2 visually shows the different hypothesis about the mental representations of two different linguistic systems in the human brain.

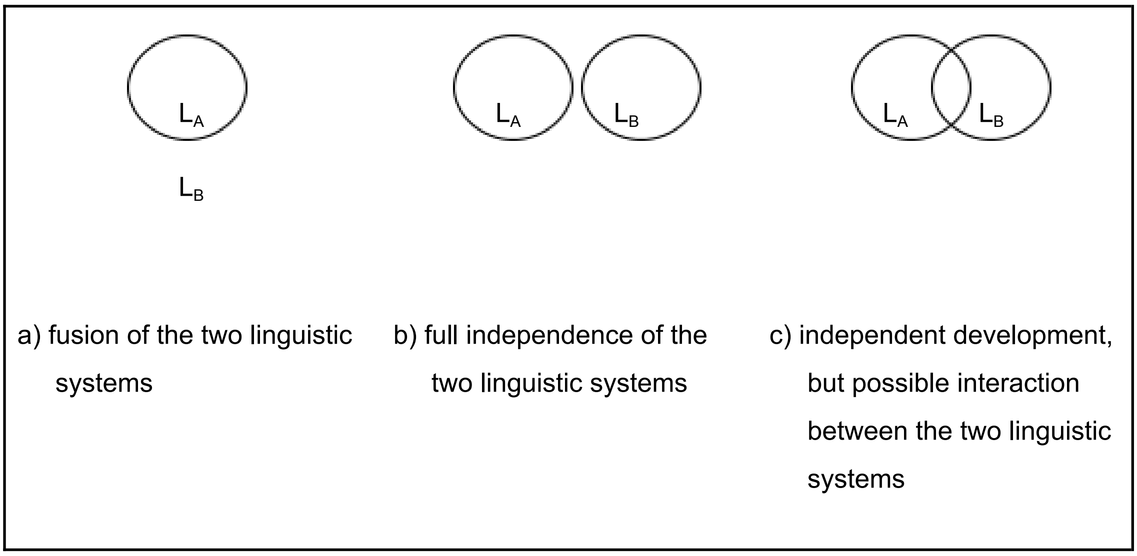


Figure 2 *Fusion, separation and interaction hypothesis between linguistic systems (Garraffa et al., 2020:25).*

Modern neuroimaging technologies allow us to visualise the operation of cognitive function in the human brain. With the help of this procedure, researchers have been able to better understand what happens inside the human brain while a linguistic input is analysed (Del Maschio and Abutalebi, 2019). Thanks to these scientific instruments, in the next few years research on the effects of linguistic processing will be able to dive deeper in understanding several phenomena.

1.2.2 Belonging to two cultures

Languages are not only a set of elements and rules that govern them, but they have a cultural dimension. A language is made up of the cultural group who uses it as much as a culture is defined by the language, and to fully comprehend the nature of a specific language it is necessary to dive into the relative culture. Bilingualism develops in societies where more than one language and perhaps more than one culture are in contact. An important distinction must be made between cultural and social identity. A cultural identity is a complex configuration of a particular society into the individual's personality. A social identity deals with the relationships created by the members of a community and therefore defines the individual through his/her role performed within a group. In order to be conscious of one's cultural identity, it is essential to conceive the existence of other societies other than the one they belong to.

Hemmi (2014) examined the concept of identity from three perspectives to better understand the identities of bilingual people.

a. *Postmodernist perspective on identity* (cfr. Wenger, 1998)

   From a postmodern view, reality is not an absolute entity, it is rather personally constructed in a mental process of understanding, in fact the way people see the World is subjective. Projecting this view on the concept of identity, a person can have different identities according to each of many roles they play in the community they belong to. This seems to be particularly true for bilingual individuals who constantly switch between two languages and cultures within the same social group. This perspective also assumes that identity can be subject to change, and, in relation to the social groups one person interacts with, it can be rebuilt over time.

b. *Socio-cultural perspective on identity* (cfr. Vygotsky, 1978)

   Socio-cultural theory focuses on the impact of society in the individual's perception and development. According to Pavlenko and Lantolf (2000), the act of learning a second language consists in a struggle to participate in a social life ruled by different customs than the ones the individual is used to. Block (2003) describes identity construction with an ongoing negotiation regarding who we are in relation to other people. From this perspective identity is the way in which people give meaning to who they are, according to the position they cover in the social group they belong to. The case of bilinguals, who socially interact with different cultures, may lead to developing more than one overlapping and often competing identity.

c. *Power and identities*

   Power seems to play a major role in shaping identities as the social position of a community might be perceived as inferior to the more popular one, in a given speaker-interlocutor setting. Bilinguals might feel free to fully express themselves or they might feel the need to hide a part of their cultural identity, according to the influence of the power hierarchies of specific communities.

Pavlenko (2006) analysed bilinguals' cultural identities as their act of socialisation within two different cultural groups. She still believes that some problems might arise by having two competing identities—as the case of linguistic schizophrenia—, but she also claims that bilinguals "may perceive the world differently, and change perspectives, ways of thinking, and verbal and non-verbal behaviours when switching languages" (Pavlenko, 2006:29). The idea that a bilingual individual can feel like more than one person according to the language spoken and the context is real, but this phenomenon is not conceived only in a negative way anymore. Instead, it is curious to observe that people can build their own identities in a vast spectrum of divergent ways.

1.2.3 Sign languages and bilingualism

Only recently, linguistic research has started focusing attention on bilingualism in relation to sign languages. Zeshan and Panda (2015) outlined three different possibilities in which a sign language can be involved in the phenomenon of bilingualism: *sign bilingualism*, *bimodal bilingualism*, and *sign multilingualism*.

Sign Bilingualism	**Bimodal Bilingualism**	**Sign Multilingualism**
sign language A & spoken language B in writing	sign language A & spoken language B	sign language A & sign language C

Table 2 *Language contact in sign languages (Zeshan, and Webster, 2020:3).*

Sign bilingualism is used to describe Deaf[3] individuals who receive an education in the written form of the spoken language directly connected to the environment they live in. This bilingualism involves two languages of mixed modalities, a signed and a spoken language, but for the latter one generally there is a written competence. *Bimodal bilingualism* (topic on which this Thesis aims at diving deeper—cfr. § 1.4 for a more detailed explanation) is related to those individuals who are native users of a signed language and a spoken language in its oral (and written) form. This is primarily the case of hearing children born from at least one Deaf parent and raised in a household primarily using sign language to communicate, also known as CODAs (Children Of Deaf

[3] Following the Cultural convention, in this Thesis upper-case *Deaf* is used to identify people who embrace their condition, are engaged in the Deaf Community and know sign language, while lower-case *deaf* only refers to the medical condition of auditory impairment.

Adults) or KODAs (Kids Of Deaf Adults, in the case of children) in literature. Lastly, *sign multilingualism* refers to individuals (either deaf or hearing) who know two or more sign languages. On this topic, the European Council funded the study “Multilingual Behaviours in Sign Language Users” (MULTISIGN), between 2011 and 2016.

1.2.4 Benefits of bilingualism

Bilingualism can result in several and important positive effects and therefore it should always be evaluated and protected. Regardless of the previous existence of any linguistic disturb, bilingualism can never cause a worsening of the condition, but instead only bring benefits in the linguistic, cognitive and socio-cultural aspects. Learning two languages is always an enriching experience. The main advantage is the development and understanding of metalinguistics, the ability to observe and comprehend how languages work, their inner structure and the relationships that exist between language, culture and society. As previously stated, bilingualism not only is beneficial at the skill level of being able to speak two languages, but also at the cognitive level and during children development. Bilinguals seem to understand easily and early how language works and thus distinguish between different languages not only for the way they sound, but also recognise a difference in the inner structure and functions. Having different words available in their lexical tank to express a single mental representation (at least one for each language), bilinguals develop the metalinguistic ability to distinguish between words and meanings. This factor stimulates the acquisition of the vocabulary, in fact, it is more common to find synonyms in a bilingual child’s vocabulary, but they are hard to find in a monolingual child’s one who, having one linguistic possibility to express a certain action or entity, doesn’t feel the need to learn a second one at first. Bialystok and Herman (1999) observed that in some cases this ability leads to an earlier development of reading skills, it supports children in recognising the existing correspondences between the sounds of the language and their graphic representation (this occurrence can be noticed in learning languages which adopt an alphabetical writing system). The same positive effects seem to extend to third and fourth languages as well, as observed by both families and teachers in Abu Rabia and Saintsky (2010).

Bilingual individuals develop an inhibition mechanism which limits any possible interference from the language not used in the real-time context, so that it does not affect the production of the language in use. This happens because in the bilingual brain both languages, with the respective systems and domains, are always operating at the same time. Thanks to this unconscious ability, bilinguals have a better performance in carrying out fast tasks which require selective attention and the inhibition of disturbing external factors. These advantages not only are valid for a limited time, but seem to persist through adulthood (Bialystok, Craik, and Luk 2008, a.o.). It also positively affects the ability to carry out many cognitive tasks at the same time at a fast rate, also in seniority. Competition and inhibition are not properties unique to bilingualism as they can also affect the way the monolingual mind manages different lexical representations of the same concept (synonyms).

It is easier for a bilingual person to be sympathetic with someone, as they develop the understanding that other people have a different perspective than theirs. This awareness appears about one year earlier than monolinguals and seems to happen because bilingual people are used to select the language of their production according to their interlocutors and cultural context (Kovács, 2009).

Bilingualism seems to show its positive effects also in ageing and in particular during the third age. Research is now focusing on investigating whether the constant cognitive exercise required for bilinguals to select the appropriate language for each communicative interaction, may help delay the senil clinical decline and prevent the onset of degenerative illnesses (Bak et al., 2014).

For an individual to better develop the bilingual status, two essential circumstances must co-occur: a rich exposure through the surrounding environment and the acknowledgement of the linguistic divergence among the socio-cultural group. It is fundamental that children understand that the minor language is a precious resource that can enrich not only themselves but the whole community they identify with.

1.3 Multilingual expressions

Among bilinguals, the phenomenon of language mixing, that is an inclination for using linguistic elements belonging to different languages within the same communicative act, is very common. This phenomenon is called *bilingual code-mixing* (or BCM), according to Bathia and Ritchie (2004). Language mixing can be expressed either in a simultaneous or a consecutive way, depending on the language modality. According to Chomsky's (1995) minimalist approach on code-mixing (Mc Swann, 2001), multilingual expressions are not ruled by any specific norm, but rather they are produced sourcing lexical elements by two available lexicons. According to this hypothesis the only difference between monolinguals and bilinguals would be the lexicon availability. Multilingual expressions have been considered the outcome of a mental confusion between the two languages (Volterra and Taeschner, 1978; Redlinger and Park, 1980; a.o.), but it is now proven that this is not the case since the two languages possess two distinct grammatical systems inside bilingual brains (Genesee, 1989; Genesee, Nicoladis, and Paradis, 1995; De Houwer, 1990; Meisel, 1989). Linguistic research has shown how common BCM productions are among bilinguals belonging to different cultures, both children and adults (see Genesee, 1989; Genesee et al., 1995; De Houwer, 1990; Meisel, 1989, Paradis et al., 2000). BCMs are now considered a resource for bilinguals who can source linguistic blanks with elements belonging to their other language. Similarly to the development and degree of linguistic competence in bilingualism, also the frequency and use of BCMs depend on different aspects, such as family use and socio-cultural role of the two languages (Poplack, 1987).

This mixing phenomenon can occur at the phrasal boundaries or within the phrase itself. According to the Matrix Language Frame model (MLF model) by Myers-Scotton (1997, 2002) in bilingual code-mixing the linguistic participation is asymmetric and the elements and rules of the non-dominant language are transferred to the main language, which states at the base of the sentence. Following this characteristic Myers-Scotton (1997, 2002) defines *Matrix Language* the one contributing the most in the bilingual production (i.e. providing grammatical structure to the final sentence and supplying more words and morphemes), and the other one *Embedded Language*. Cases of language mixing can be categorised as *code switches* or *code-blends*, which will be further described respectively in § 1.3.2 and § 1.3.3.

1.3.1 Language mixing and sign languages

Language mixing in bimodal bilingualism allows for the parallel use of the two languages, an option which is not possible when two spoken languages are involved, as it is impossible to produce two vocal expressions at the same time. In bimodal productions, on the other hand, the simultaneous production of two language strings is possible, as two distinct channels are involved, the hands and the vocal tract.

During the MULTISIGN project three different phenomena of language contact involving sign languages have been identified: *cross-signing*, *sign-speaking*, and *sign-switching*. The first one is the sudden occurrence of inter-languages manifestations during sign language contact, the second one is the simultaneous production of signs and speech in a mismatched structural organisation and the latter is a form of code-switching between sign languages (Adamou et al., 2020).

1.3.2 Code-switching

Code-switching is a communication strategy commonly used among bilinguals which consists in the alternate use of two different languages within the same utterance. Based on Romaine (1989) code-switching is the juxtaposition of segments of speech belonging to different grammatical systems or subsystems within the same communicative exchange. Code-switching is the only possible interaction that can occur between two spoken languages as they both use the vocal apparatus as the only expressive channel of both spoken languages. It is made possible by language inhibition and Meuter and Allport (1999) observe that asymmetric switch costs. According to their study, it seems to be easier for bilinguals to switch from their L_1 to L_2, but vice versa switching from L_2 to L_1 takes longer. The authors claim that this asymmetry is due to the different cognitive effort of inhibition, which is higher for the primary language and needs to be lifted. Muysken (2000) described three different categories of code-mixing:

- *Insertion*: L_2 segments are integrated into an utterance in the dominant language (L_1) of the speech;

(1) Yo anduve *in a state of shock* por dos dias
'I walked in a state of shock for two days'

[Muysken, 2000]

- *Alternation*: the two languages are separated and they take turns during the communicative act;

(2) Andale pués, *and do come again*
'Go on now, and do come again'

[Muysken, 2000]

- *Congruent lexicalisation*: the languages share the same grammatical structure, and in eliciting the sentence lexical elements are sourced by either vocabulary.

(3) Bueno, *in other words*, el *flight* que sale de Chicago *around three o'clock*
'Okay, in other words, the flight which departs from Chicago around three o'clock'
[Muysken, 2000]

Linguistic selection costs significant inhibition efforts for bimodal bilinguals, and code-switches may be the outcome of an utterance produced with smaller cognitive effort (Abutalebi and Green, 2008). Unimodal bilinguals are allowed to produce and comprehend only one language at a time, this is because both languages use the same sensory and motor system, for this reason it is impossible to determine if inhibiting one language is always a choice or rather if they would prefer using both. In the case of bimodal bilinguals, Emmorey et al. (2016) found that both adults and children show a preference for code-blending over code-switching.

1.3.3 Code-blending

Code-blending (term coined by Emmorey et al. 2005) is a simultaneous sign-speaking production. It refers to the action of producing linguistic elements from two different languages produced in different modalities (speech through the acoustic-vocal channel, and sign through the visual-gestural channel) at the same time. In such productions combinatorial possibilities can vary in structure according to the spoken language, the sign language or it could be shared by both languages. Following, Emmorey et al. (2008) identified a preference among bimodal bilinguals in producing code-blends without suppressing any of their natural languages, requiring a lesser demanding cognitive inhibition effort. On their study involving American CODAs, Emmorey et al. (2005) found out that 6% of the mixed utterances were produced on a single language at a time scheme (code-switches), while in 94% of recorded mixed languages utterances words and signs co-occurred. This study was expanded to other pairs of languages in children productions and mother-child interaction, like English-American Sign Language (ASL) (Schiff and Ventry, 1976; Maestas y

Moores, 1980; Moores and Moores, 1982, Meadow-Orlans, Erting, and Spencer, 1987; Mallory, Schein, and Zingle, 1993), Dutch-Sign Language of the Netherlands (Nederlandse Gebarentaal, NGT) (Van den Bogaerde, 2000; Van den Bogaerde and Baker, 2006), Spanish-Portotican Sign Language (Lengua de señas puertorriqueña) (Rodriquez, 2001), French-Québéc Sign Language (Langue des Signes Québécoise, LSQ) (Petitto, Katerlos, Levy, Gauna, Tetreault, and Ferraro, 2001); and in adult productions, like ASL-English (Emmorey, Borinstein and Thompson, 2005; Bishop and Hicks, 2005); LIS-Italian (Bishop, Hicks, Bertone, and Sala, 2006). This systematic preference for code-blending shows that as soon as the simultaneous production is allowed by the independence of the linguistic channels, the double activation is the favourite option. It therefore seems reasonable to assume that code-blending is the shape code-switching takes when articulatory constraints are lifted (Branchini and Donati, 2016). In Emmorey et al. (2008) the dominant spoken language (English) seems to be easier to inhibit and when American Sign Language (ASL) is the matrix language, English words rarely accompany ASL signs. The opposite occurs when English is the matrix language and ASL signs are continuously produced in the form of code-blends. Code-blends can be semantically distinguished in two types: when signs and speech are *translation equivalents* (e.g. the word *water* is produced together with the sign for WATER), or when signs and speech carry out *different meanings* that contribute to give additional information (e.g. the word *water* is produced together with the sign for COLD, meaning that the water is cold) (Emmorey et al., 2016). Equivalent code-blends seem to be favoured among adult bimodal bilinguals, although additional code-blends seem more convenient, this might mean that the seconds require a greater cognitive effort.

Code-blending must not be confused with the act of speaking with accompanied gestures of monolinguals (or unimodal bilinguals) as signs profoundly differ from gestures for being lexical elements belonging to a complex linguistic system. In this case, the conversation is carried out through the spoken utterances and the accompanying gestures sometimes appear spontaneously. Conversely, code-blends require dynamic and efficient coordination between the two languages, as manually produced signs carry meaning and can affect the overall meaning of the utterance. Another bimodal type of communication which differs from code-blending is *Simultaneous Communication*, or *Sim-Com*, a communication system frequently used by educators of the deaf. It is an unnatural and forced coding where spoken English is accompanied by single ASL signs for each equivalent translatable spoken word, mixed with some form of Manually Coded English (a coding system invented to represent morphology and syntax of the spoken language). Sim-Com is only ruled by the structure of the spoken language, which is imposed on the signed production, while in code-blends the sign and spoken language grammars interact. Sim-Com is almost unintelligible by Deaf people who don't have a sufficient competence in the English language, but it is an educational instrument in deaf education for oral rehabilitation.

1.4 Bimodal Bilingualism

Bimodal bilinguals know and use two languages which employ different input-output channels: a signed language expressed through the visual-gestural modality, with manual and non-manual components, and a spoken language expressed through the acoustic-vocal modality. Bimodal bilingualism allows us to carry out research on some aspects of bilingualism which would be impossible to understand through a mere observation of unimodal bilinguals. Adamou et al. (2020), stress the fact that it is important to underline the difference between bimodal bilingualism and the so-called *sign-supported speech* or *simultaneous communication*, a modality used in formal settings that explicitly targets the parallel use of signed and spoken languages. Bimodal bilinguals' mixed productions are natural, these individuals do not think about their productions and perhaps don't even realise what they are doing unless someone brings up the topic. This aspect confirms that, as for any other cases of bilingualism, both linguistic systems are active at the same time. Another similarity bimodal bilinguals have with their unimodal equals is the early development of a selective ability, which allows them to choose and privilege the use of one of their two available languages, according to the communicative context, interlocutors and intention. Language control requires a stronger cognitive effort for bimodal bilinguals. In situations where linguistic control is needed and only one language must be chosen for production, unimodal bilinguals only have to focus on inhibiting the secondary language and let the intended one prevail. For bimodal bilinguals instead this process is not sufficient, because even if the primary required language is used for production, the second language could still appear in the form of a simultaneous production (cfr. § 1.3.3). For this reason, they need not only to select the target language, but also to force single code utterances, inhibiting any possible mixed production (Ding, 2016).

Fisher (1978) defined the interface between signers and speakers *Contact Signing* and identified four characteristics of this phenomenon: *imported lexicon*, *code-switches*, *foreign speaking*, and *interferences*. Bringing the idea of this contact to a different level, these characteristics could happen inside the bilingual's mind (Celo, 2004). The influence is generally from the dominant language to the minor one, so for example from Italian to LIS (Italian Sign Language). Imported lexicon can be expressed through mouthing or finger spelling, code-switches are the juxtaposition of segments belonging to different languages, foreign speaking is using one language to explain the meaning of the other language, and lastly interferences are noticeable in the syntactic structure or initialisations. Similar contact phenomena can be found in Deaf parents' communication with their hearing children, where a strong interference from both languages can be perceived.

1.4.1 CODAs

The most common and well-known case of bimodal bilinguals are CODAs, who naturally develop their bilingualism while growing up in a household with Deaf, signing parents and being exposed to both a signed language at home, and a spoken language in the hearing community. Hearing children can learn the two different systems simultaneously as they can have access naturally to both languages, whereas deaf children often need to be taught at least one of the two (usually the spoken language they cannot naturally have access to). It is important to remember that not all hearing children born from deaf adults are exposed to a sign language, but in this Thesis the term “CODA” will be used to identify only hearing bimodal bilinguals exposed to sign language from birth. Another widespread acronym is KODA (Kids Of Deaf Adult), used to identify bimodal bilingual children, younger than 18 years old. These children seem to naturally develop and favour the parallel use of sign and spoken languages in their natural productions, while as far as identity is concerned some issues might arise over the years (Preston, 1995). At this stage, kids are not sensitive to, nor influenced by, any social stigma yet, and therefore their mixed language productions are more frequent in any language pair (Meisel, 1989). This frequency could also be affected by the fact that deaf caregivers often produce words and signs simultaneously to enrich the kid’s linguistic exposure, and it is possible that in their adulthood bimodal bilinguals show a preference for language switching than simultaneous sign-speech expressions (Emmorey et al., 2008).

Studies have shown that, despite the spontaneous onset of mixed language utterances, the spoken language seems to be prevalent in bimodal bilinguals’ communication with other hearing people, even when their interlocutors know sign language (Müller de Quadros et al., 2020). Sign language utterances produced by CODAs are sometimes accompanied by spoken words which follow the structure of the sign language and are referred to as *Coda-Talk*. The same voice style can be found in CODAs’ blended productions when the dominant string is the sign language (Branchini and Donati, 2016). In fact, Deaf parents sometimes speak and sign simultaneously in order to expose their hearing children to the spoken language too. When this situation occurs, CODAs' linguistic experience will, to some extent, mirror that of bilingual children who grow up with two languages and among two cultures. The linguistic exposure could take place in different modalities: both the parents could sign and speak to their children or there could be a one-parent-one-language situation if only one parent is Deaf and the other one is hearing, similar to what happens in unimodal bilingual households. The two languages could be used separately, one only at home with family and the other one only outside, and one language could be prevalent over the other. Sign languages are always considered minority languages in society and, as for any other linguistic minority, the socio-cultural status might affect the children's linguistic and identitarian development. Since in this case Deaf parents do not fully share the deaf culture (or they do not share the hearing culture) with their children, nor they have similar life experiences, according to Singleton and Tittle (2000) they are essentially “raising foreign children".

Given that the majority of the surrounding community is usually hearing and primarily uses a spoken language, it seems to be the dominant communicative choice for CODAs. Some similarities have also been noticed between CODAs and “heritage speakers” (Chen Pichler et al., 2017; Müller de Quadros et al., 2016). In the same way, they are firstly immersed in a home language in which they develop various levels of proficiency, but once they begin attending school, they are immersed in the dominant language of the community which becomes their prevalent language of use. As for heritage speakers, the pattern of bilingual history might influence language processing. In close social groups of CODAs cross-modality utterances seem to be a language play. Supposedly in an environment where cross-identity and cross-linguistic conditions are shared, bilingual individuals do not feel the need to choose to show only one part of themselves and inhibit the other, but instead they seem to feel free to express themselves in their most naturalistic way (Bishop and Hicks, 2005). Comparable circumstances can happen, for example, during informal meetings with family and friends which include other CODAs, or for example through the Coda Associations (like Coda Italia[4]) during organised events (i.e. meet-ups, conferences, seminars). CODA organisations exist in different countries throughout the World.

1.4.2 Bimodal productions

The first communicative intents of children are shown through gestures (i.e. reaching for object, or pointing referents), facial expressions and vocalisations, which come earlier than any proper production of symbolic words or signs. Their productions grow gradually to simultaneous realisations of, for example, a deictic gesture and the word for the object (e.g. the child says *book* and points a finger towards the book). This happens in all hearing monolingual or bilingual children. As mentioned by Baker and van den Bogaerde (2014), Code-blended utterances appear in KODAs early on, with the first combinations of items in both modalities (signed and spoken). For some individuals, voice sounds might be omitted while signing and replaced by mouthing (i.e. mouth articulation of words without omitting any voice and producing no sounds). KODAs can change language modalities naturally, accidentally and smoothly. In addition, they seem to learn how to adapt their language choice according to their interlocutors early in life. Sometimes the ‘person-to-language’ principle is applied to match the communicative mode most used by their interlocutor at the moment, regardless of their auditive condition. All bilingual children, including KODAs, naturally develop this ability of language finding according to the situation and conversation partner.

During their study on the inputs from bilingual mothers to, and outputs form their bilingual children, Baker and van den Bogaerde (2008) found four types of code-blends between oral Dutch and NGT (Nederlandse Gebarentaal, Dutch

[4] Coda Italia is an Association of Social Promotion (APS) founded in Italy in 2014 with the aim to help hearing children of Deaf adults better understand and embrace their identity through community events and safe spaces to share personal experiences. (from Coda Italia APS official website https://www.codaitalia.org).

Sign Language or Sign Language of the Netherlands), categorising them on the basis of the semantics of the utterances as follows:

- Code-blended Dutch Base Language (Oral BL)

(4) where is the horse?
HORSE?
'Where is the horse?'

[Baker and van den Bogaerde, 2014:221]

- Code-blended NGT Base Language (Sign BL)

(5) outside
BICYCLE RED OUTSIDE
'The red bicycle is outside.'

[Baker and van den Bogaerde, 2014:221]

- Code-blended Mixed

(6) big
HORSE
'a big horse'

[Baker and van den Bogaerde, 2014:221]

- Code-blended Full

(7) that is a horse
$\text{POINT}_{\text{to-horse}}$ HORSE
'That is a horse.'

[Baker and van den Bogaerde, 2014:221]

In adult CODAs, all the four types of code-blending are found, too, and the vast majority of them are based on the spoken language. According to Bishop and Hicks (2008) adult code-blends produced by American CODAs are 59% English BL, 7% ASL BL, 28% Full and 6% Mixed. This preference for the oral modality may be due to the hearing status of the interlocutors, or to the dominance of the spoken language in the environment.

1.4.3 Deaf bimodal bilinguals

Besides CODAs, a more common and well-known case of bimodal bilinguals are deaf people who receive an education in the spoken language (and often undergo speech therapy). Deaf bilinguals competent in a sign and a spoken language may not feel comfortable with the label of “bimodal” bilinguals because of their auditive impossibility to comprehend a spoken language in its natural oral form.

In Italy about 1:1000 children are born profoundly deaf. 5-10% of them are born from at least one Deaf parent and grow up in a household where sign language is used for everyday communication, therefore having the chance to acquire it naturally and spontaneously, following linguistic developmental stages similar to those of hearing children acquiring a spoken language. The remaining 90-95% of deaf children are born in hearing families, who probably have never come in contact with the Deaf culture before. It is rare for hearing parents to spontaneously undertake a bilingual approach in their children’s education as it involves unknown communicative skills which makes it hard for them to interact with their little ones. For this reason, deaf children born from hearing parents are often addressed to speech therapy and only get in touch with sign language later in life (if ever), in formal educational contexts. Whether they are born in a Deaf or hearing household, all deaf children will sooner or later be exposed to the spoken language (i.e. for oral rehabilitation purposes, or through education) at least in its written form (Rinaldi, Sanalitro, and Caselli, 2019). Since sign languages do not have a written form, the spoken language is used to teach deaf children reading and writing, other than being the main communicative possibility in interacting with the major hearing community. There is a strong heterogeneity among deaf children’s bimodal bilingualism status, according to the degree and age of exposure to both the spoken and the sign language.

When considering linguistic exposure, it is important to consider the fact that while hearing unimodal bilinguals are naturally able to perceive and process the languages they are exposed to, deaf bimodal bilinguals cannot spontaneously perceive the spoken language flow, as it is inaccessible (or only partially accessible, i.e. auditive gain provided by hearing aids, or distractive environmental noises) and can receive the sign language input only if they are looking at their interlocutor. Regarding linguistic input perception, Harris (1992) talks about *uptake*, which is the linguistic input actually perceived by the deaf child. If the child is not paying attention to an adult signing that input will get lost, in fact for sign languages the uptake will always be inferior to the input. For these reasons, deaf children are required a stronger focus and therefore a bigger effort to engage in linguistic interactions, regardless of the linguistic modality. In most cases bimodal bilingualism in deaf children is a case of consecutive bilinguality. If they are born in a Deaf household, sign language will be their L_1 and later they will learn the spoken language as an L_2. If they are born from hearing parents who choose to undertake the way of oral rehabilitation through speech therapy, the spoken language will be considered their L_1 (considering the case of a successful rehabilitation, and a significant auditive gain provided by hearing aids, although the exposure to the spoken language may be late) and the later possible exposure to sign language (i.e. in educational context, or thanks to an encounter with the Deaf culture) will provide them with the resource of a sign language as an L_2. In both cases, they may be considered bimodal bilinguals as individuals who know and use more than one language, in different modalities, to communicate.

1.5 Conclusions

This chapter presented an introduction to bilingualism. This phenomenon is described as the ability to speak two languages, but as we have seen the degree of competence and time or circumstance of acquisition can vary. The process of learning two languages is introduced from a cognitive perspective, and a brief consideration about the socio-cultural implications of bilingualism is also made. Bilingualism displays several benefits in ageing at the cognitive level as well as in multitasking performance at the skills level. Among bilinguals it is not surprising to find multilingual expressions, as in some communicative circumstances the two languages cooperate in forming a sentence composed by lexical elements belonging to the two different linguistic tanks. Multilingual expressions can be of different nature: sequential, as in the case of code-switches, or simultaneous, as in the case of code-blends. Finally the chapter describes the phenomenon of bimodal bilingualism, a peculiar kind of bilingualism in which the two languages are transmitted through different independent channels: acoustic-vocal for the spoken language, and visuo-gestural for the sign language. The most common cases of bimodal bilinguals are CODAs and Deaf people who are highly competent in the spoken language (either in its spoken or written form). The next chapter will specifically focus on bimodal bilingualism presenting some linguistic research conducted so far in this field in different language pairs.

Chapter II. Previous studies on Bimodal Bilingualism

Studies on bilingualism are a relatively new topic of linguistic research, or better we could say that the positive approach to bilingualism as an advantage for all is. In earlier approaches, bilingualism was considered to be a disadvantage especially for kids, because it was thought to cause significant delay in development. This perspective derived from the constant comparison of bilinguals to their monolingual equals, they were therefore evaluated on single language scales. In 1989, Grosjean published what was going to become a well-known paper for bilingual linguistic research claiming that bilinguals are not equal to the sum of two monolinguals. Bilinguals were expected to be perfectly fluent, and have no accents in their languages, but, as he explained, this is not true since bilinguals learn their languages in different contexts and sometimes for different purposes, resulting in specified linguistic domains which do not always overlap (Grosjean, 2012). The phenomenon of bimodal bilingualism (or 'speech-sign bilingualism', as can sometimes be found in earlier literature) started to gain the researchers' attention in the last decade of the twentieth century. The possibility of the simultaneous language production offered by the independence of the linguistic articulators opened the way to several new considerations and possibilities for research in the field of bilingualism. Many aspects are yet to be investigated, this chapter aims to provide an overview of some of the most important research on bimodal bilingualism carried out so far. This chapter is divided into three main sections: in § 2.1 are presented previously conducted studies on ASL-English bilingualism, mainly focusing on Emmorey et al.'s (2005 et seq.) pionieristic work; § 2.2 provides an overview of some outcomes from the MULTISIGN project (Zeshan and Webster, 2020); finally in § 2.3 the situation on Italian-LIS bilingualism is introduced with some previously conducted studies.

2.1 Studies on ASL-English bilingualism

Karen Emmorey is a linguist and a cognitive neuroscience researcher, distinguished Professor at San Diego State University. She dedicated her career to the study of the functioning of the linguistic brain in sign language use, and to the comparison between the auditory-vocal and the visual-manual modalities. Together with some colleagues, she provided some fundamental works on the multiple modalities of bilingualism over the years, primarily by analysing the behaviour of English-American Sign Language (ASL) bimodal bilinguals. Below are presented some of their most important works for bimodal bilingualism research.

2.1.1 Definition of code-blending

In 2005, Emmorey, Borinstein, and Thompson conducted the first study on CODAs. In other words, for the first time they examined the behaviour of ASL-English adult bilinguals, who acquired both a signed and a spoken language in a natural way. The first query of their study was to identify whether bimodal bilinguals respected the sequential times of code-switching even when the phonology of the two languages allows for simultaneous productions. Secondly, they supposed that perhaps the natural co-speech gesture used by bimodal bilinguals could, in fact, be actual ASL signs, regardless of the interlocutor's knowledge of the sign language. Lastly, they compared bimodal bilingual natural conversation with SimCom to identify the differences between these two communicative systems.

As introduced above, the eleven participants were born and raised in Deaf, or partially Deaf, households and therefore had acquired both ASL and English from birth, their mean age was 32.

The participants were presented with three different tasks aimed at investigating natural conversations between CODAs: natural conversation on guided topics, and retelling the plot of a cartoon firstly in unimodal/bimodal condition and then using SimCom. All three tasks were repeated twice, once with an English monolingual interlocutor and one with an English-ASL bimodal bilingual interlocutor.

The results showed that, for most participants, ASL signs co-occurred with English speech occasionally or even frequently, and that only in 5% of the cases they paused their spoken production to sign. The remaining 95% of the cases make up what in this research has been named *code-blend*, the simultaneous production of ASL signs and English words. Examples (8), (9) and (10) show some of these productions.

(8) So Sylvester who's on the ledge [jumps into][5] the apartment.
JUMP

[Emmorey et al., 2005:666]

(9) I [don't] [think] he would [really] [live].
NOT THINK REALLY LIVE

[Emmorey et al., 2005:666]

(10) He's like hmm [all of a sudden] Ack!
LOOK-AT-ME

[Emmorey et al., 2005:666]

Semantic equivalency of code-blends was then analysed to find out that 94% were semantically equivalent, as in examples (8) and (9), and only 6% were non-equivalent, as in (10).

As for grammatical categories, as summarised by the graphic in figure 3 below, the majority of code-blends turned out to be on verbs and nouns.

[5] Square brackets [ ] delimit the co-occurrence of sign and speech.

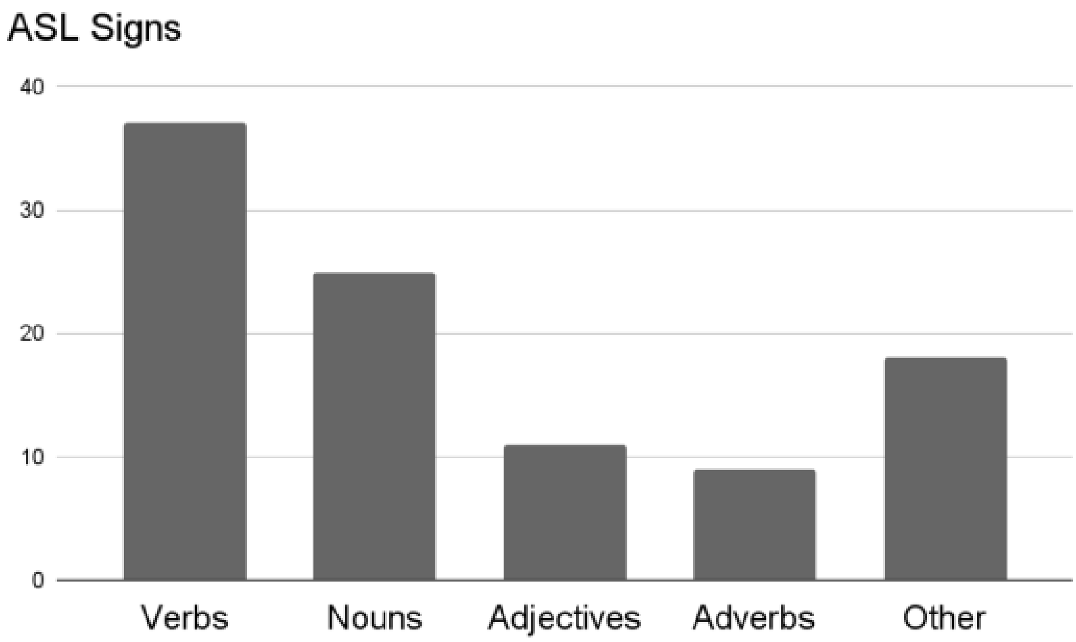


Figure 3 *Grammatical categories of ASL code-blends (Emmorey et al., 2005:667).*

If we compare the different contexts, in bilingual situations 23% of English words presented a code-blend, but in monolingual situations only 6% did. The presence of this even minimal percentage proves that even in a monolingual context both languages are activated simultaneously in the bilingual brain.

2.1.2 Models of bimodal language production

Having discovered the existence of code-blends, in 2008 Emmorey, Borinstein, Thompson, and Gollan investigated the models of language production in ASL-English code-blends. As for the previously presented experiment, the participants were hearing native bimodal bilinguals. The mean age of the eleven CODAs was 34. This time the participants were presented with two tasks of the previous tasks: free conversation and cartoon plot retelling.

Similarly to the previous results, code-blends were more frequent (35.71%) than code-switches (6.26%) in the bimodal bilinguals' productions, and the vast majority (98%) of the mixed-language utterances contained at least a code-blend. Furthermore, they analysed the synchronism on a sample of 180 selected code-blends, considering as the beginning point the onset of the auditory waveform for speech, and the formation of the handshape or the beginning of the movement for signs. The results showed that ASL signs and speech were highly synchronised as in the 89.44% of the analysed utterances the production was simultaneous. For the remaining cases, in 8.34% signs preceded words by a mean time of 230ms, and in 2.22% words preceded signs by a mean time of 133ms. More than a half (63.08%) of code-blends were multi-sign, as in example (11) while only 36.92% were single-sign as in (12), showing that this phenomenon is not isolated to single terms only.

(11) I [don't think he would really live.]
NOT THINK REALLY LIVE

[Emmorey et al., 2008:48]

(12) And there's [the bird].
BIRD

[Emmorey et al., 2008:48]

Concerning semantics, the results of this study mirror the previous as the majority of code-blends are semantically equivalent (81.54%), but some semantically non-equivalents are also present (16%). In the data set, many bimodal utterances had English as the Matrix Language (according to Myers-Scotton, 1997, 2002) and ASL as an Embedded language—or, as Emmorey et al. note, ASL can be considered an Accompanying language, since it does not frame within the English phrase, but it goes with it—(as in examples 11 and 12). ASL-influenced English sentences were found, like utterances where the word order of spoken English follows the structure of ASL, which therefore is considered the Matrix language (example 13). The dual role both languages can play proves that in bimodal bilingualism, as true for unimodal bilingualism, there is no strict rule for which the prevalent language (L_1) dominates the L_2, or one modality prevails over the other.

(13) [Wonder what do].
WONDER DO-DO
(Sylvester) wonders what to do.

[Emmorey et al. 2008:50]

2.1.3 Bilingual lexical processing

In the study by Emmorey, Petrich, and Gollan (2012a), the researchers focused on the mental processing of code-blends in American bimodal bilinguals. In order to do so, they formulated two experiments: one for production and one for comprehension, in which the cognitive mechanisms underlying code-blends processing were compared to isolated ASL signs and English words with the aim of identifying any potential cost or benefit for bimodal bilinguals.

- Experiment 1: CODE-BLEND PRODUCTION

  Forty bimodal bilinguals participated in the experiment, both CODAs and late learners of ASL, but two of them were not included in the data analysis bringing the total down to thirty-eight. All of the participants made use of both English and ASL on a daily basis either in family or for work.

  They were asked to name 120 line drawings of objects[6] divided by 40 in each modality: English, ASL and code-blended productions. To calculate the response time (RT) the productions were recorded using a microphone and a pressure release key, which respectively triggered a sensor by sound emission and hand lifting. For code-blended productions, both times were registered individually and simultaneously. Only correctly produced responses were included in the RTs analysis.

  Results for ASL showed no difference whether the production occurred on its own or accompanied by the English word (code-blend). High-frequency signs were named more quickly than low-frequency

---

[6] Taken from the UCSD Center for Research on Language International Picture Naming Project (Bates et al., 2003; Székely et al., 2003).

ones, as expected. The only facilitation code-blends seemed to provide was a faster retrieval of low-frequency signs (no facilitation was observed in the retrieval of high-frequency signs).

English results showed a longer response time for code-blended productions. This might be due to the coordination of signed and vocal onsets. As for ASL, also for English high-frequency words were produced more quickly, but in this case code-blended productions seemed to worsen this delay. It is important to note that, for all participants, ASL is the non-dominant language, therefore the frequency of lexical elements in this language is expected to have a larger effect on production than it does for English. Figure 4 represents these results visually.

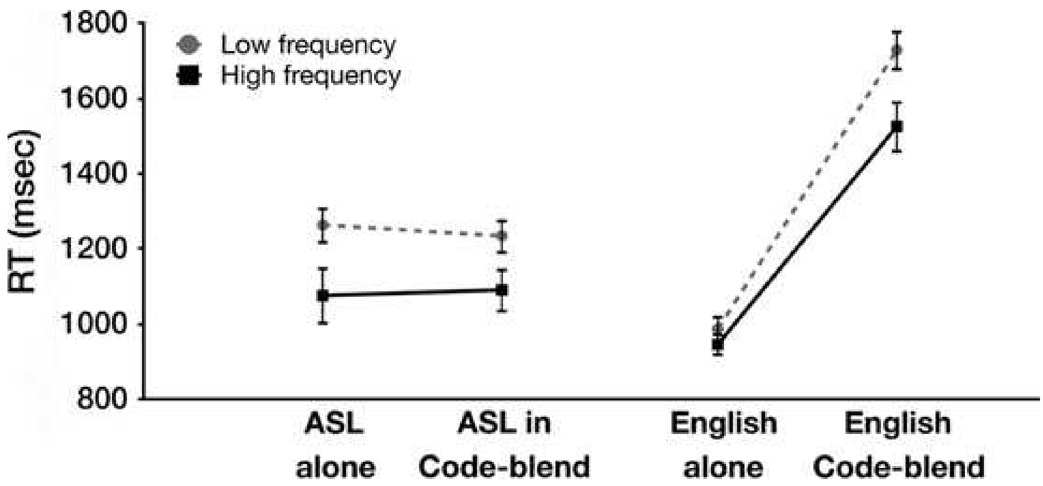


Figure 4 *Naming latencies for high- and low-frequency ASL signs and English words produced alone or in a code blend (Emmorey et al., 2012a:202).*

- Experiment 2: CODE-BLEND PERCEPTION

Of the forty-five bimodal bilinguals participating in the experiment, two were eliminated and therefore the examined data came from forty-three people. Twenty-three of them also participated in the production experiment. Similarly to the participants of the production session, all used both ASL and English on a daily basis.

The task proposed was a determination of edibility accessed as either an English word, an ASL sign, or a code-blended form of the two. The edible/non edible semantic category was chosen as it is natural, unique and not subject to any personal judgement. 90 selected elements (equally divided between 45 edible and 45 non edible elements) were videotaped in ASL, English, and code-blend form, produced by an early bimodal bilingual (CODA). Response times were measured by pressing the keyboard on specific keys identified as affirmative and negative feedback. Response time for ASL was calculated from the beginning of the video as they were cut to begin with the articulation of the sign, while for English it was calculated from the beginning of the soundwave. As before, two different RTs were calculated for code-blended productions, one for each modality. Only correct responses were included in the RTs analysis.

Results showed that ASL signs were processed faster in code-blend condition than on their own. In addition, late bilinguals were facilitated significantly more by code-blended modality.

Similar results were identified for English words, as they were processed faster when presented in the code-blended modality, than on their own as well. In this case though, early bilinguals were the ones who were facilitated the most by the code-blended modality. It can then be stated that the processing of both languages takes advantage of the bimodal productions, and the facilitation effect depends on the type of bilingualism. For this reason, the results visible in figure 5 have been divided according to the bilingualism type. The results of this experiment prove that dual lexical availability in the code-blended modality speeds the lexical access and semantic processing in both the dominant and non-dominant language.

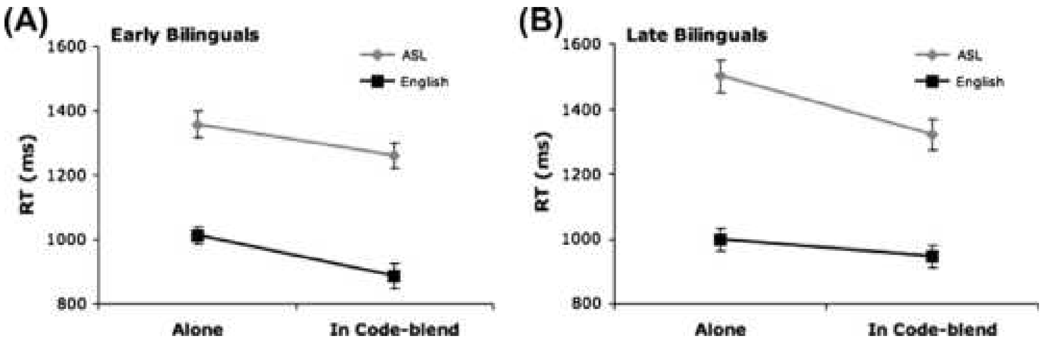


Figure 5 *Response times (RTs) for early bilinguals (A) and late bilinguals (B) for making semantic categorization decisions (edible/non-edible) to each language produced alone or in a code-blend (Emmorey et al., 2012a:207).*

2.1.4 The Frequency-Lag Hypothesis

Concurrently with the data collection for their experiment on lexical processing, Emmorey, Petrich, and Gollan (2012b) also included English native speakers and Deaf ASL native signers to test the effect of the frequency-lag hypothesis in bimodal bilinguals. According to the frequency-lag hypothesis, when compared to their peer monolinguals, bilinguals have a slowed lexical retrieval in their non-dominant language, a phenomenon which is more evident and therefore easier to be recognised for low-frequency words. This frequency-lag can be observed in picture naming tasks and tip-of-the-tongue (TOT) retrieval failures (Gollan and Acenas, 2004; Gollan and Silverberg, 2001). According to Gollan et al. (2008, 2011), the frequency-lag in bilinguals could be due to the fact that, speaking more than one language, bilinguals use each of their two languages less frequently than monolinguals. A minor use of the lexical elements belonging to each of their two languages would result in a delayed retrieval of elements related to their lesser practice. For this reason, frequency-lag affects low-frequency words more.

The study involved 40 hearing ASL-English bimodal bilinguals (some early bilinguals—CODAs—, and some late bilinguals), 28 native or early Deaf ASL signers and 21 native monolingual English speakers. As in Emmorey et al. (2012a) described above, the participants were asked to name the same 120 line drawing objects. Monolinguals named all 120 figures in their mother tongue (ASL or English), while bimodal bilinguals named 40 in each language, and the remaining 40 in code-blended modality (data collection in this last category was analysed for the aims of the previously described study). The frequency-lag hypothesis was tested on bimodal bilinguals since the possibility of producing code-blends does not force these speakers to fully divide their two languages, therefore their linguistic practice (or frequency of use) could be hypothesised to be closer to monolinguals' than to unimodal bilinguals. Lexical retrieval times (RTs) of bimodal bilinguals were compared to hearing monolinguals in English and to Deaf monolinguals in ASL. It is important to consider that, even for early bilinguals (CODAs), even if ASL may be the dominant language in their childhood, English will soon prevail to become their dominant language when immersed in the English-speaking hearing environment. For this reason, as frequency effects are usually larger in the non-dominant language, bimodal bilinguals are expected to be affected by a frequency-lag in ASL, rather than English.

In the RT analysis, only correct responses were examined. For ASL as shown in figure 6 RTs were faster for high- than for low-frequency signs in both monolingual and bilingual participants, as expected. The frequency effect in ASL is larger in bilinguals than in monolinguals (figure 7).

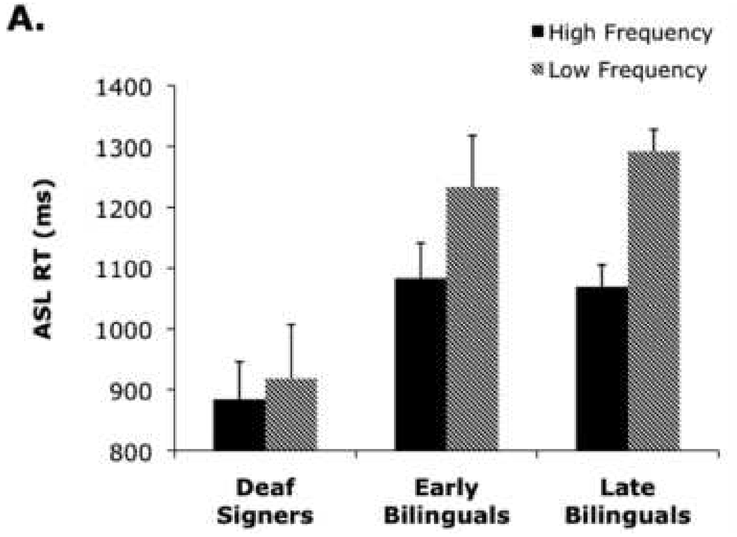


Figure 6 *ASL naming latencies are greater for bimodal bilinguals than for Deaf signers and for low-frequency signs than for high-frequency signs (Emmorey et al., 2012b:6).*

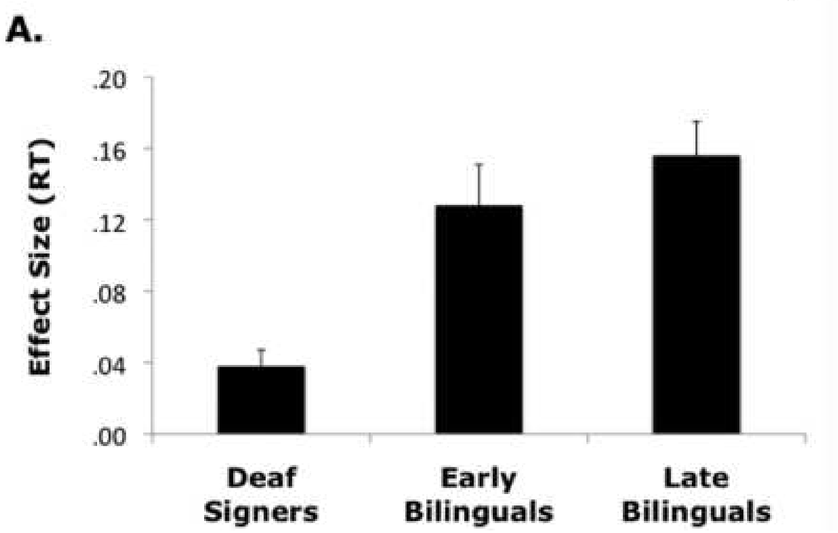


Figure 7 *The size of the ASL frequency effect for naming latencies is larger for bimodal bilinguals than for Deaf signers (Emmorey et al. 2012b:6).*

In English RTs for high-frequency words were faster than for low-frequency words, but there was not a significant difference across speaker groups (figure 8).

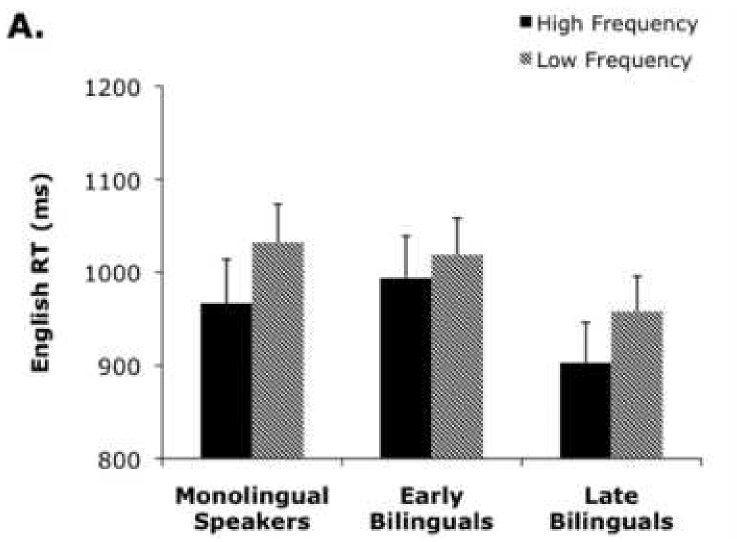


Figure 8 *English naming latencies are greater for low-frequency words than for high -frequency words, but lexical frequency does not interact with participant group (Emmorey et al. 2012b:7).*

If we compare the size of the frequency effect in bimodal bilinguals for the two languages, we can notice that it is larger for ASL than English, this result is in line with the anticipated shift of English to dominant language position, even in early bilinguals.

2.2 The MULTISIGN Project

The MULTISIGN Project ("Multilingual behaviour in sign language users")[7] was funded by the European Commission and took place from March 1st, 2011 to August 31st, 2016, hosted by the University of Central Lancashire, United Kingdom, and led by the International Institute for Sign Languages and Deaf Studies (iSLanDS), in collaboration with Ankara University (Ankara Universitesi), Turkey, and in cooperation with other partners in the Netherlands,

[7] Supported by European Research Council (ERC), Seventh Framework Programme under grant agreement no. 263647 awarded to Ulrike Zeshan and the University of Central Lancashire.

India, Germany, and the USA. The goal of this project was to examine complex multilingual behaviours, in particular:

- *Cross-signing*:

  the development of improvised communication (ad hoc Pidgins) between users of different sign languages in contact situations.

- *Sign-speaking*:

  the simultaneous production of sign and speech, where the different structures of both languages are kept largely intact.

- *Sign-switching*:

  code-switching between sign languages in multilingual sign language users.[8]

This project aimed at expanding bi- and multilingual research onto sing languages, with particular interest in phenomena specific to the visual-gestural modality and to intermodality bilingualism (also known as bimodal bilingualism, or sign-speaking). The prevalent method used for the study of bimodal bilingualism is the corpus-based analysis of semi-spontaneous interactions. The major literary output of the MULTISIGN project is "Sign Multilingualism" (Zeshan, and Webster eds., 2020).

2.2.1 Sign-speakers at IDBA

Sibaji Panda, having served as Chief Advisor of the Indore Deaf Bilingual Academy (IDBA) in India, where he also conducted several training events and workshops, had the chance to observe interaction strategies of a group of bimodal bilinguals in that environment (Panda, 2020) while contributing on the MULTISIGN project. IDBA is a school that welcomes approximately 550 Deaf pupils, and hosts training programs for ISL interpreters and teachers, where the

[8] https://cordis.europa.eu/project/id/263647

use of Indian Sign Language (ISL) is widespread. Several are the possible communicative interactions that one could bump into while walking the corridors of the school, from signed conversations between Deaf people, to spoken conversations between hearing individuals, or mix-modality conversational circumstances. The group focus of this observation was composed of hearing bimodal bilinguals, three native ISL speakers and one later learner, all trilingual in Hindi, English, and ISL who were able to properly adopt the conversational strategy of sign-speaking in bimodal interactions.

Throughout the campus, the three main bilingual conversational strategies adopted when Deaf and hearing people interact are:

- Signing and speaking consecutively;
- Signing and speaking simultaneously, with one dominant language (usually the spoken language) influencing the structure of the second language;
- Sign-speaking.

Sign-speaking (Zeshan and Panda, 2018, cfr. § 2.2.2) is a simultaneous production of a sign language and a spoken language having different linguistic structures. In these cases, both languages taken individually are structurally correct, and in simultaneity there is a consistent mismatch of items. No language seems to be dominant or significantly influence the other. Sign-speaking is not a forced occurrence, but a natural production. It is used by highly competent bilinguals when the conversational circumstance requires effective linguistic access to both hearing and Deaf interlocutors, as for example in the case of hearing visitors of deaf families, when the hearing child does not act as an interpreter, but rather carries on a conversation accessible to all. Panda's observation reveals that the simultaneity phenomenon actually does exist in natural circumstances among bimodal bilinguals.

2.2.2 The structure of simultaneous bimodal utterances

Zeshan and Panda (2018) studied the simultaneous co-production of signs and words by bimodal bilinguals in conversational circumstances involving Indian Sign Language (ISL), Hindi, and English to investigate the linguistic structure underneath the utterances, and the grammatical and semantic contributions carried by each language.

To better understand the data collected from this study and the presented analysis it is important to take a look at the differences between the general rules governing the morphological structures of ISL and Hindi, presented in table 3.

	Hindi	ISL
Sequential inflectional morphology (nominal)	Highly inflectional, incl. case, number, gender	None; no case, no gender
Sequential inflectional morphology (verbal)	Highly inflectional, incl. tense, aspect, aktionsart, causative	Very little; no morphological tense
Adpositions	Postpositions	None
Simultaneous morphology (non-spatial)	None	Some, incl. aktionsart, compounding
Simultaneous morphology (spatial)	None	Highly inflectional, incl. verb agreement, aktionsart, classifiers, auxiliary
Clause constituent order	Basic SOV, but high degree of flexibility, esp. in conversational speech	Fixed constituent orders: predicate-final; clause-final functional particles
Placement of wh-question words	Unmarked order in-situ	Obligatory clause-final
Placement of basic clause negator	Unmarked order pre-verbal	Obligatory clause-final

	Hindi	ISL
Compound verbs, copula verbs	Yes	No

Table 3 *Some characteristics of ISL and Hindi (Zeshan and Panda, 2018:9).*

The participants are the same four individuals introduced in § 2.2.1 (Panda, 2020), bimodal bilinguals highly competent in Hindi, and ISL, who acquired English through formal education. All are associated with the IDBA school. Three of them are CODAs, while one is a late learner of ISL and a trainee in sign language interpreting at the time of data collection. The setting of IDBA and the strong presence of linguistic inputs/outputs in both ISL and Hindi provided the ideal environment for developing simultaneity skills. The methodology used to collect data was to identify the suitable individuals and shadow them in their daily life routines and communicative interactions, so that the settings and occurrences of simultaneous sign-speaking could be as natural as possible. During data annotation, realised with the software ELAN, sign-speaking utterances were coded in four different categories, according to the mismatch degree:

- *PAR*: parallel utterances without any mismatch (example 14, figure 9)

(14)	IX:1	FAMILY	DEAF	NOTHING	
	mer-i	family mein	deaf	koi nahin hai	
	my-f	family in		deaf	any not COP.PRS.3SG

‘There are no deaf (people) in my family’

[Zeshan and Panda, 2018:24]

Figure 9 *Participant producing example 14 (Zeshan and Panda, 2018:25).*

- *SEM*: utterances presenting a semantic mismatch (example 15, figure 10)

(15) TODAY FIRST TIME 2:WELCOME:1

aaj pehl-i baar aap aae hain

today first-f time you.HON come-NF COP.2PL

'Today you are welcomed here for the first time.' (ISL)

'Today you have come here for the first time.' (Hindi)

[Zeshan and Panda, 2018:26]

Figure 10 *Participant producing example 15 (Zeshan and Panda, 2018:27).*

- *SYN*: utterances presenting a syntactic mismatch (example 16, figure 11)

(16)	FORCE	NO-NO	ANY	GOOD		
	kuch bhi force	kar-oge	to	acha	nahin	ho-ga
	anything force	do-FUT.2SG	then	good	not	be-FUT.3SG

‘Don’t force anything; that is better.’ (ISL)

‘(If) you are going to force anything, that won’t be good.’ (Hindi)

[Zeshan and Panda, 2018:27]

Figure 11 *Participant producing example 16 (Zeshan and Panda, 2018:28).*

- *SYNSEM*: utterances presenting both a syntactic and semantic mismatch (example 17, figure 12)

(17)	IX2	FAMILY	FAMILY	SCHOOL	GROW-UP	
	jaise aap eh	family	men	aur kaun	kaun	hain
	like you.HON	family	in	also who	who	COP.PRS.3PL

EXPERIENCE	DEM:3pl
aap	-ke
you.HON-POSS.2PL	

‘In your family, who else has experiences with schooling/education?’(ISL)

‘Like, who else is in your family?’ (Hindi)

[Zeshan and Panda, 2018:30]

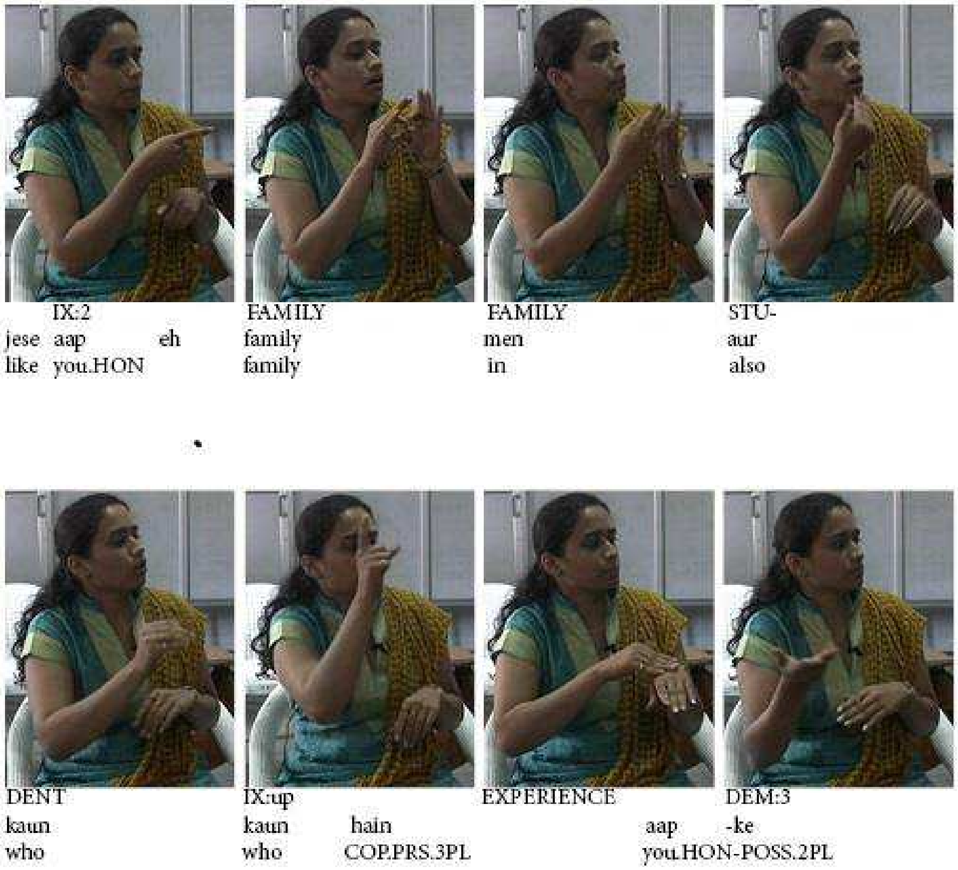


Figure 12 *Participant producing example 17 (Zeshan and Panda, 2018:30).*

Most of the sign-speaking utterances in the collected data are judged as grammatical in both languages. The majority of mismatches detected are SEM-coded which could be considered the hardest linguistic aspect to process. This study names as *sign-speaking* a particular case of code-blending in which each utterance maintains its own structural integrity, and defines it as a "simultaneous bilingual production where a) for the large majority of utterances, neither the signed nor the spoken output is grammatically compromised, and b) utterances include frequent syntactic and/or semantic mismatches" (Zeshan and Panda, 2018:8).

2.2.3 Code-blending in TİD-Turkish bimodal bilingualism

İşsever, Makaroğlu, Ergenç, and Dikyuva (2020) studied bimodal bilingualism between Turkish and TİD (Türk İşaret Dili, Turkish Sign Language). The participants involved 12 hearing bimodal bilinguals who acquired TİD as a first language while growing up in Deaf households, 12 hearing native Turkish speakers and 12 Deaf native TİD signers. Data collection took place in the context of a conversation delivered by a bimodal bilingual to a mixed audience of signers and speakers who respectively had only access to either the signed or the spoken language. The bilinguals were given the task to make their conversation as accessible and clear as possible to their mixed audience. They recorded a total of 460 minutes of data, which was then annotated using the software ELAN.

Results show different possibilities for code-mixing between signed and spoken languages. Code-blending prevails over code-switching, in line with previous research on different bimodal language pairs. One of the most common phenomena in congruence, which may be of semantic or a structural nature. Semantic congruence occurs when both languages convey a single meaning through different linguistic forms and modalities. As far as structure is concerned, the linguistic items of each language may follow the word order of only one of the two which would influence the other.

İşsever et al. (2020) classified blending types in TİD-Turkish bimodal bilingualism in three macro categories:

- *Dominant blending*:

  One of the two languages prevails over the other in blended productions. Dominant blending can be *supportive* if the dominant language is fully articulated while only some isolated signs or words from the non-dominant language accompany (or support) the production, as in example (14). If all the elements of the sentence are produced also in the non-dominant language but following the structure of the dominant language it is a case of *syntactic calque*, as in (15).

(18)	O-nun	için	mimik-ler-i	kullan-ıyor-UZ
	that-GEN	because	mimic-PL.ACC	use-PROG.1PL
			MIME	WE

‘That’s why we use mime’

[İşsever et al., 2020:178]

(19)	Adam	cevap	ver-iyor
	man	answer	give-PROG.3SG
	MAN	ANSWER	GIVE

The man answers’

[İşsever et al., 2020:180]

- *Independent blending*:

Both languages follow their own grammatical structure. If the two structures match, the utterance is a blending of *congruent structures*, as in (16), while if they do not, it is a blending with *discrete structures*, as presented in (17).

(20)	Çok	kötü	bir	yer	değil
	very	bad	a	place	not
	VERY	BAD	A	PLACE	NOT

‘It’s not a very bad place’

[İşsever et al., 2020:182]

(21)	Kız-ınız-dan	ayrıl-ıyor-um	de-di-m
	girl-POSS.2PL-ABL	leave-PROG.1SG	say-PAST.1SG
	GIRL	ENGAGEMENT THROW	I SAY

‘I said that I’m breaking off the engagement with your daughter’

[İşsever et al., 2020:183]

- *Blended blending*:

  Both languages convey part of the elements that only together provide full meaning to the utterance, a similar case is presented in (18).

(22)	Ben	de	gid-ip	izle-me-di-m
	I	too	go-CONJ	watch-NEG.PAST.1SG
	I		GO	MOVIE NOT

‘I didn’t go to watch the movie, either’

[İşsever et al., 2020:184]

2.2.4 Language acquisition in bimodal bilinguals

Müller de Quadros, Lillo-Martin, and Chen Pichler (2020) observed bimodal bilingual language development in ASL-English and Libras (Brazilian Sign Language)-Brazilian Portuguese language pairs, in both Kodas and Deaf children from Deaf families with a Cochlear Implant (DDCI). The analysis presented in the quoted study engages the linguistic development of two Kodas: Ben and Igor (respectively, one for each of the language pairs listed above) both of whom are exposed to their signed language inside the household and to the spoken language through the outside hearing community. Data collected were videotapes of natural communication conditions captured between age 2;00 and 2;07 (years;months), successively annotated through the software ELAN. During data annotation they separated spoken from signed and bimodal utterances, and divided the latters in the following categories (adapted from Van den Bogaerde and Baker, 2008):

- *Fully bimodal*: the same meaning is expressed in both modalities.
- *Sign-base*: both modalities are in use but the most information is expressed through signs.
- *Speech-base*: both modalities are in use but the most information is expressed through speech.

- *IX+Speech*: speech is produced while pointing (IX) towards the referred object.
- *Complementary*: the content of the utterance is split into the two languages and having access to both is essential to fully understand the meaning.

Secondly, they categorised bimodal utterances according to the timing of sign and speech production as shown in table 4.

Coextensive	sign speech	---------------- ----------------	Sign and speech start and end at the same time
Included	sign/speech speech/sign	---------------- ----------	The extent of one modality is completely within the other
Mismatch	sign/speech speech/sign	----------- -----------	One modality starts before the other; the second ends later

Table 4 *Three types of timing between sign and speech in bimodal utterances (Müller de Quadros, Lillo-Martin, and Chen Pichler, 2020:211).*

In Ben's productions a significant difference can be observed between sign-target sessions and speech-target sessions. In particular, he mostly produced sign-base of fully bimodal blends while interacting in a sign-target session, as shown in example (19), and the presence of these productions remained stable in time. Speech-target sessions instead induced Ben to produce more speech-base (as in 20a) or IX+speech (20b) blends, while full blends were only common in one word utterances. Growing up Ben's utterances in speech-target sessions became speech alone, and blends slowly disappeared. Most of Ben's utterances were included in timing, with one modality overlapping the other.

(23) HAVE COOKIE (Ben, 2;00, sign-target)
cookie
'(he) has a cookie'

[Müller de Quadros et al., 2020:213]

(24) a. POUR (Ben, 2;06, speech-target)
I wanna dump this
'I wanna dump this'

b. IX(off-camera)
I wanna train
'I wanna train'

[Müller de Quadros et al., 2020:214]

Igor has a stronger speech dominance. In fact, in his productions most blends are IX+speech (21a), or fully bimodal (21b), and later they become speech-base (21c). Many blends produced by Igor were mismatches, with some coextensive blends produced during later sign-target sessions.

(25) a. IX(toy) (Igor, 2;02, speech-target)
olha, olha aqui vermelho
look look here red
'Look, it's red here!'

b. BIRD (Igor, 2;02, sign-target)
pássarinho
birdie
'(it's a) birdie'

c. IX(toy) (Igor, 2;07, speech-target)
mãe quer esse não
mom wants this no
'I wanna train'

[Müller de Quadros et al., 2020:216]

2.3 Italian-LIS bilingualism

Bimodal bilingualism in Italy involves spoken Italian and Italian Sign Language (LIS). The main subjects who naturally develop this peculiar kind of bilingualism, as happens for most countries in the rest of the world, are CODAs, hearing children born from Deaf parents who grow up in a Deaf household using LIS as their primary language, and learn Italian from other relatives and in general the outside hearing community. Sign language in Italy is still perceived as a linguistic minority and is not widely diffused or even recognised by the population among whom prejudices are still strongly popular. Despite ratifying the ONU Convention in regard to the rights of people with disabilities, which involved aspects of inclusion of people affected by hearing impairment and deafness, back in 2009, Italy was the last country in Europe to officialise the legal recognition of the sign language spoken by its people. To be specific, with the approval received by the Chamber on the 19th of May 2021 the Italian Republic officially "recognises, promotes and protects Italian Sign Language (LIS), and Tactic Italian Sign Language (LISt)"[9]. This is an important achievement that finally brought the Deaf community to light, but plenty of work remains to be done to prove its undeniable value to the hearing community. For this and other reasons, as of today LIS users are still perceived as a linguistic minority and this causes several social implications in the community of bimodal bilinguals who tend to prefer letting the Italian language prevail over their naturally acquired LIS. It is important to bear in mind these aspects while reading the studies presented below.

[9] Art.34-ter, Legge n.69 del 21-05-2021
ATTO COMPLETO - Gazzetta Ufficiale:
https://www.gazzettaufficiale.it/atto/vediMenuHTML?atto.dataPubblicazioneGazzetta=2021-05-21&atto.codiceRedazionale=21G00080&tipoSerie=serie_generale&tipoVigenza=originario

2.3.1 Naturalistic discourse in Italian adult CODAs

Bishop, Hicks, Bertone and Sala (2006) analysed a corpus of naturalistic conversation between Italian adult CODAs with the aim to identify their communicative preferences when no linguistic needed to be activated. A further consideration was also made about CODAs' "Third identity" and the feeling of not belonging completely to either Deaf culture nor the hearing culture. This section won't dive deep in this aspect, but rather focus only on the collected linguistic productions.

Ten participants, all adult Italian bimodal bilinguals from birth (CODAs) were divided in two conversational groups of 5 people each, and videotaped during a nineteen minutes discussion about their childhood, family and relationship with the Deaf community. In each group one member was in charge of moderating the conversation to the desired topics, which were strategically chosen to lead the participants to bimodal productions.

Similarly to previously conducted studies, the collected data presented a preference for code-blends rather than code-switches in bilingual utterances, as the proportions in figure 13 show.

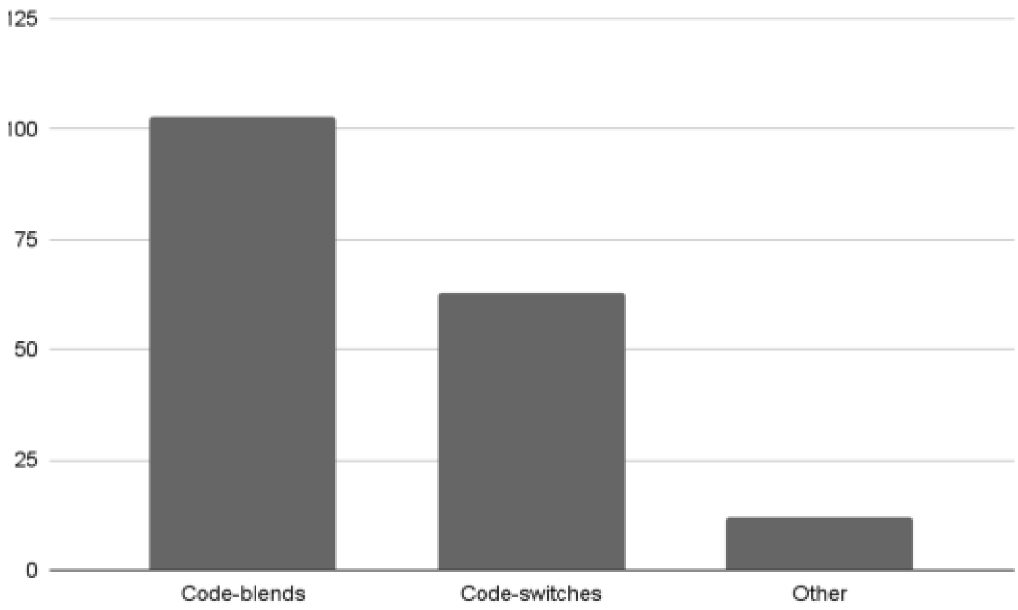


Figure 13 *Comparison of frequency of code-blends versus code-switches (Bishop et al. 2006:91).*

The main reasons for choosing code-switching were:

- to keep part of a conversation private (in the example below the participants don't want to be overheard by the technicians in the room)

(26) A: Qui l'unica single sono io… VERO, NON CAPISCONO. HANNO CAPITO?
'I am the only single here... THEY DON'T UNDERSTAND, RIGHT? DO THEY UNDERSTAND?'

B: NON CREDO NO
'I DON'T THINK SO'

[Bishop et al., 2006:92]

- when the visual components of LIS helped to better describe a situation

(27) a. Non esistono lati positivi o negativi, è lo stesso ELENCO
'There are no positive or negative sides; it's the same AGENDA'

b. Come dico una mezza parola, TUTTI-MI-GUARDANO
'Since I stopped midway, THEY-ALL-LOOKED-AT-ME'

[Bishop et al., 2006:93]

- because the lexical element was retrieved faster in LIS, and is then followed by the Italian word.

(28) Mio padre non poteva parlarci perché, BUIO, c'era il buio totale
'My father couldn't talk to us because, DARK, it was completely dark'

[Bishop et al., 2006:93]

Different forms of code-blending were found in the data. The grammatical categories of single-word code-blends are presented in figure 14, and examples are given of bimodal productions with single-word code-blends on a verb (29a) and on a noun (29b).

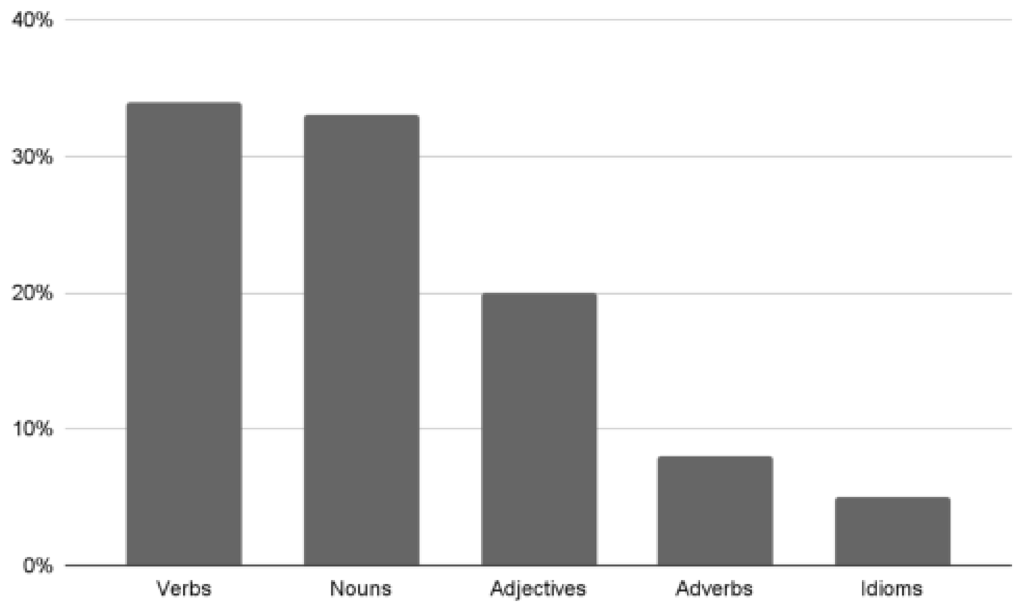


Figure 14 *Grammatical categories for code-blends (Bishop et al. 2006:92).*

(29) a.	IT	Io l'ho	capito	bene	
	LIS		CAPITO		
	tr.	'I understood it well'			
b.	IT	non è un		problema	
	LIS			PROBLEMA	
	tr.	'It's not a problem'			

[Bishop et al., 2006:95]

In the collected data, code-blending cases of semantically non-equivalent linguistic strings were also found, as in (30), where the participant signs the location of the bruises while describing them with words.

(30)	IT	Ero viola
	LIS	TUTTA-LA-FACCIA
	tr.	'My entire face was purple'

[Bishop et al., 2006:96]

Data presented in this study confirm the simultaneous activation of the two languages in naturalistic discourse of Italian adult CODAs, and their preference for code-blends over code-switches in bilingual productions, as found in previous research on different language pairs. Similarly to American CODAs (Emmorey et al. 2005), they are capable of mixing their languages in several ways, but they never seem to do it intentionally.

2.3.2 Multilingual utterances in Italian KODAs

One of the first, and perhaps the most important to date, study on bimodal bilingualism in Italy was conducted by Branchini and Donati, and has been presented and discussed in several publications (Branchini 2011; Donati and Branchini 2012; Branchini and Donati 2015, 2016; Donati 2021). The aim of their work was to investigate the phenomenon of simultaneous mixed utterances in Italian bimodal bilinguals, with particular interest on the relation between the two linguistic sentences. They mainly analysed a naturalistic corpus, with some grammatical judgments of elicited production data. Following they presented a possible partition of code-blending types according to both meaning and structure of the sentences.

The participants of this study were 6 Italian KODAs (age 6 to 10), bimodal bilinguals with balanced linguistic competence in Italian and LIS, all born from Deaf parents who regularly interacted with the Deaf community. All the kids during the recording sessions proved to be perfectly able to separate their two languages and produce them in isolation, according to the comprehension possibilities and preferences of their interlocutors. The choice of younger participants for this study was made firstly following Meisel (1989) who states that children are more incline in producing mixed language utterances in any language pair, and secondly because ingenuity of children might help in suppressing the social stigmas which often burdens adult CODAs in publicly using LIS.

The recording sessions took place in their domestic environment with the presence of family and friends, other than two bimodal bilingual researchers: one hearing and one Deaf. This setting was carefully ideated with the aim of collecting a corpus of data as natural as possible, and stimulating the children in producing multimodal utterances. Other than recording natural conversations, some activities were presented to the participants. In the first one, after seeing a video telling the story of “Snowhite and the seven dwarfs” in LIS they were asked to retell the story adding their own impressions. Then they were given a set of cards representing different scenes of a story and they were told to organise them in temporal order and narrate the story. A third activity consisted of retelling a story that was presented to them in the form of a video recording of a bimodal bilingual switching languages and modality throughout the whole production. As for the grammatical judgements, the participants were presented a series of bimodal productions elicited by adult CODAs and they were afterward asked a simple question related to each sentence. These judgments were necessary to obtain negative evidence of the collected data and prove that bimodal productions were an understandable input, not a confused output. KODAs found themselves astonished by the simplicity of questions they could answer easily, hence the demonstration of the condition of naturality both in input and output of bimodal productions in bimodal bilinguals was proved. The corpus was recorded with a digital camera, and successively the videos were converted in digital files and linguistic data was annotated using the software ELAN for linguistic transcription.

In the language-mixed productions recorded, both code-switches (as in 31) and code-blends were present.

(31)		e	poi	l’ha	preso
		and	then	it’have.3SG	take.PTCP
	CUT-HEART				TAKE-HEART

‘(He) has cut the heart and has taken it’

[Donati and Branchini, 2012]

The examples collected from the data were categorised according to word order and syntactic structure to differentiate and describe code-blending types. The main distinction was made between *dependent blending* and *independent blending* whose characteristics are summarised in table 5.

Dependent blending	**Independent blending**
One word order	Two word orders
One full-fledged morphological string	Two full-fledged morphological strings
One intact prosody	Two intact prosodies

Table 5 *Correlations observed between word order types, morphology and prosody of the language strings in blending utterances within the corpus (Donati 2021:629).*

In dependent blendings the linguistic strings that compose the mixed utterance are not autonomous if produced isolatedly (statement which can be true for at least in one of the two languages). The most common case of dependent blendings are *dominant blendings* which occur when only one linguistic string is autonomous and complete if taken individually and the other one (non-dominant) reinforces the production with only some lexical elements accompanying the production. This phenomenon can be observed in example (32).

(32)	La	strega	dà	la mela	a Biancaneve
	the	witch	give.3SG	the apple	to Snowhite
			CL-GIVE		

‘The witch gives the apple to Snowhite’

[Donati and Branchini, 2012]

The insertion of the sign CL-GIVE serves only as a reinforcing element that gives no additional meaning to the meaning. The two lexical elements carrying the same meaning are not necessarily synchronised, but could appear in different parts of the sentence even in the form of a repetition, as shown in (33) where the sign SAY is produced in correspondence with the subject and its determinant, but not the corresponding verb.

(33)	La	regina	dice
	the	queen	say.3SG
	SAY	SAY	
	'The queen says'		

[Donati and Branchini, 2012]

Independent blendings, instead, occur when both linguistic strings are complete and autonomous if produced individually, meaning that they both are grammatically correct and acceptable monolingual utterances. In these productions, the linguistic strings can partially carry different meanings or specifications, as in (34) where the signed string gives additional information about the way in which the climbing occurs.

(34)	I	sette	nani		sono	saliti
		the.PL	seven	dwarf.PL	be.3PL	climb.PTCP
		SEVEN		DWARVES		CLIMB ON-SHOULDERS
	'The seven dwarves have climbed on the shoulders'					

[Donati and Branchini, 2012]

Independent strings composing a code-blend can differ according to the linearization of lexical elements present in the two languages. Following this differentiation, Donati and Branchini (2013) identified three different categories: *congruent lexicalisation*, *syntactic calque*, *two word orders*.

Congruent lexicalisation is made possible if, and only if, in a given sentence the syntactic structure ruling the word order of the elements in both languages match. In this case all the lexical elements would match their counterparts, but each linguistic string would be independent and grammatically correct on its own, as in (35).

(35)	Lei	sa	tutto
	she	know.3SG	everything
	IX	KNOW	ALL[10]

'She knows everything'

[Donati and Branchini, 2012]

In syntactic calque one of the two languages follows its prescribed word order and the other follows it producing concurrently the corresponding lexical elements, the originated string may not be the most grammatical choice, but it's still comprehensible if produced in isolation. A syntactic choice can be sign-based as in (36) where LIS provides its word order to Italian, or speech-based if viceversa (37).

(36)	Il papà la mamma la sorella	mangiato	finito
	the father the mother the sister	eat.PTCP	finish.PTCP
	FATHER MOTHER SISTER	EAT	DONE

'The father, the mother and the sister have done eating'

[Donati and Branchini, 2012]

(37)	Una	bambina	va	allo	zoo
	a	girl	go.3SG	to.the	zoo
		GIRL	GO		ZOO

'A girl goes to the zoo'

[Donati and Branchini, 2012]

The third case of linearisation presents two different word orders, for each language the one prescribed by their internal structure. This is the most interesting type as it proves more than any other that the two different

[10] This construction is correct and acceptable in LIS because universal quantifiers are a documented exception to the common SOV liner order, and occupy a postverbal position (Geraci, 2006)

grammars are activated at the same time and both languages are processed together, but separately inside the bilingual brain. In (38) the negative element keeps its original position which is preverbal in Italian, but postverbal in LIS.

(38)	Ha	detto:	non	sei	tu
	have.3SG	say.PTCP	NEG	be.2SG	you(SG)
		SAY	YOU		NOT
	'(He) said: it is not you'				

[Donati and Branchini, 2012]

The same phenomena can be observed in the placement of the wh- elements in (39), first position in Italian, but last in LIS, and the topicalization of the pronoun in different positions in (40).

(39)	Chi	ha	chiamato?
	who	have.3SG	call.PTCP
	CALL		WHO
	'Who called?'		

[Donati and Branchini, 2012]

(40)	Io	sempre	puntuale
	I	always	on.time
	ALWAYS ON-TIME IX		
	'As for me, I am always on time!'		

[Donati and Branchini, 2012]

Finally, this study also introduced and defined *blended blending*. In this very peculiar phenomenon the elements of the sentence are split between the two languages, so each one carries only part of the constituents. For this reason, none is complete on its own, but the full meaning can only be perceived from the blended utterance. The following examples clarify this typology. In (41) the verb is present in both modalities, but the subject can only be found in LIS and the indirect object only in Italian. In (42) only the sign for the verb is given, but the locative argument is provided vocally.

(41)	Parla	con	Biancaneve
	talk.PRS.3SG	with	Snowhite
	TALK	HUNTER	
	'The hunter talks to Snowhite'		

[Donati and Branchini, 2012]

(42)	Dalla	regina	cattiva
	to.the	queen	wicked
	GO		WICKED
	'(He) goes to the wicked queen'		

[Donati and Branchini, 2012]

2.4 Conclusions

This chapter presented an overview of some previously conducted studies on bimodal bilingualism. First it focused on the pionieristic work conducted on ASL-English bilingualism by Karen Emmorey and colleagues (2005 et seq.), from the definition of code-blend for multimodal simultaneous expressions, to the frequency-lag hypothesis in bilingual lexical processing. Some outcomes from the MULTISIGN project (Zeshan and Webster, 2020) were then presented, regarding bimodal bilingualism in India, Turkey, and Brazil. Finally previous studies on bimodal bilingualism in Italy were introduced, from the analysis of naturalistic discourse in Italian adult CODAs (Bishop et al., 2006), to the observation of natural multilingual expression in KODAs (Branchini 2011; Donati and Branchini 2012; Branchini and Donati 2015, 2016; Donati 2021). In chapter 3 a brief comparison between Italian and LIS will be provided, in order to make the following contents available to the readers, regardless of their previous competence in these languages.

Chapter III. Grammars in comparison (Italian-LIS)

Italian is the official language spoken in Italy, but (as reported in § 2.3) the Italian Republic lately recognised the language status also to Italian Sign Language (LIS) and Tactile Italian Sign Language (LISt), which are widespread languages among the Italian Deaf, and Deaf-Blind communities. LIS and LISt could and should therefore be considered official languages of the Italian population, even if they remain minority languages. It is important to state that LIS and Italian are not two divergent representations of a single linguistic system, but two independent languages. The primary difference between Italian and LIS is the channel used to communicate, acoustic-vocal for Italian and visuo-gestural for LIS. Although displaying the properties common to all natural languages, they are typologically very different. A widespread misconception in Italy seems to be that LIS is simply a visual reproduction of spoken Italian. Similar productions are in fact used especially in older educational contexts to teach Italian to deaf students, it is a communication strategy called SIgn Italian (Italiano Segnato, IS), such as each part (words and particles) of Italian is represented manually with a corresponding sign or letters belonging to the manual alphabet. The result of this strategy is similar to a signing calque of Italian.

Going back to the grammatical differences between Italian and LIS, beyond the modality used, they are precious for research in bimodal bilingualism as they open the way to new possible investigations by testing previously formulated theories in this field.

This chapter provides a description of the main differences between Italian and LIS mainly focusing on aspects at the sentence level, which will be relevant when addressing the study of Jaber, Branchini, Donati, Geraci and Giustolisi (in preparation). Most of the notions presented in this chapter comes from two important research projects which involved Italian Sign Language. The first one is PRIN[11] (2008-2010), whose aim was to collect a LIS corpora, and to do so the participation was extended to signers coming from several different socio-linguistic backgrounds. The second project is SIGN-HUB[12] (2016-2020), whose outcomes had the goal to collect, investigate and describe the grammar of Italian Sign Language (LIS). This chapter is divided into three main sections: in § 3.1 the formational parameters of word and signs are presented; § 3.2 provides a brief description of noun and verb classes, followed by the description of some morphological modifications; and § 3.3 focuses on syntax giving some general information about how elements are organised in the sentence (in particular those elements which are present in the items selected for the research presented in chapter 4) and the internal structure that governs this order.

3.1 Phonology

Sign languages are expressed through the visuo-gestural channel while spoken languages use the acoustic-vocal channel. Different expressive modalities induce a substantial diversification in word generation strategies. In spoken languages sounds act as protagonists, in a domain which is called phonology. Soundwaves travel through the air from the mouth of the speaker to the ears of the listener. Different frequencies generate different sounds which can be followed by other sounds and combined into words, and further into sentences. Phonology is therefore the domain which collects the smallest elements of language called phonemes. A phoneme is a distinctive sound of a given language and can be identified by the presence of a minimum pair, two words identical, but for a sound able to modify the meaning of the two words. Clearly

[11] "Dimensioni di variazione nella Lingua dei Segni Italiana", Progetto di Ricerca di Interesse Nazionale (PRIN), Università di Urbino, Sapienza Università di Roma, Università Ca' Foscari Venezia, Università di Milano-Bicocca.

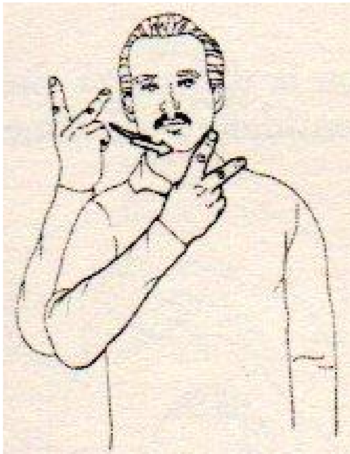
[12] "The SIGN-HUB project: preserving, researching and fostering the linguistics, historical and cultural heritage of European Deaf signing communities with an integral resource", Grant Agreement 693349, funded by the European Commission within the Horizon 2020 framework program, http://www.sign-hub.eu/.

sounds are not the basic element of sign languages, as the visuo-gestural channel operates through movements (mainly, but not uniquely, of the hands) captured by the eyes. Stokoe (1960) identified five parameters which can change the meaning of a sign and therefore can be considered the equivalent of phonemes of sign languages. The basic parameters of any sign language are *handshape*, *location*, *movement*, *palm and fingers orientation*, and *non-manual markers (NMMs)*.

A brief description of each phonological parameter is provided below.

- Handshape refers to the hand configuration, i.e. the shape of the hand during the production of the sign. Most handshapes can be found in the manual alphabet of a given sign language. A minimal pair for handshape in LIS is represented by the signs MISTAKE (signed with '5' handshape) and TRUE (signed with 'V' handshape), shown in figure 15.

MISTAKE



TRUE

Figure 15 *Minimal pair for handshape in LIS (Volterra, 1987:73).*

As can be seen by the images above, the two signs are produced in the same location in front of the face and with the same movement from side to side. Palm and fingers are oriented towards the same direction (upwards) and no sign presents any specific NMM. The only difference between the two signs is the handshape, which in the sign MISTAKE is 5, where all five fingers are extended), while in the sign TRUE is V, where only index and middle fingers are extended.

- Location refers to the area within the signing space where a sign is produced. A sign may be produced on the body (near the eyes, chest, mouth), or on the neutral signing space, perhaps agreeing with a specific referent). A minimal pair for location in LIS is represented by the signs HUNGER (signed on the lower side of the chest) and DOG (signed under the chin), shown in figure 16.

HUNGER DOG

Figure 16 *Minimal pair for location in LIS (Volterra, 1987:45).*

As can be seen by the images above, the two signs are produced with the same handshape (B: fingers extended and united) and movement towards the signer. Palm and fingers are oriented towards the same direction (palm downwards and fingers sideways) and no sign presents any particular NMM. The only difference between the two signs is the location: the sign HUNGER is produced in the lower side of the chest, while the sign DOG is produced under the chin.

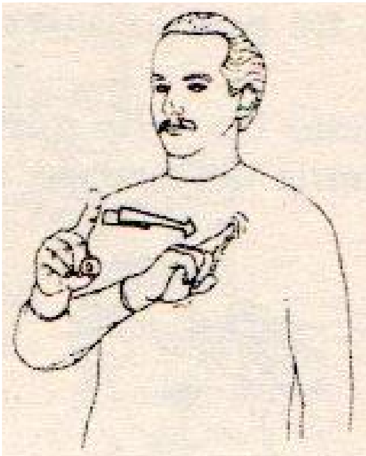
- Movement refers to the changing of location of the hands during sign production (e.g. a sign may be moving away from or towards the signer, or from one referent to another), or could also refer to the frequency of an action, through repetition of the same movement within verb signs. A minimal pair for movement in LIS is represented by the signs CHURCH (signed joining hands together twice) and PRAY (signed with joint hands moving forward), shown in figure 17.

CHURCH PRAY

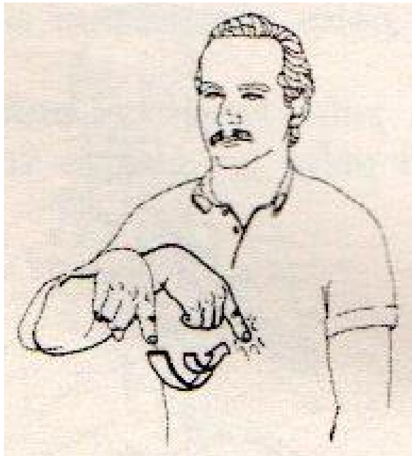
Figure 17 *Minimal pair for movement in LIS (Volterra, 1987:114, 115).*

As can be seen by the images above, the two signs are produced in the same location in front of the chest, and with the same handshape (B: fingers extended and united). In both signs the palms are facing one another and the fingers are oriented upwards. No sign presents any particular NMM. THe only difference between the two signs is the movement: the sign CHURCH is produced joining the hands together twice, the first time closer to the chest, and the second time a little further, in the sign PRAY the two hands touch while moving from the chest forward.

- Palm and fingers orientation refers to the direction in which the hand is turned when producing the sign (e.g. palm up, palm down, palm right, palm left, palm outward, palm inward). A minimal pair for palm orientation in LIS is represented by the signs MY (signed with the index facing upwards) and PRIVATE (signed with the index facing downwards), shown in figure 18.



MY

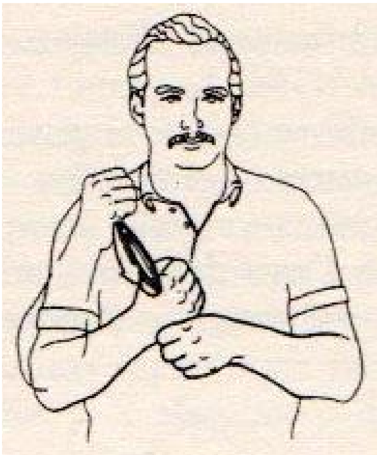


PRIVATE

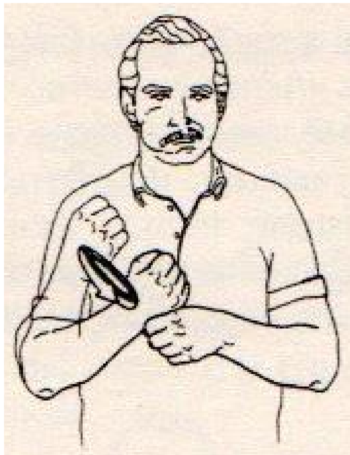
Figure 18 *Minimal pair for palm and fingers orientation in LIS (Volterra, 1987:116).*

As can be seen by the images above, the two signs are produced with the same handshape (G: index extended), and in the same location (upper chest). During the production of both signs the hand moves towards the chest, and no sign presents any particular NMM. The only difference between the two signs is the finger orientation which in the sign MY is upwards, but in the sign PRIVATE is downwards.

- NMMs are signals or gestures produced solely with the shoulders, head, and face expressions, without the use of the hands. Within this parameter are some oral components belonging to two categories: so-called IPP and COS. IPP (Immagini Parole Prestate, images borrowed from words) are the occurrence of the mouthing of the corresponding Italian word while producing a sign, they can be partial or total. COS (Componenti Orali Speciali, special oral components) are specific features embedded in sign production. COS can be transparent, translucent or opaque depending on the degree of intelligibility of the relationship between the COS itself and the sign meaning. A minimal pair for NMMs in LIS is represented by the signs WORK (signed without any specific NMM) and LOAN (signed with an inflated cheek), shown in figure 19.



WORK



LOAN

Figure 19 *Minimal pair for NMMs in LIS (Volterra, 1987:162).*

As can be seen by the images above, the two signs are produced with the same handshape (A: closed fist), and in the same location (neutral space). During the production of both signs the dominant hand performs a circular movement over the non-dominant hand, and both hands present the same palm orientation towards the signer. The only difference between the two signs is noticeable in the NMMs which in the sign WORK are neutral, while in the sign LOAN a cheek is inflated.

3.2 Lexicon and some morphological modifications

Lexicon is the domain of a language where all the words that compose it are collected. The main elements of the discourse that will be discussed in this section are nouns and verbs. In LIS some signs are phonologically very similar between their name/verb classification, only differing for a phonological difference (mainly a difference in movement), in other cases, their phonology matches and they can only be distinguished by the context.

3.2.1 Nouns

Nouns are the lexical elements in a language with a denotative purpose (i.e. they can denote a person, a place, an object, an idea, and so on) (Checchetto, Fornasiero, Mantovan, and Branchini, 2020). The two main classes of nouns in LIS are *common nouns* and *proper nouns*.

- *Common nouns*

  Concern generic referents with no individualistic features. They can be countable (and therefore inflect the plural form), uncountable, concrete (perceivable by the five human senses), or abstract.

  Common nouns can have different origins. They are iconic if their manual representation recalls the shape of the object or the physical action involved. Some neologisms belonging to this class may have originated from classifiers, for example the sign BINOCULARS (figure 20) is produced with the same handshape (C) and turning movement used when holding the object.

Figure 20 *BINOCULARS in LIS (Volterra, 1987:81).*

There are nouns whose origins can be traced back to Italian. This is the case of some signs whose handshape is the initial letter of the corresponding Italian word, for example the days of the week: MONDAY (figure 21) is signed with the handshape ‘L’ (*it. LUNED*Ì).

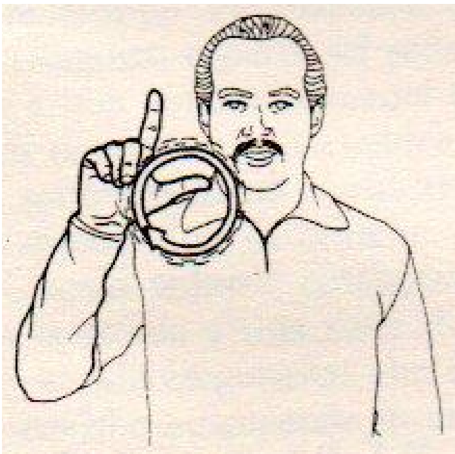


Figure 21 *MONDAY in LIS (Volterra, 1987:239).*

Some names find their origin in the cultural gesture and are considered a peculiar kind of borrowings (not from other languages, but from a different communicative system). An example is the sign EAT (figure 22), also used with the meaning “food”, which is produced similarly to the cultural gesture associated with the same semantic field.

Figure 22 *EAT in LIS (Volterra, 1987:184).*

Lastly, many nouns belonging to the same semantic category can be originated through assimilation and therefore have similar realisations (Bertone, 2011). In LIS, the sign ELECTRICITY (figure 23) is often used in compounds for electrical items, for example, the sign COMPUTER (figure 24) is a compound noun “electricity+type”: ELECTRICITY^CL (5): ‘type’.

Figure 23 *ELECTRICITY in LIS (Checchetto et al., 2020:265).*

Figure 24 *COMPUTER in LIS (Checchetto et al., 2020:265).*

- *Proper nouns*

This class of nouns concerns specific referents identified among similar ones, they can refer to a person, an object, or a place. Proper nouns referring to a person are called *name signs*. The origin of proper names in LIS can be iconic (also called *descriptive*) or related to Italian words. Descriptive signs may identify a referent by its shape, or a person by their job, or some physical or behavioural characteristics . In the examples below, ANNA (figure 25) is the name sign of a person with voluminous and long hair, while ELENA (figure 26) is the name sign for a person who smiles a lot.

Figure 25 *ANNA (Checchetto et al., 2020:267).*

Figure 26 *ELENA (Checchetto et al., 2020:267).*

Proper names may be also influenced by Italian, by presenting the hand shape of the initial letter used in writing (called initialisation), or some form of partial fingerspelling; if the written form of the name/surname of a person matches a lexical item in Italian, its translation could be used as a name sign. For example, the name sign for Virginia Volterra (figure 27) is realised with a ‘V’ to recall the first letter of her name and surname, combined with the movement used to represent the physical characteristic of thinness.

Figure 27 *VIRGINIA_VOLTERRA (Checchetto et al., 2020:268).*

3.2.2 Agreement

In naturalistic discourse languages adopt different strategies to mark agreement relationships. In Italian the final part of names (usually the last letter) can be modified in accordance to the referent category (i.e. feminine singular uses the suffix *-a*: *bambin-a* (*girl*), or masculine plural uses the suffix *-i*: *bambin-i* (*kids*)). To mark agreement between the elements of a sentence LIS uses the signing space, that is the space immediately in front of the signer in which the signer moves the hands while speaking. Introducing a new element in a certain area of the signing space allows other elements to mark their agreement with that element by being produced in the same point, or moving from it (agent) or towards it (recipient). For this reason, agreement can be considered a geometric match between referents and spatial sites in LIS, as in other sign languages.

3.2.3 Plurals

Similarly to agreement, plural forms are marked towards a modification of the suffix in Italian (i.e. the suffix *-i* generally marks plural for masculine items, while the suffix *-e* generally marks plural for feminine items). An exception are collective names, which are nouns that present a different lexical form and which refer to a plurality of items. In LIS plural forms can be expressed by a partial or total repetition for signs produced in the signing space. The use of quantifiers, adjectives expressing a quantity, or numerals can also denote a plural semantics, as well as classifiers. Classifier production is usually used to mark plurals by representing more than one item or by representing the same item more than once. In some particular cases, the handshape parameter of a sign could be modified with a numeral configuration (up to number 5) to match the intended quantity. This is the case, for example, of the sign MONTH produced with the index finger of the dominant hand moving down the non-dominant hand palm (figure 28).

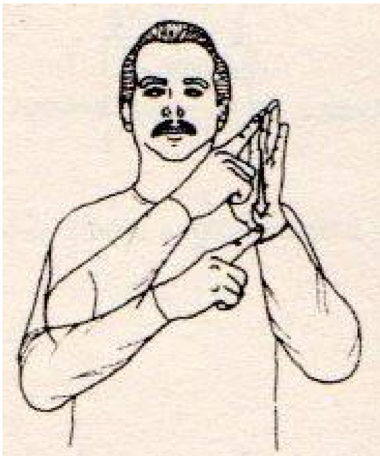


Figure 28 *MONTH in LIS (Volterra, 1987:52).*

To express the meaning of two months the handshape of the dominant hand will be changed into 2, and so on up to 5 months. To convey plurality for signs produced on the body, the signer can repeat the sign for at least three times, together with the NMMs of head nod and/or a movement of the head from left to right.

3.2.4 Definiteness

Definiteness of referents is expressed by determiners both in Italian and in LIS. Italian has two different categories of determiners: definite and indefinite, and they can be used in accordance with the characteristics of the referent.

In LIS definite determiners are expressed by pointing at the site in space linked to the desired referent. Determiners are not mandatory, but optional in signed productions, and occupy a post nominal position. Definiteness may be accompanied by NMMs concerning raised eyebrows, lifted chin, contracted cheeks, and mouth slightly open. These NMMs are shown in figure 29a.

As mentioned for plural forms (§ 3.2.3), nouns can be accompanied by numeral adjectives that carry the state of definiteness other than the plurality.

Indefiniteness is expressed in LIS by a generic index sign pointing upwards. This difference is also marked by specific NMMs which for definiteness involve eyebrows arching, a light rise of the head, cheeks tensing and a soft opening of the mouth. Specific NMMs for indefiniteness instead involve the sides of the mouth moving down, making the lips form an inverted "U" (Bertone, 2011). These NMMs are shown in figure 29b.

a.  b. 

Figure 29 *NMMs of definiteness (a) and indefiniteness (b) (Mantovan, 2020:650).*

3.2.5 Verbs

Verbs are the main part of a linguistic sentence, the only necessary element to form a sentence for both Italian and LIS. In Italian, the lexical items belonging to this category can agree with their referents for person, number and tense in Italian and, similarly to nouns, they do so through different suffixes. The root of the suffix depends on one of three main conjugations, which are the suffix of the infinitive form of the verbs: *-are*, *-ere*, and *-ire*. In LIS agreement concerns person and number, and is expressed through space. Agreement between a verb and its referents is marked by spatial relations. In particular, three classes of verbs can be distinguished on the basis of their phonological articulation, influencing the possibility of displaying agreement with their arguments. Each class displays a different pattern of agreement. Class 1 includes verbs which have an invariable phonological form, and are known as *plain verbs*. Class 2 includes verbs which mark agreement with their referents through spatial modification, these are called *agreement verbs*. Class 3 includes verbs which can be spatially modified to mark agreement, similarly to class 2, but only involve locative arguments (i.e. from-to).

The three classes are described in more detail below.

- Class 1: *plain verbs*

  Plain verbs cannot mark agreement spatially because of their phonological realisation, in fact the verbs belonging to this class are articulated on the body of the signer and cannot be produced elsewhere. Plain verbs usually refer to mental or physical states, or actions related to a specific body part. They remain unaltered, regardless of the referent they agree with they always keep their citational phonological form. Plain verbs can be intransitive and select only one argument, or transitive and select two arguments. In this second case, subject and object are usually identified by the order of constituents, according to the unmarked word order, which in LIS is SOV (see § 3.2.1 for additional information on word order). An example of a plain verb in LIS is the sign DRINK (figure 30), produced on the mouth of the signer.

Figure 30 *DRINK in LIS (Volterra, 1987:60).*

- Class 2: *agreement verbs*

Agreement verbs mark agreement with their referents through movement in space. They are also known as *directional verbs*, or *indicating verbs*. Semantically, agreement verbs usually express an idea of transfer, whether concrete or abstract. Three different phonological typologies belong to this class: verbs with two articulation points in the neutral space, characterised by a movement from A to B; verbs with one point of articulation on the neutral space; and verbs whose articulation begins on the body of the signer and then moves toward a point of the neutral space. With each point of the space being a specific referent in the discourse, agreement is marked through the movement of the verb toward the location in space occupied by the referent. Agreement verbs can be mono-, bi- or tri-argumental. Mono-argumental verbs act as intransitives and they are produced in the point of articulation linked to their only referent. Bi-argumental verbs act as transitives and agree with both arguments, if they have two articulation points in the neutral space, or generally with the object if they only have one argument produced in the signing space. Tri-argumental verbs act as ditransitives. In this case, they agree with the subject and indirect object, or only with the indirect object. Sometimes agreement is expressed not only through the direction of the verb movement, but also through the orientation of the signing hand(s). An example of a mono-argumental agreement verb in LIS is the sign BREAK represented in its citational form in figure 31a, and expressing agreement with a referent in figure 31b. The sign GIFT (figure 32a) is an example of a bi-argumental agreement verb, which performs a movement from the subject to the object to express agreement (figure 32b).

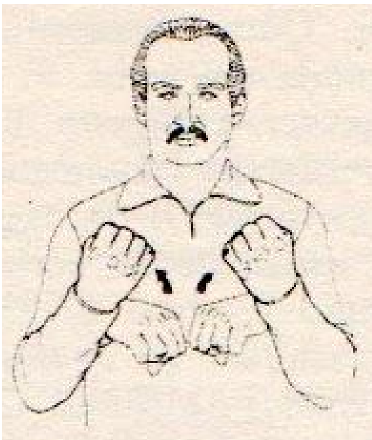
a.  b. 

Figure 31 *BREAK in LIS (Volterra, 1987:196).*

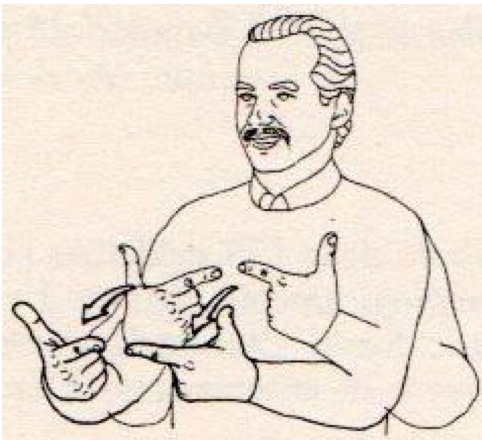
a.  b. 

Figure 32 *GIFT in LIS (Volterra, 1987:190, 193).*

- Class 3: *spatial verbs*

  Spatial verbs agree with their locative arguments in space. Directionality of the movement in sign production reflects physical movement of the object. Within this category of verbs, the hands often assume a holding shape or a representative shape. Only transitive verbs belong to this category as it includes items whose semantics convey the concept of movement. MOVE is a spacial verb in LIS, as shown in figure 33, the handshape expresses a holding agreement with the physical object being moved (in this example, a book), while the directionality of the movement expresses the change of location.

Figure 33 *MOVE_BOOK (Checchetto et al., 2020:273).*

3.3 Syntax

Syntax is the domain of grammar that involves the study of the combination and relation holding between the elements of phrases, clauses and sentences. Both spoken and sign languages are governed by the presence of a syntactic structure. Italian and LIS are typologically different languages, as far as their word order is concerned. However, syntax does not only refer to the order of words within sentences and to their relationship, but also to the hierarchical structure beneath sentence formation. This structure, proper to each language, is acquired by young children in the first month of life. Generative syntax is the field of study that focuses on this hierarchical structure to explain what rules it, the internal relations between the elements, and the natural movements of items that take place within it.

3.3.1 Word order

Word order reflects the grammatical relation holding between the elements composing a sentence, mainly subject (S), object (O), and verb (V), and is one of the first linguistic aspects learned by children during language acquisition. Every language has its specific unmarked order and, even if the possible combinations of these elements are six, only three of them (shown in 43) seem to be more often implemented by natural languages (Greenberg, 1963): SOV (a), SVO (b), and VSO (c). The languages of the World are estimated to be 45% SOV, 42% SVO and almost 10% VSO.

(43) a.	Taroo ga	tegami o	kaita.	(SOV: Japanese)
	Taroo	letter	write.PAST	
	‘Taroo wrote a letter’			

[Kuno, 1978:65]

b.	Harry hit the dog.	(SVO: English)

[Hawkins, 1983:1]

c.	LLaddodd	y	ddraig	y	dyn.	(VSO: Welsh)
	kill.PAST	the	dragon	the	man	
	‘The dragon killed the man.’					

[Comrie, 1981:81]

Laudanna (1987) was the first to study the unmarked word order in LIS. Italian and LIS differ for word order as Italian, similarly to English, follows a SVO order, while LIS is a SOV language. The examples below show the word order of Italian (44) and LIS (45)

(44) Gianni ama Maria
Gianni love.3SG Maria
'Gianni loves Maria'

[Geraci and Chesi, 2009:79]

(45) GIANNI MARIA AMARE
Gianni Maria love
'Gianni loves Maria'

[Geraci and Chesi, 2009:79]

These orders, despite being mostly used, are not the only accepted possibilities. Both LIS and Italian accept marked orders which can be used to stress or put a higher emphasis on the desired part of a sentence. For instance, Italian could be expressed in an OSV order (46) or VOS (47) using a particular intonation. Laudanna (1987) found that a possible alternative order in LIS is SVO (48) which is highly used among native speakers especially when there are no specific relationships of agreement in space. Alternatively, in some cases the speaker might feel the necessity of highlighting one constituent through topicalization and therefore creating the orders VO,S with the subject appearing at the end of the sentence, or O,SV with the object in the first place accompanied by the relevant NMMs (Non Manual Markers) specific for topicalization (Brunelli, 2006).

(46) Il tradimento il marito non le ha mai perdonato
The cheating the husband NEG forgive.PAST her
'The husband never forgave her the cheating'

[Mantovan, 2010:8]

(47) Prepara il pasticcio la zia
prepare.3GS the lasagna the aunt
'The aunt prepares the lasagna'

[Mantovan, 2010:8]

(48) MOTHER COMB GIRL
'The mother combs the girl'

[Mantovan, 2010:8]

From the observation of natural conversations, Geraci (2002) discovered a difference in the use of different word orders in LIS and defined SOV as the prevalent unmarked order. According to the result of a later socio-linguistic study involving only 54 signers from three cities (Bologna, Roma, and Bari), with an age range from 18 to 55 years old, conducted within the PRIN project by Branchini and Geraci (2011) on LIS word order, both SOV and SVO orders are used with the first one slightly prevailing over the other (see figure 34).

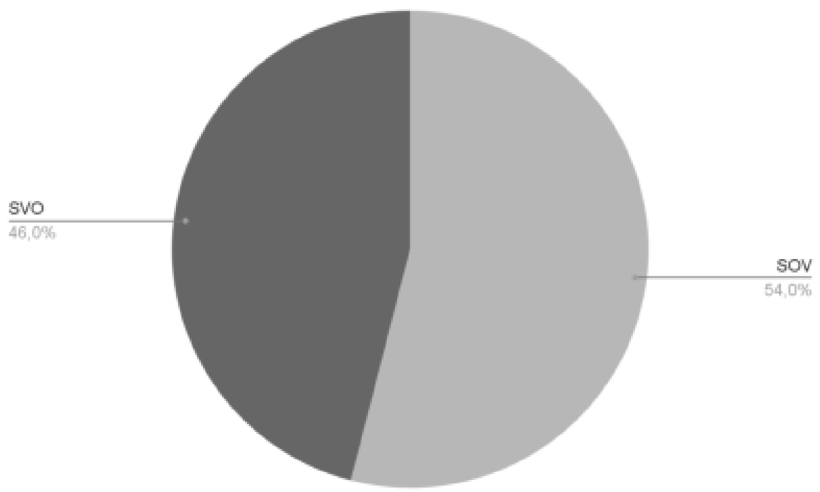


Figure 34 *Distribution of SOV and SVO word orders in the population interview (Branchini and Geraci, 2011:121).*

In their study, Branchini and Geraci (2011) claim that word order seems to be influenced by both linguistic and sociolinguistic factors. Linguistically, the presence of other functional elements within the sentence may affect its internal structure and therefore the pre- or post-verbal position of the object. In addition, with reversible verbs the order SVO seems to be favoured, while with irreversible verbs the order SOV is favoured as there is no risk of ambiguity.

The geographical origin of signers seems to affect the order of the elements in the sentence with a prevalent VO order in northern Italy, while in central and southern Italy the object is preverbal in most cases. Word order does not uniquely affect subject, verb, and object, but governs the distribution of other elements of the sentence like determiners, negations, and modals. It is important to remember that this study was conducted within a project (PRIN) whose aim was to identify the sociolinguistic variations of Italian Sign Language, and that the participants involved were not a significant number compared to the totality of the population using LIS. The sociolinguistic background of PRIN participants was intended to be various to achieve the research goals, therefore including signers with different educational backgrounds and different ages of exposure to sign language.

3.3.2 Sentence structure

The X' scheme is a visual representation of the internal structure of a linguistic phrase (Haegeman, 1996), it is particularly useful to understand the difference in word order between Italian and LIS. Every phrase has a head (X, as to indicate a linguistic element belonging to any grammatical category) which is the most important component since it carries all the agreement features which apply to all elements of the phrase. The head first combines with its Complement forming the X' node which later combines with the Specifier, forming the higher XP node. According to the unmarked order between verb and object, a language can be head-initial (or head first language, figure 35) hence the complement follows the head, so the object follows the verb, or head-final (or complement first language, figure 36) with the complement/object preceding the head. This X' structure is read from left to right.

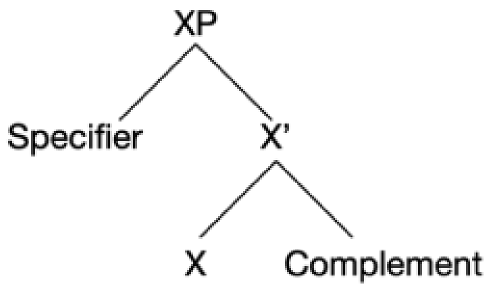


Figure 35 *X' scheme of a head-initial language (Specifier-Head-Complement).*

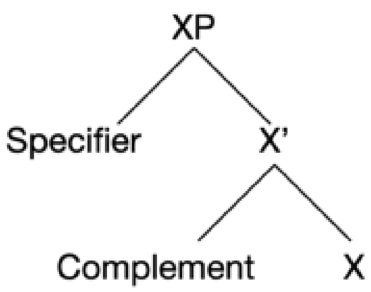


Figure 36 *X' scheme of a head-final language (Specifier-Complement-Head).*

Within the Verb Phrase (VP) the head hosts the verb, which is the most important element of the sentence. The Object is the direct complement of the verb and it integrates additional meaning, and the Subject fills the specifier position. According to their unmarked word orders Italian is a head-initial language (VO) and LIS is a head-final language (OV). The basic structural representations of the Verb Phrases (VP) in (44) and (45) with all their projections are presented in figure 37 for Italian and in figure 38 for LIS.

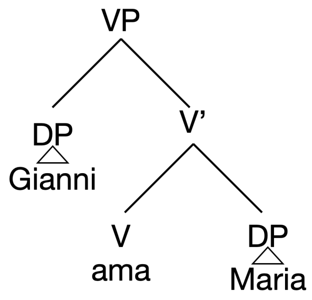


Figure 37 *Sentence structure of Italian (44).*

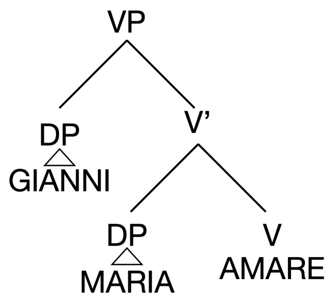


Figure 38 *Sentence structure of LIS (45).*

3.3.3 Auxiliaries

Auxiliaries are a form of accompanying verbs that add functional or grammatical meaning (i.e. tense, aspect, agreement). On a structural level, the auxiliary is the head of the Inflectional Phrase (IP) which is located above the VP. In Italian there are two main auxiliary verbs which precede the base verb of the clause: *essere* (tr. *to be*), and *avere*, (tr. *to have*). They are used to build composed verb tenses and are followed by an infinite form of the base verb. The auxiliary always agrees in person and number with the subject of the clause, while the main verb only agrees with the subject when expressed in the participial form, while the gerund form does not inflect. The sentence structure in Italian including the IP representation is shown in figure 39.

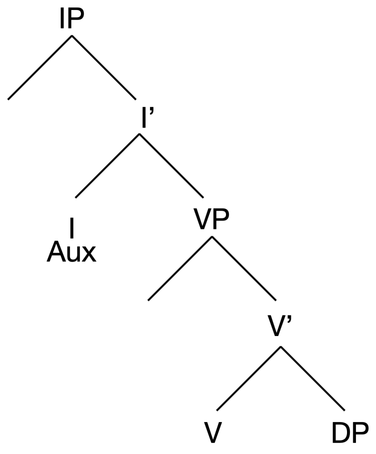


Figure 39 *IP structure of Italian.*

In LIS the features of agreement, tense, and aspect can be conveyed by either manual or non-manual markers. If expressed manually, the signs expressing agreement features follow the verb. One example of a manual marker for tense is the sign DONE illustrated in figure 40, which states that the event is concluded (Zucchi, 2009). This sign occupies the head position of a dedicated projection named AspP, which is below the IP. The sentence structure in LIS including the IP representation is shown in figure 41.

Figure 40 *DONE in LIS (Checchetto et al., 2020:274).*

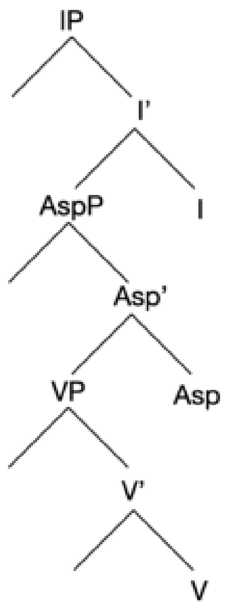


Figure 41 *IP structure of LIS.*

3.3.4 Modals

Modals are a peculiar kind of verbs which accompany another verb expressed in its infinitive form (in Italian and in other spoken languages) to provide additional meaning. The name derives from the ability of these verbs to define the modality in which an action is realised (i.e. intention, obligation, ability, permission, suggestion, capacity, etc…). In Italian, modal verbs precede the verbs they accompany, and when an auxiliary is needed to form the required tense they assume the one proper of the main verb (either *essere*—tr. *to be*, or *avere*—tr. *to have*). Modal verbs in Italian include *potere* (tr. *can*, expressing permission), *volere* (tr. *want*, expressing desire/intention), *dovere* (tr. *must*, expressing obligation/necessity), and *sapere* (tr. *be able*, expressing ability). In LIS modal verbs have similar functions, but they follow the main verb they accompany. LIS modal verbs are four and convey meanings similar to the previously listed for Italian: CAN (expressing permission), WANT (expressing desire/intention), MUST (expressing obligation/necessity), and BE_ABLE (expressing ability). The examples below present the realisation of each modal in context for both languages (in a are examples for Italian, and in b the same examples in LIS).

(49) a.	Daniele	può		frequentare		l'università.
	Daniele	can.3SG		attend	university	
	'Daniele can attend university.'					

b.	DANIELE		UNIVERSITY	ATTEND	CAN
	'Daniele can attend university.'				

[Mantovan, 2020:543]

(50) a.	Stasera	voglio	mangiare	la	pizza.
	tonight	want.1SG	eat	the	pizza
	'Tonight I want to eat pizza.'				

b.	EVENING	IX_1	PIZZA	EAT	WANT
	'Tonight I want to eat pizza.'				

[Mantovan, 2020:543]

(51) a.	Domani		devo	andare	alla	polizia.
	tomorrow	pro.1SG	must	go	to_the	police
	'Tomorrow I must go to the police.'					

b.	TOMORROW	IX_1	POLICE	GO	MUST
	'Tomorrow I must go to the police.'				

[Mantovan, 2020:543]

(52) a.	Il	bambino	sa	sciare.
	the	child	be_able.3SG	ski
	'The child is able to ski.'			

b.	CHILD	SKI	BE_ABLE
	'The child is able to ski.'		

[Mantovan, 2020:543]

On a structural level, modals occupy the head position of the Inflectional Phrase (I). To provide a visual example, figures 42 and 43 present, respectively, the structural representations for (49a) and (49b).

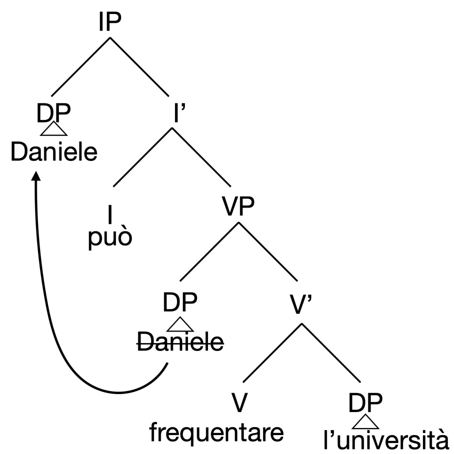


Figure 42 *Structural representation of Italian (49a).*

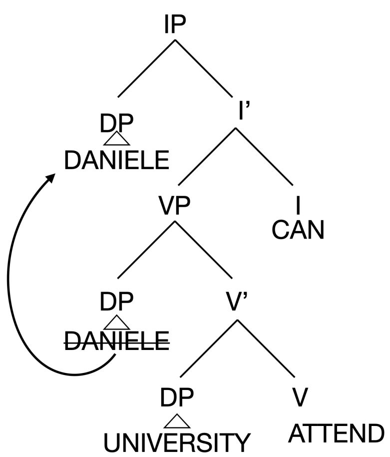


Figure 43 *Structural representation of LIS (49b).*

In these representations the arrows represent the rise movement of the subject from the SpecVP where it is generated to its final SpecIP position. This property applies to both Italian and LIS.

3.3.5 Negation

Negation is lexically expressed both in Italian and LIS with different items that can be categorised in two groups: negative markers and N-words. Negative markers are functional elements that affect the meaning of the whole clause by semantically overturning the statement. N-words are lexical items that can be the arguments of verbs and also negate the truth value of the clause. A main difference in negation between Italian and LIS is that Italian allows for double and sometimes even triple negation, while LIS only allows one negative element within the clause. In Italian, the Negative Phrase (NegP) is placed below the IP, as shown in figure 44.

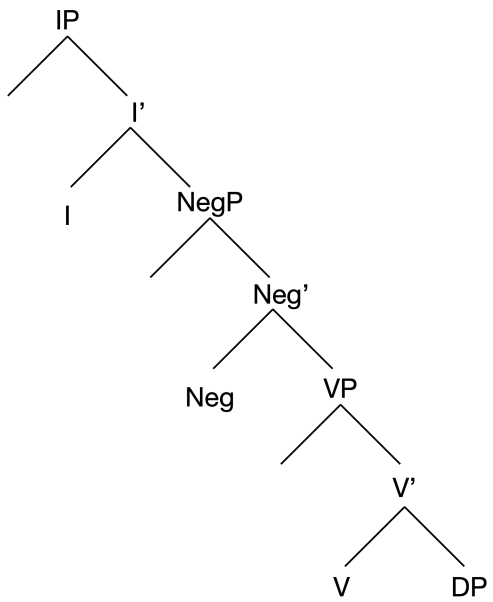


Figure 44 *Position of NegP within the sentence structure in Italian.*

Negative signs in LIS are produced with the following obligatory NMMs: headshake, eyebrows frown and lowering of the sides of the mouth. In the following examples these NMMs are indicated with 'neg' and the extension of the line over the manual signs indicates their spreading. An example of negation with a negative marker is presented in (53a) for Italian and in (53b) for LIS.

			neg
(53) a.	GIANNI	CALL	NOT

‘Gianni has not called.’

b.	Gianni	non	ha	chiamato
	Gianni	neg	have.3SG	call.PTCP

‘Gianni has not called.’

[Geraci, 2006:219]

Geraci (2006) investigated negative phenomena in LIS corpora and noted that in cases of co-occurrence of modals and negative markers, the modal precedes negation, as in (54a). In (54b) the same example is provided in Italian to show the different position of modal and negation. For this reason, Geraci proposed that, on a structural level, NegP is above the IP in LIS, and the negation element occupies the specifier position which is projected right, as shown in figure 45 presenting the structure of example (54a).

					neg
(54) a.	GIANNI	CONTRACT	SIGN	CAN	NOT

‘Gianni cannot sign the contract.’

b.	Gianni	non	può	firmare	il	contratto
	Gianni	neg	can.3SG	sign	the	contract

‘Gianni cannot sign the contract.’

[Geraci, 2006:220]

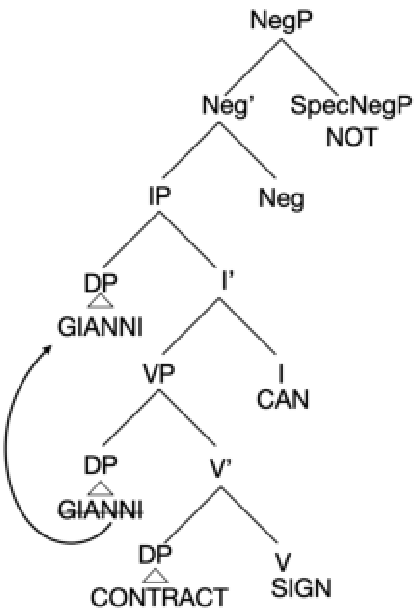


Figure 45 *Position of NegP within the sentence structure in LIS (54a).*

According to Geraci (2006), the negative marker occupies the Specifier position of the NegP, negation precedes the verb in Italian, but follows it in LIS. N-words (or negative quantifiers) occupy a structural position according to their argumental role (subject/object) to complete the meaning of the sentence. For this reason, they may also occupy a preverbal position in the case of a N-word subject produced in situ, as in (55).

			neg
(55)	NOBODY	CONTRACT	SIGN

‘Nobody signed the contract’

[Geraci, 2006:221]

The neg-NMMs in LIS must co-occur with the production of the negative sign. However, if the negative quantifier is produced in situ, as in example (55), the neg-NMMs must spread from the N-word to the end of the sentence.

3.3.6 Wh- elements

Wh- elements are used to produce interrogative clauses. The main wh- elements used to create direct questions in most languages are *who* (it. *chi*), *where* (it. *dove*), *when* (it. *quando*), *what* (it. *cosa*), *why* (it. *perché*), *which* (it. *quale*) and *how* (it. *come*). In Italian, wh- elements occupy the left periphery of the clause and are the first item produced. In LIS, wh- interrogatives are characterised by specific NMMs mainly concerning furrowed eyebrows (indicated as wh in the examples below) and obligatory spreading over the wh-phrase (and optionally over more material of the sentence). LIS prescribes different NMMs for polar interrogatives, questions that require a yes/no answer: wide-open eyes and raised eyebrows (indicated as y/n in the examples below).

(56) a. $\mathrm{IX_2}$ WORK $\overline{\text{WHERE}}^{\,wh}$

'Where do you work?'

b. $\overline{\mathrm{IX_2}\ \text{WORK WHERE}}^{\,wh}$

'Where do you work?'

[Mantovan, 2020:473]

(57) a. $\mathrm{IX_2}$ PIZZA WANT $\overline{\text{YES\^{}NO}}^{\,y/n}$

'Do you want pizza?'

b. $\overline{\text{PIZZA WANT }\mathrm{IX_2}}^{\,y/n}$

'Do you want pizza?'

[Mantovan, 2020:471]

Geraci and Bayley (2011) studied the distribution of wh- element in the LIS corpora collected during the PRIN project (2008-2010), which involved an heterogeneous group of signers (as mentioned in § 3.3.1). The results, presented in figure 46, showed that the favoured position for wh- elements is postverbal, with a consistent presence of preverbal occurrences. In some cases

(13%) the wh- element was found to be replicated both in preverbal and postverbal position.

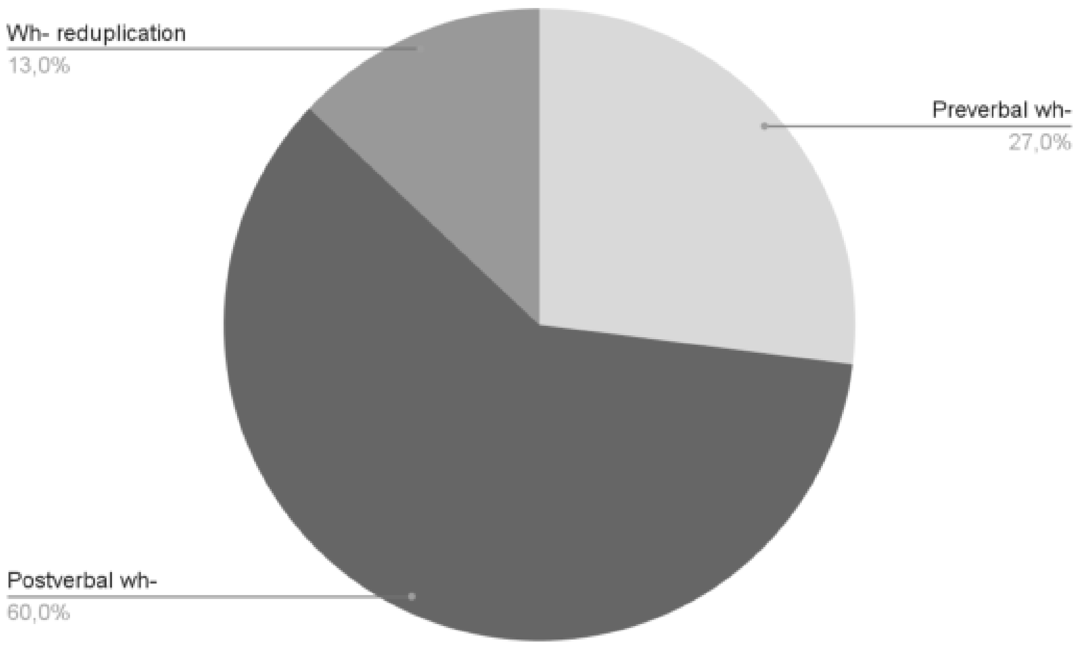


Figure 46 *Wh- signs distribution in LIS according to Geraci and Bayley (2011:138).*

Postverbal wh- signs occupy the right periphery of the clause (58), preverbal wh- signs occupy their argumental position according to their grammatical function (subject (59a), object (59b), and so on) and when reduplicated wh- signs are found in sentence-initial and sentence-final position (60).

(58) a. GIANNI BUY DONE $\overline{\text{WHAT}}^{\text{wh}}$

'What did Gianni buy?'

b. MILK BUY DONE $\overline{\text{WHO}}^{\text{wh}}$

'Who bought milk?'

[Geraci and Bayley, 2011:127]

wh

(59) a. WHO MILK BUY

'Who bought milk?'

wh

b. GIANNI WHAT BUY

'What did Gianni buy?'

[Geraci and Bayley, 2011:128]

wh

(60) IX-2 WHERE CRASH-CL WHERE

'Where did you crash?'

[Geraci and Bayley, 2011:135]

3.3.7 Copula

The word *copula* has a semantic origin related to the meaning *to tie*. In linguistics, a copula is a verb, or a verb-like word, used to link the subject to its complement. Copular constructions are used to express the state of being of someone or something, to attribute a property to an argument. In some languages it can be overtly expressed, as in English, where the verb *to be* has this function, or be covert. If expressed as a verb it is often referred to as *copulative verb* and is considered the predicate of the sentence, followed by a predicative expression (i.e. a noun phrase (NP), a prepositional phrase (PP), a verb phrase (VP), etc.). The predicative expression is the complement of the copulative verb. Italian behaves similarly to English. The copula is the auxiliary verb *essere* (tr. *to be*), which in sentence construction is generally preceded by the subject and followed by the predicative expression. LIS is a language with no overt copula, meaning no grammatical element is used to specifically mark these expressions. Copular constructions are a case of non-verbal predications in LIS. In (61) examples of copular construction in Italian (60a) and LIS (60b) are presented.

(61) a.

Pietro	è	buono.
Pietro	is	nice

‘Pietro is nice.’

b.

PIETRO	NICE

‘Pietro is nice.’

[Mantovan, 2020:527]

Copular sentences can also be used in locative sentences to express the state of being of a referent in a certain place. Some examples are presented in (62) for Italian (62a) and LIS (62b).

(62) a.

Paride	è	a	scuola.
Paride	is	at	school

‘Paride is at school.’

b.

PARIDE	SCHOOL

‘Paride is at school.’

[Mantovan, 2020:528]

3.4 Conclusions

This chapter presented an overview of some grammatical differences between Italian and LIS. In particular how information is transmitted through the visual-gestural channel in comparison with the acoustic vocal channel, also drawing a line to define different classes of nouns and verbs in LIS, and some possible morphological modifications. The sentence structures of LIS and Italian were then compared, first presenting their different word order which determines the different structures, then analysing the internal representation of the two languages and their outcomes in terms of how the items composing a sentence are organised (particularly focusing on auxiliaries, modals, and negation). This allowed to visualise the difference in how several structural elements are presented to the recipient in the two languages, a difference which is fundamental to be able to understand the goals and experiments of the research conducted by Jaber, Branchini, Donati, Geraci and Giustolisi (in preparation) which will be presented in chapter 4.

Chapter IV. Observing Bimodal Bilinguals

Emmorey, Petrich, and Gollan (2012a) (presented in § 2.1.3) brought light on interesting aspects of bimodal bilingual perception in CODAs. Following them, a similar work has been conducted parallely with Italian CODAs (bimodal bilinguals in Italian and LIS - Italian Sign Language) and French CODAs (bimodal bilinguals in French and LSF - Langue des Signes Française, French Sign Language). This study, conducted in Italy by Ca' Foscari University of Venice and University of Milan-Bicocca for LIS-Italian bimodal bilinguals in collaboration with Université de Paris and the CNRS (Centre National de la Recherche Scientifique, National Center of Scientific Research) in France for LSF-French bimodal bilinguals, not only investigated bilingual perception on the lexical level (as previously done by Emmorey et al. 2012a), but also included an investigation on the syntactic level. The participants, for both the lexical and syntactical test, were presented input in three conditions: sign language condition (SL), spoken language condition (SpL), and code-blending (or bimodal) condition (CB). This chapter will describe the study conducted by Jaber, Branchini, Donati, Geraci and Giustolisi (in preparation) while also presenting and discussing its results. In § 4.1 the research is introduced with its objectives and predictions; § 4.2 provides an overview of the subjects who participated in the experiment; § 4.3 presents the structure of the experiments and the procedure for data collection; in § 4.4 the results are displayed and discussed in § 4.5, with some final considerations and hypothesis for future research raised in § 4.6.

4.1 The research

The team who conducted this research included Prof. Chiara Branchini (Ca' Foscari University of Venice) and dott. Beatrice Giustolisi (University of Milan-Bicocca) in Italy, PhD student Angélique Jaber, Prof. Caterina Donati (Universté de Paris) and Prof. Carlo Geraci (CNRS) in France. The aim of this study is to verify the findings of Emmorey et al. (2012a) in two bimodal bilingual populations, specifically Italian-LIS bilinguals and French-LSF bilinguals. The same lexical test, concerning a judgement of edibility vs. non edibility of the items presented, was submitted to the participants. Additionally, the study has been extended to the processing at the sentence level in order to verify whether the same advantages found by Emmorey et al. (2012a) can also apply at the clausal level. To this end, participants were presented with a set of full-fledged sentences to which they were asked to give a truth value judgement. The most interesting aspect of this study comes to play precisely when investigating syntactic processing, because the language pairs involved present a fundamental difference. Bimodal productions in LSF and French are a case of *congruent* code-blends, while bimodal productions in LIS and Italian are *incongruent* code blends. Congruence is defined upon the unmarked word order of the two languages which compose the code blend. While both LSF and French present a SVO order and are therefore congruent, LIS and Italian are incongruent as they present a different unmarked word order: SVO for Italian and SOV for LIS (see § 3.1). In figure 47 the elements which make up a code-blend for both language pairs are represented visually, so that the concept of (in)congruence can be better understood.

Figure 47 *Word order for congruent / incongruent code blends.*

The representation of the same parallel is shown in figure 48. Visualising a timeline of the production (conventionally moving from left to right) the red dashed line helps understanding the moment in which the recipient has all the needed elements available for interpretation by sectioning the scheme vertically. It is immediately visible that in the language pair LSF-French all elements are available only after the third element is produced, not allowing any answer before the end of the utterance. The situation is different in LIS-Italian as the second element produced is different in the sign and the spoken modality, making all three lexical items available to the participant after the second element of the code-blended utterance is produced, before the last element is presented.

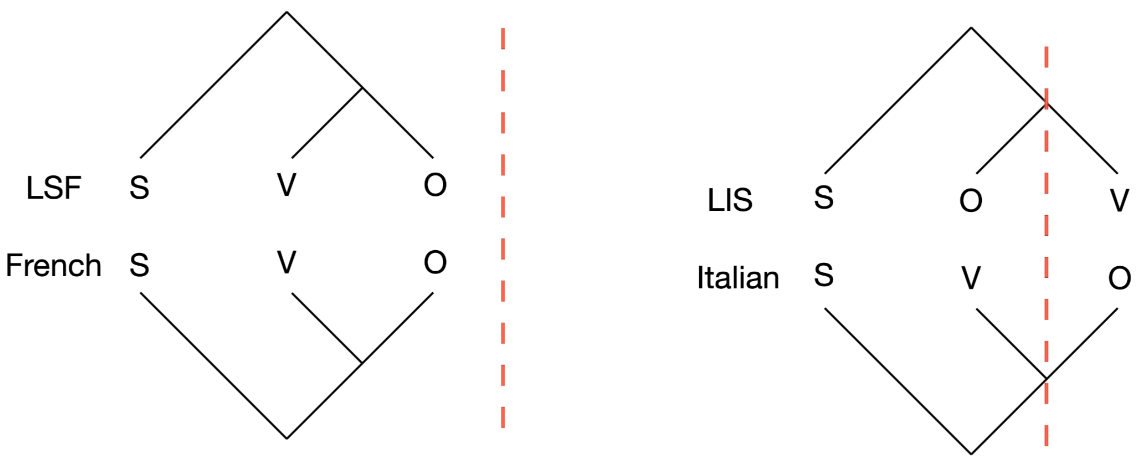


Figure 48 *Sentence structure and timeline for congruent / incongruent code blends.*

As the word order of LSF and French matches, the production of code-blends will be similar to a co-speech gesture as every element composing the sentence will be simultaneously produced in both languages and modalities. As far as Italian and LIS are concerned, instead, the code-blended productions will start with the simultaneous production of the Subject in both languages which will then be followed by the Verb in Italian and the Object in LIS. The last element to be produced is the Object in Italian and the Verb in LIS.

The main questions of this research are two, holding for both language pairs.

- Lexical task:

  Can we replicate Emmorey et al.'s (2012a) results with other language pairs?

- Syntactic task:

  Can we observe the same advantage found by Emmorey et al. (2012a) beyond the lexicon, at the clausal level?

4.1.1 Predictions

The first experiment of the present study is a replication of a previous study conducted on a different language pair (English-ASL). The expectation with respect to the lexical test, is a confirmation of the advantage of code-blending found in the previous study, meaning that the blended condition is expected to be faster to process than the sign alone or speech alone condition (figure 49a). Alternative possible results for the lexical experiment could be slower times of reaction of the code-blending condition with respect to sign alone or speech alone (figure 49b), or a parallel processing if code-blending is equally long to process than sign alone or speech alone (figure 49c).

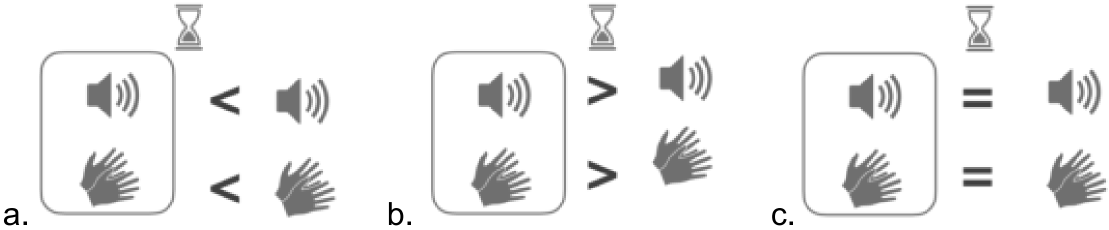


Figure 49 *Lexical experiment predictions.*

The second experiment allows for a variety of possible outcomes, which partially depend on the difference between the data collected in the two language pairs. Three different outcomes, similar to those anticipated for the lexical experiment may haìold for the syntactic test: an advantage of coactivation at the sentence level, if code-blending is faster to process than sign alone or speech alone (figure 50a); a cost of coactivation at the sentence level if code-blending is slower to process than sign alone or speech alone (figure 50b); or a parallel processing if code blending is equally long to process than sign alone or speech alone (figure 50c).

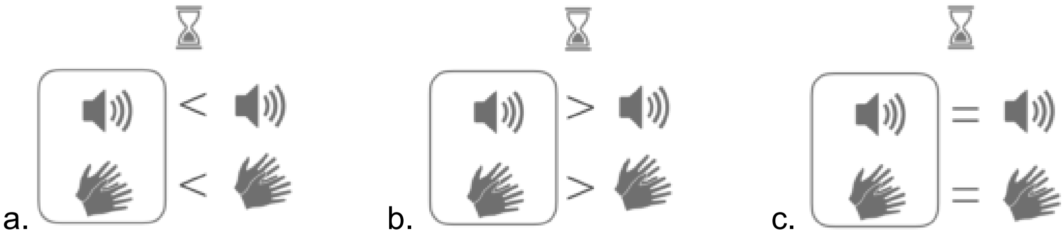


Figure 50 *Syntactic experiment predictions with no difference between the language pairs.*

If, on the other hand, the language pairs LSF-French and LIS-Italian display different results, four are the possible outcomes of data collection: an advantage for code-blending processing only for congruent structures (figure 51a); faster reaction times for code-blending only for incongruent structures (figure 51b); congruent structures are processed in parallel, with no difference in reaction times for the French-LSF language pair, while incongruent structures register an advantage for the code-blending condition (figure 51c); incongruent structures are processed in parallel, while congruent structures present an advantage in the code-blending condition (figure 51d).

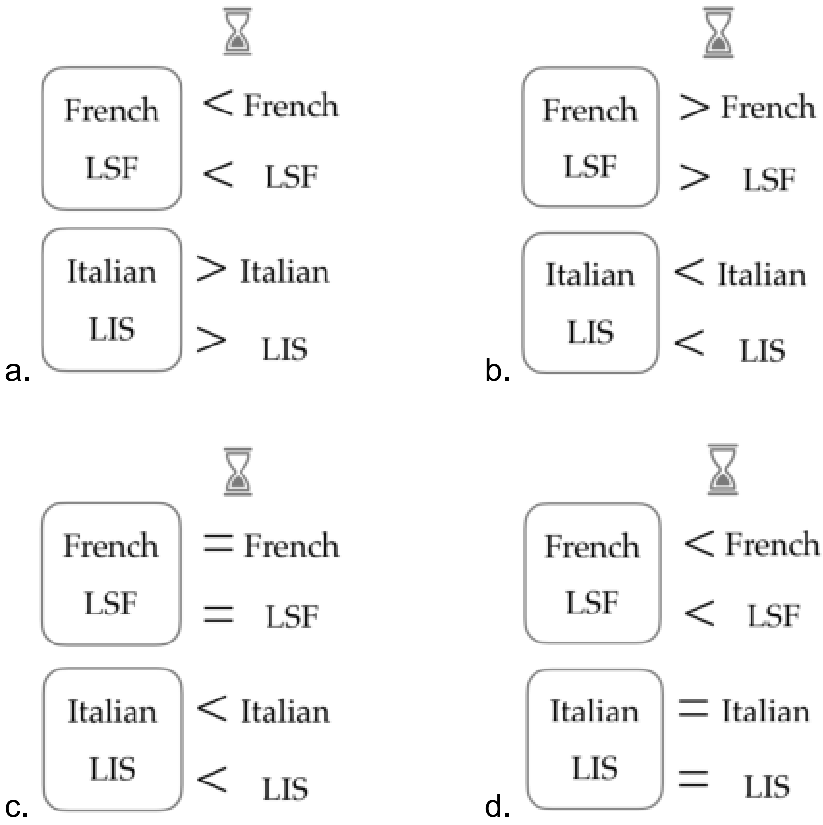


Figure 51 *Syntactic experiment predictions with different results between LSF-French and LIS-Italian.*

4.2 The subjects

The participants of this study are adult CODAs, hearing children of Deaf adults, born and raised in Deaf households naturally exposed to sign language from birth. The same CODA participants took part in both tasks for each language pair: Italian CODAs in LIS-Italian lexical and syntactic tasks, and French CODAs in LSF-French lexical and syntactic tasks. Both groups counted 25 participants. Two different thresholds were set for accuracy: at least 75% correct answers for the syntactic task, and at least 80% correct answers for the lexical task.

French CODAs were 20 females and 5 males, with a mean age of 33.92 years (SD 11.47). Their mean accuracy was 0.904 for the syntactic experiment, and 0.952 for the lexical experiment. No participants were below the threshold. One participant was very slow in answering, therefore this participant was removed in data analysis.

Italian CODAs were 18 females and 7 males. With a mean age of 36.64 years (SD 9.72). Their mean accuracy was 0.920 for the syntactic experiment, and 0.933 for the lexical experiment. No participant was below the threshold. One participant was very slow in answering, therefore this participant was removed in data analysis. Some additional sociolinguistic information was collected from Italian participants. Most participants had Deaf relatives other than their parents, all of them had received an education at least till the end of High School (half also held a University degree), and their geographical origin is representative of the entire country, with no significant assemblance in a specific area (for this reason data collected can be considerate representative for all Italian CODA population). All the participants upon availability were asked to fill in a form for personal data collection (stored and consulted only for research purposes), and were offered a small compensation in the form of an Amazon discount at the end of the test.

The initial phases of the experiment also engaged late bilinguals to test the functioning and user-friendliness of the procedure for data collection, these mainly included students native in the spoken language and competent users, albeit being late learners, in the sign language.

4.3 The procedure for Data collection

Data collection took place as an online experiment implemented on LabVanced (Finger et al., 2017), a JavaScript web application that offers an online editor for the creation and manipulation of experimental content using an intuitive graphical user interface.

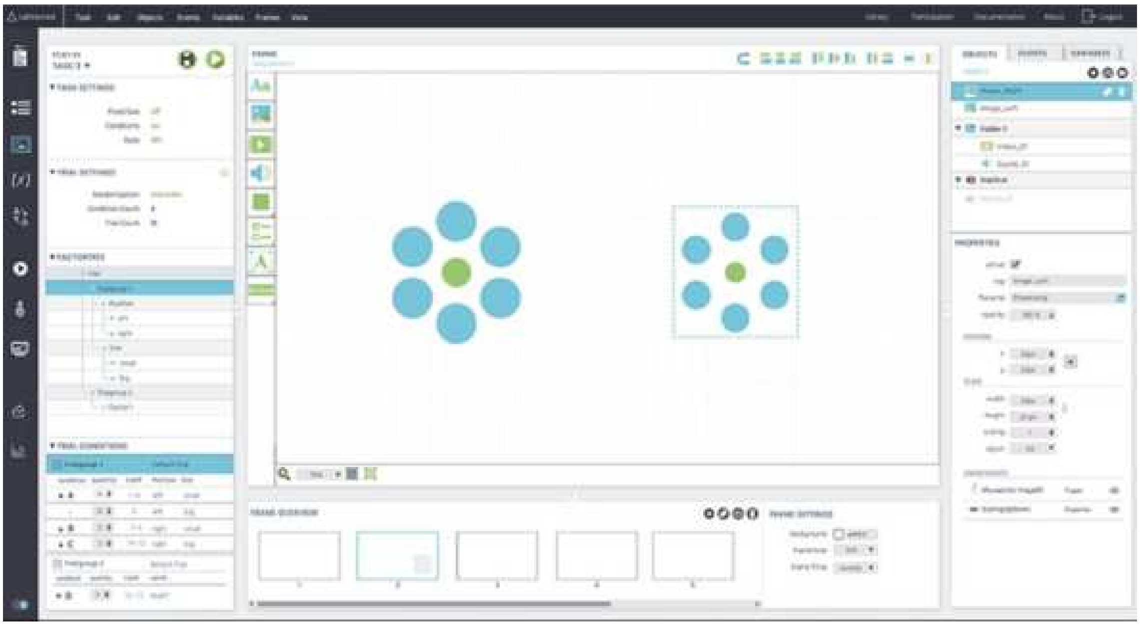


Figure 52 *LabVanced interface*[13].

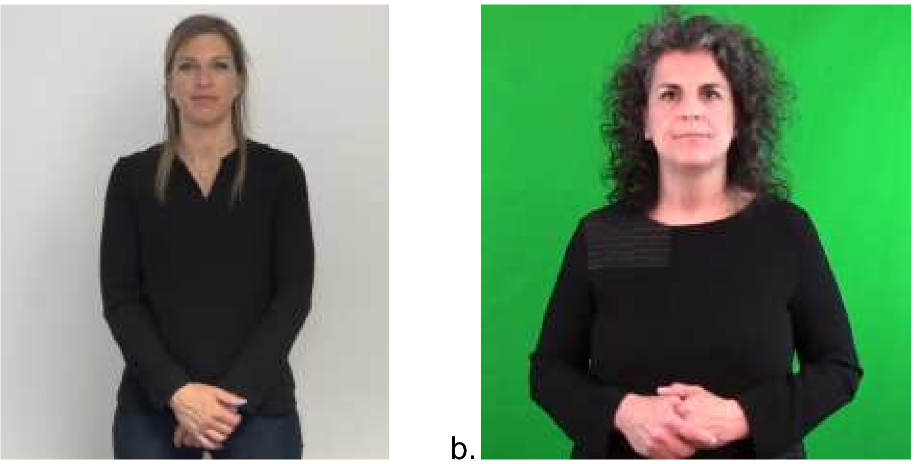
Participants could access the test from the comfort of their homes, with no need for virtual meetings with the researchers. They were asked to complete the test within a single sitting (the estimated duration was of 30 minutes), in a silent environment, using a computer with a physical keyboard, and headphones connected for better sound reception. During the test, participants were asked to answer simple questions by clicking on keyboard keys. Each session was preceded by a trial session of 4 items in which the understanding of the task and answer-giving procedure was verified.

[13] https://www.labvanced.com

4.3.1 Structure and recordings

The items selected for the recordings were 188 in total: 90 for the lexical experiment (LEX) and 90 for the syntactic experiment (SYN), plus 8 training items, 4 for each experiment. All items were recorded in 3 different conditions: sign language only (SL), spoken language only (SpL), and code-blend (CB). The total amount of video recorded counts 564 files (282 LEX, and 282 SYN). During the test, the participants were presented with 90 stimuli for each test in three counterbalanced conditions (30 SL, 30 SpL, and 30 CB) and were requested to provide feedback by pressing a keyboard key corresponding to the desired answer as fast as possible. The distribution of the items in three lists is presented in the attachments, at the end of this thesis.

The recording session took place in a location dedicated to video recordings and, for this reason, silent and properly equipped with a plain background and good lighting conditions. The webcam was arranged on a tripod precisely at 135 cm from the floor and 180 cm from the recorded subject. The videos were shot thanks to the collaboration of two native bimodal bilinguals, both women, one in France (figure 53a) and one in Italy (figure 53b).



a. b.

Figure 53 *Native bimodal bilinguals who participated on stimuli recordings in France (a) and in Italy (b).*

For the recordings the signer was required to keep a rest position (one hand above the other in front of the stomach) before the beginning and after the end of sign productions. The same rest position was required during the entirety of spoken language only utterances. During sign language only recordings the signer was not allowed to produce any form of mouthing, this because it could partially pass through as a spoken language interference in signed production. As far as code-blended modality was concerned, no specific rules were given with the aim of recording productions as natural as possible. All videos were recorded with a silent and rest time of about three seconds both before the beginning and after the end of the utterance, for editing purposes.

As previously said, the editing phase took place on LabVanced, the software allowed to cut all the recorded videos as desired generating new files. The convention for video-cutting, similar to what had been done by Emmorey et al (2012a), for the SpL condition was 9 frames before the *word onset* (beginning of spoken production) and 9 frames after *word offset* (end of spoken production). For the SL condition, the release and come back to the previously described rest position set respectively the beginning and end of the utterance. In the CB condition, the researchers followed the rules already described for both conditions for editing purposes. Subsequent to this phase, the cut files were analysed using the software Praat[14], a scientific tool for linguistics studying that can analyse spectrograms, developed by Paul Boersma and David Weenink (University of Amsterdam). This analysis allowed the definition of the *onset times* in milliseconds, that are the exact beginning times of the spoken productions with respect to the beginning of the video. This data was collected by visualising the sound track on the spectronomus and by pinpointing the beginning of the speech sound wave. For every participant, onset times were subtracted to the response times for each presented item in order to accurately determine the effective RT from the reception of the input. Accuracy in answering and error rate were detected.

[14] http://www.praat.org/

4.3.2 Lexical task

For the lexical task, the participants were asked to provide an edibility judgement for the items they were presented with, by answering the question "Can you eat or drink it?". In order to do so, they were supposed to press two different keys, chosen according to their position in the keyboard and therefore different for the two countries:

- for the Italian test, participants had to press the key **A** to judge the item as *edible*, and **L** to judge the item as *non-edible*;
- for the French test, participants had to press the key **Q** to judge the item as *edible*, and **M** to judge the item as *non-edible*.

The first given answer was recorded and unmodifiable, as it led to the visualisation of the next video. The test had three different sessions, one for each condition: sign language only, spoken language only, and code-blend. The total of visualised items amounted to 90 for the Italian test and 84 for the French test, balanced both among condition and edibility.

The lexical items selected for this task, together with the expected responses, are presented in attachments A (Italian) and B (French). The two lists do not completely match for the two countries, as the items selection required specific conditions which not in all cases could be applicable to both languages. Specifically, the criteria used for the items selection were the following:

- *No composed nouns*

  Lexical items which are generated as the juxtaposition of two different signs were to be avoided, as this would take a longer time to be produced as signs than as words. As a consequence, the input would be received at different times in the signed and in the spoken modality.

- *No variants*

  Sign languages can present several sign variants to express the same idea, this is especially true among the regions of Italy for semantic categories such as colours, months or family members. Choosing to use one variant over another may have differently affected participants in their reaction times, as it could have been easier or harder to understand, depending on their geographical origin. The chosen lexical items were therefore widespread signs.

- *No signs with oral components*

  The decision to avoid signs requiring oral components is due to the impossibility to produce them during the code-blended condition, therefore affecting the correct interpretation of the sign.

- *No synonyms*

  Some lexical signs can have more than one meaning and spoken counterpart. To avoid ambiguity, only signs with one possible interpretation were chosen for this study.

At the end of the lexical task, the test continued with the syntactic task within the same session.

4.3.3 Syntactic task

For the syntactic task, participants were asked to provide a truth value judgement for the items they were presented with, by answering the question "Is it generally true?". To do so, they were supposed to press two different keys, chosen according to their position in the keyboard and therefore different for the two states:

- for the Italian test, participants had to press the key **A** to judge the item as *true*, and **L** to judge the item as *false*;

- for the French test, participants had to press the key **Q** to judge the item as *true*, and **M** to judge the item as *false*.

The first given answer was recorded and unmodifiable, as it led to the visualisation of the next video. The test had three different sessions, one for each condition: sign language only, spoken language only, and code-blend. The total of visualised items amounted to 100 for the Italian test and 90 for the French test, balanced for condition and truth value.

Sentence selection for this task included not only simple affirmative sentences, but also negation and modals. As for the lexical task, the two lists do not completely match, due to some differences between the two pairs of languages. Specifically, the criteria used for sentence selection (together with the lexical criteria presented above, applied to the elements of each sentence) were the following:

- *Different word orders*

  The natural realisation of the two sentences in the language pair LIS-Italian had to present a mismatch in word order to test the initial research hypothesis, in contrast with the pair LSF-French whose languages display a matching word order.

- *No complex constructions*

  Only simple clauses as plausible and concrete as possible were chosen, avoiding subordination as relative clauses, conditional clauses. “Light” constituents were preferred, more generic and without particular attributes.

- *No double negation*

  Although negation was included, double negation in Italian was to be avoided, as it could affect the word order mismatch in LIS-Italian language pair. Negative sentences were included, and sometimes both a negative element and a modal verb occurred together in the same sentence.

- *No ambiguity*

  The selected sentences had to present only one acceptable interpretation. Any possible semantic ambiguity was to be avoided, in order to avoid errors due to interpretative reasons during data collection.

- *No extended NMMs*

  It has already been said that lexical items were not to be affected by the production of specific NMMs. As negative elements were included in the research, some syntactic constructions presented the neg NMM of headshake, which although can co-occur with spoken Italian in the code-blend condition. The requirement was that NMMs did not extend to the whole sentence, but only spread over the negative sign.

To confirm the absence of any semantic ambiguity on the selected syntactic items, a preliminary test has been conducted with 68 Italian native speakers (42 women, 25 men and 1 unspecified, aged 18 to 65—mean age 37,15) on a list of 100 elements. This test is presented in attachment C, where next to the expected responses the error rates are presented. Any error rate higher than 5 was considered significant, any sentence receiving more than 5 errors was eliminated from the test. All edits (either due to the amount of errors observed, or to the necessity of sticking to the lexical and syntactic criteria presented above) are presented in *italic* on the attachment, below the original version. The final sentences selected for the syntactic task, together with the expected responses, are presented in attachments D (Italian) and E (French).

At the end of the syntactic task, the test was concluded.

4.3.4 Pilot and data collection

Before submitting the test to CODAs, the addressees of this research, a pilot version was submitted to late bilinguals (the majority of whom being University students of sign language) in order to verify the clearness and operation of the test itself. The participants were asked to provide some feedback on their experiences that could help improve the final test structure and presentation. The feedback received on this pilot test revealed that the inputs were presented too fast, and for this reason in the final test submitted to native bilinguals a longer pause was inserted between each video. Late bilinguals also found it difficult to process code-blends, as expected due to the condition of unbalanced bilingualism.

The official test was submitted online, and sent to the participants by means of a digital link sent via email. As previously said, it had a total duration of approximately 30 minutes, and could be completed individually at the desired time. CODAs were contacted personally, or received an invitation to reach the research team for additional information, if willing to participate. The availability of the Association Coda Italia APS to allow a presentation of the research project during one of their events was very helpful to find new CODA participants.

4.4 The results

The results of this study were measured both on accuracy and response time. An overview of the results which will be better revealed and further discussed below is introduced in table 6 showing the difference in reaction times between different conditions. The advantage is considered significant if above 100 ms (significant results are indicated as ***).

	Lexical task		**Syntactic task**	
	CB-SL	**CB-SpL**	**CB-SL**	**CB-SpL**
LSF-France	- 37 ms	- 137 ms, ***	- 588 ms, ***	+ 8 ms
LIS-Italian	- 106 ms, ***	- 152 ms, ***	- 511 ms, ***	+ 135 ms

Table 6 *Results summary of RT differences between code-blending and sign alone, or speech alone.*

The data collected is presented both numerically and also visually in the form of *box plot* graphs (also known as *box-and-whisker plot*), which represent the locality and spread of numeric data. These graphs are generated from five main points:

- *Minimum*: lowest data point (0th percentile).
- *Maximum*: highest data point (100th percentile).
- *Median*: middle value in the data set (50th percentile).
- *First (or lower) quartile*: middle value of the lower half of the data set (25th percentile).
- *Third (or upper) quartile*: middle value of the upper half of the data set (75th percentile).

In the graph representation, the median is represented with a thick horizontal line inscribed in a box whose top and bottom lines are, respectively, the third and the first percentile. Two vertical lines, called *whiskers*, generate from the borders of the box to extend upwards till the maximum and downwards till the minimum. The shorter the box (and the whiskers), the closer the data are to the mean value and vice versa. Occasionally, if some data collected qualifies as an outlier (data that differ significantly from the rest) it can be represented as a dot above or below the whisker line. The three different conditions of this study assume different colours in the box plots: violet for CB (Code-Blending), turquoise for SL (Sign Language), and yellow for SpL (Spoken Language).

The reaction times (RTs) to CB inputs were respectively compared with the RTs to SL and SpL inputs. The RTs obtained after subtracting the onset times (which, for code-blends where different as video onset was considered in comparison with SL inputs, and audio onset was considered in comparison with SpL onset) were put into comparison between different conditions by means of the difference between CB and other conditions. A negative result proves evidence of an advantage, but is considered significant only if above 100 ms.

Below numeric data for all comparisons in each language pair are presented, followed by the respective box plot graph.

4.4.1 Lexical experiment

The results from the lexical experiment are summarised in table 7 which displays the fastest processed condition, according to the collected data, in a comparison between code-blending and sign alone, or speech alone, for each language pair.

	SL vs CB	**SpL vs CB**
LSF-French	Code-blending	Code-blending*
LIS-Italian	Code-blending	Code-blending

* In code-blending vs French there is only a tendency towards an advantage for code-blending.

Table 7 *Result summary of favoured conditions in lexical processing.*

The **mean accuracy** for the lexical test in **LSF-French bilingualism** was 0.952. For each condition, the mean accuracy rate was:

- Code-blend (CB): 0.977 (SD 0.149)
- Sign Language (SL): 0.899 (SD 0.301)
- Spoken Language (SpL): 0.977 (SD 0.151)

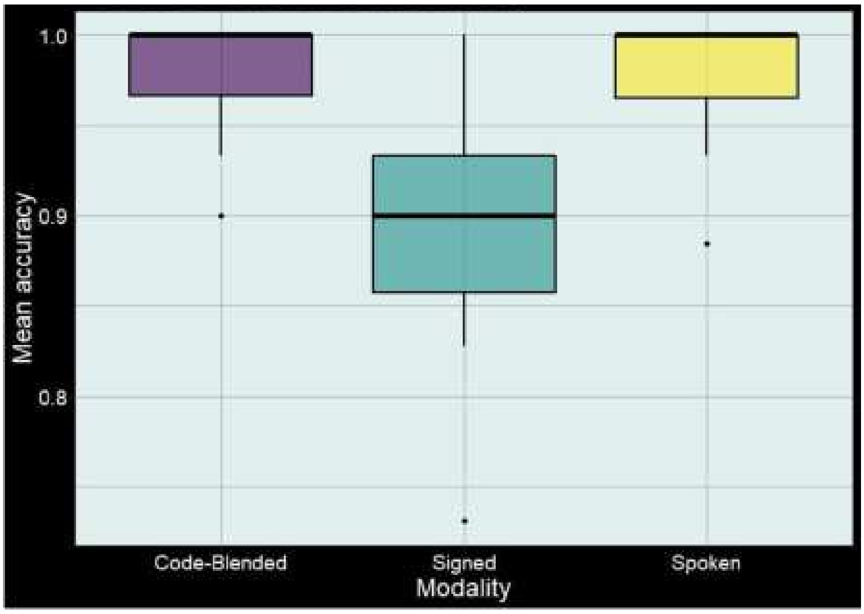


Figure 54 *Lexical accuracy task in LSF-French.*

The **mean accuracy** for the lexical test in **LIS-Italian bilingualism** was 0.933. For each modality the mean accuracy rate was:

- Code-blend (CB): 0.977 (SD 0.149)
- Sign Language (SL): 0.843 (SD 0.364)
- Spoken Language (SpL): 0.980 (SD 0.140)

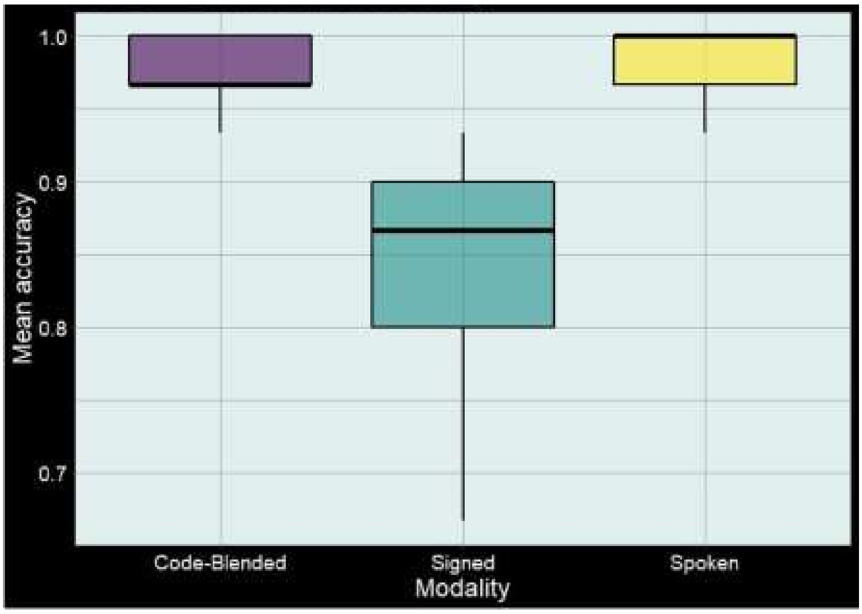


Figure 55 *Lexical accuracy task in LIS-Italian.*

For both language pairs, the accuracy rate in SL was significantly lower than the other conditions.

Mean RTs in **LSF-French bilingualism** in milliseconds:

- Code-blend (CB): 1558 (SD 333) *video onset*
- Sign Language (SL): 1595 (SD 425) *video onset*
- Code-blend (CB): 0867 (SD 334) *audio onset*
- Spoken Language (SpL): 1004 (SD 208) *audio onset*

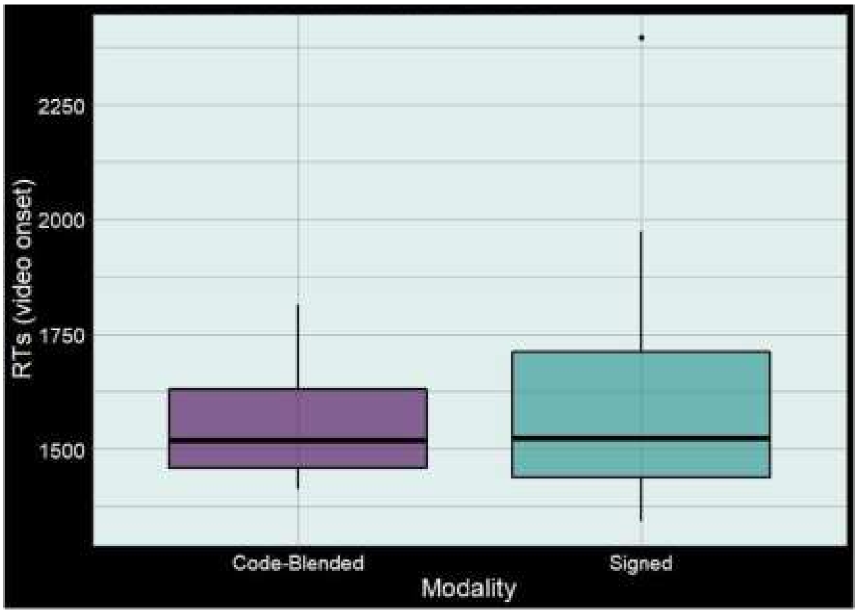


Figure 56 *CB vs SL: RTs from video onset (LSF-French, LEX).*

The difference in RTs from video onset between CB and SL is **-37 ms**, there is a minimal advantage for code-blends, but the measure of this advantage is not significant.

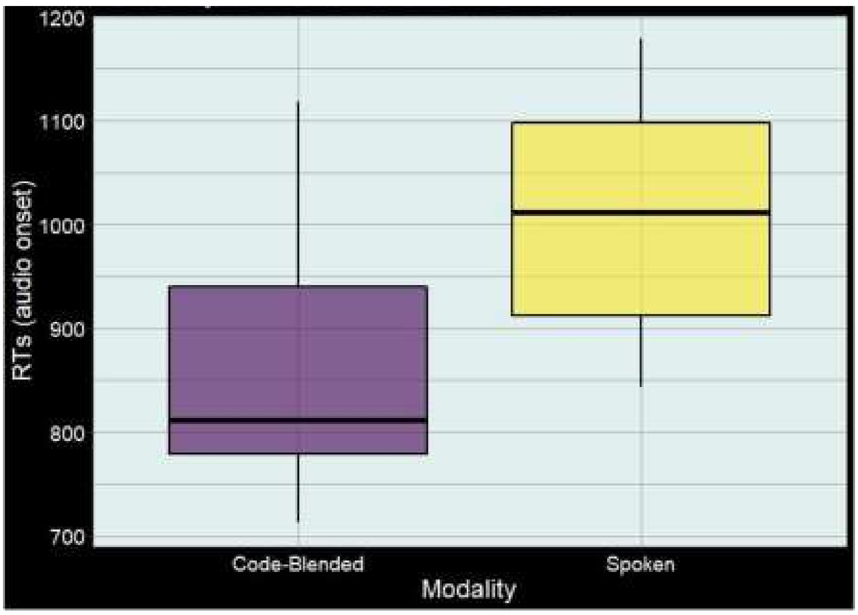


Figure 57 *CB vs SpL: RTs from audio onset (LSF-French, LEX).*

The difference in RTs from audio onset between CB and SpL is **-137 ms**, the advantage for code-blends is significant.

Mean RTs in **LIS-Italian bilingualism** in milliseconds:

- Code-blend (CB): 1460 (SD 225) *video onset*
- Sign Language (SL): 1566 (SD 416) *video onset*
- Code-blend (CB): 0829 (SD 255) *audio onset*
- Spoken Language (SpL): 0981 (SD 242) *audio onset*

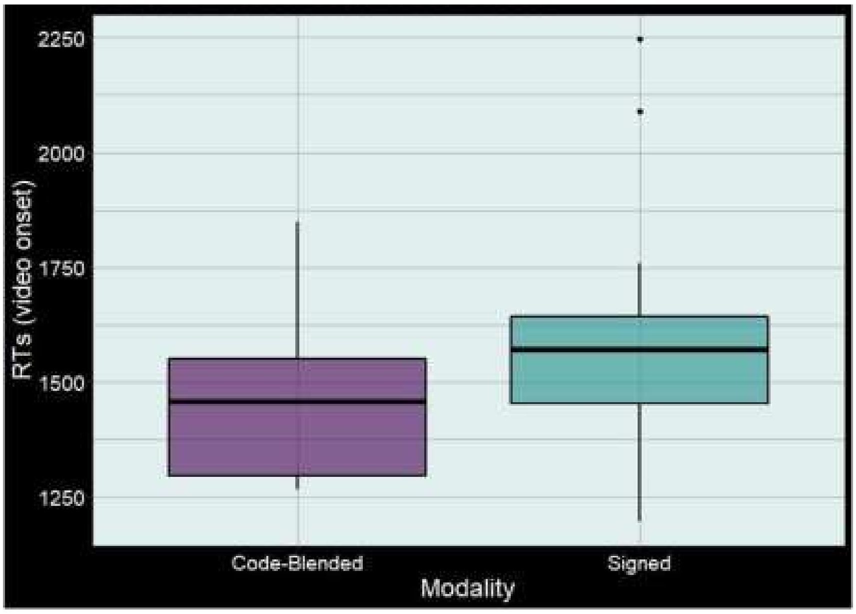


Figure 58 *CB vs SL: RTs from video onset (LIS-Italian, LEX).*

The difference in RTs from video onset between CB and SL is **-106 ms**, the advantage for code-blends is significant.

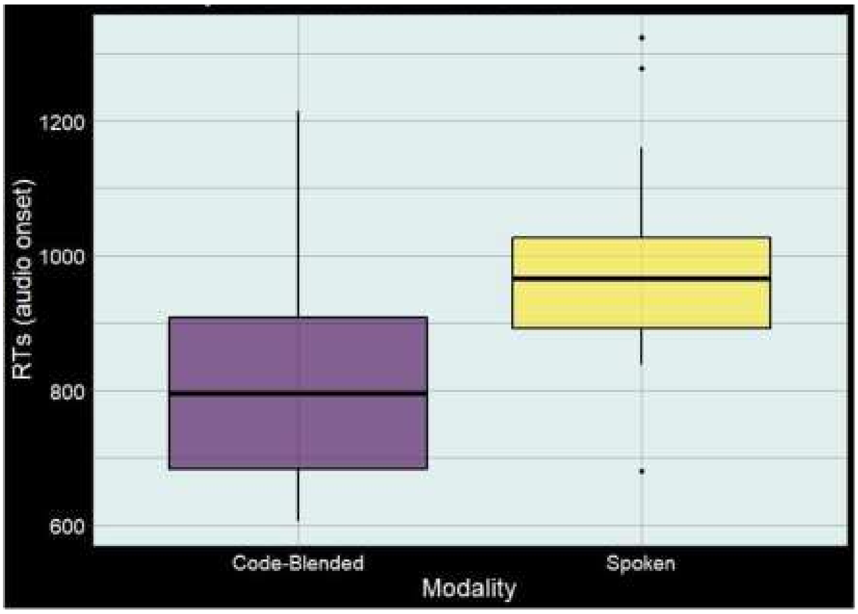


Figure 59 *CB vs SpL: RTs from audio onset (LIS-Italian, LEX).*

The difference in RTs from audio onset between CB and SpL is **-152 ms**, the advantage for code-blends is significant.

Can we replicate Emmorey et al.'s (2012a) results with other language pairs?

According to the collected data, the results of Emmorey et al. (2012a) for ASL-English bilingualism have been partially replicated in LSF-French results and fully replicated in LIS-Italian results, as response to code-blends is always faster. These data tell us that there is a solid advantage for bimodal stimuli in lexical tasks, which can be found when compared to both the sign only and speech only condition.

4.4.2 Syntactic experiment

The results from the syntactic experiment are summarised in table 8 which displays the fastest processed condition, according to the data collected, in a comparison between code-blending and sign alone, or speech alone, for each language pair.

	Type of language pair	**SL vs CB**	**SpL vs CB**
LSF-French	Congruent word order	Code-blending	Parallel*
LIS-Italian	Incongruent word order	Code-blending	Speech

Table 8 *Result summary of favoured conditions in syntactic processing.*

The **mean accuracy** for the syntactic test in **LSF-French bilingualism** was 0.904. For each condition, the mean accuracy rate was:

- Code-blend (CB): 0.963 (SD 0.190)
- Sign Language (SL): 0.795 (SD 0.404)
- Spoken Language (SpL): 0.953 (SD 0.211)

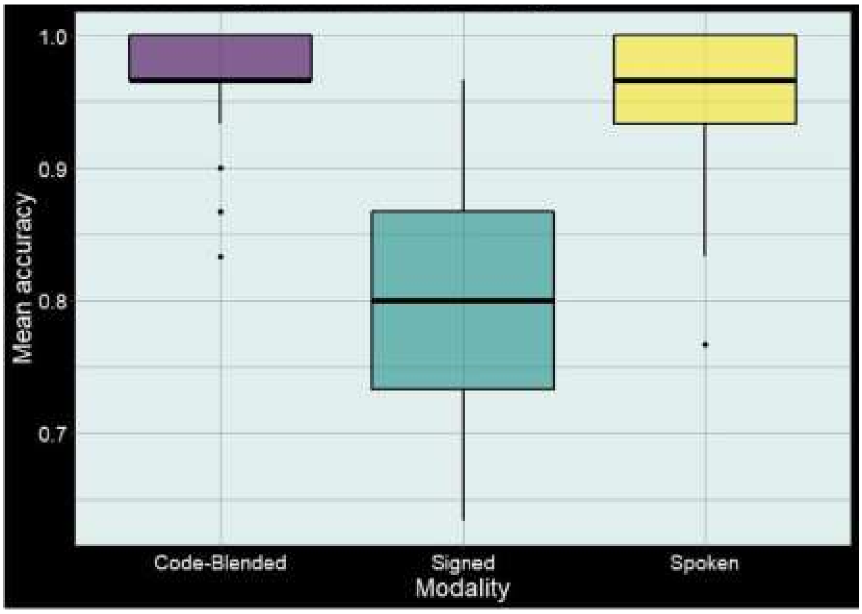


Figure 60 *Syntactic accuracy task in LSF-French.*

The **mean accuracy** for the syntactic test in **LIS-Italian bilingualism** was 0.920. For each condition, the mean accuracy rate was:

- Code-blend (CB): 0.964 (SD 0.186)
- Sign Language (SL): 0.819 (SD 0.386)
- Spoken Language (SpL): 0.976 (SD 0.153)

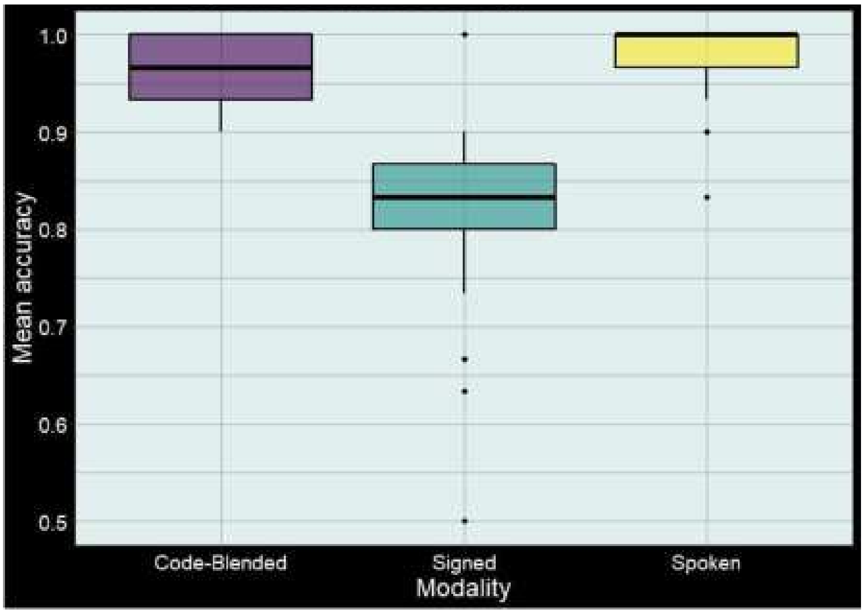


Figure 61 *Syntactic accuracy task in LIS-Italian.*

For both language pairs, the accuracy rate in SL was significantly lower than the other conditions.

Mean RTs in **LSF-French bilingualism** in milliseconds:

- Code-blend (CB): 2977 (SD 0668) *video onset*
- Sign Language (SL): 3565 (SD 1149) *video onset*
- Code-blend (CB): 2382 (SD 0656) *audio onset*
- Spoken Language (SpL): 2374 (SD 0676) *audio onset*

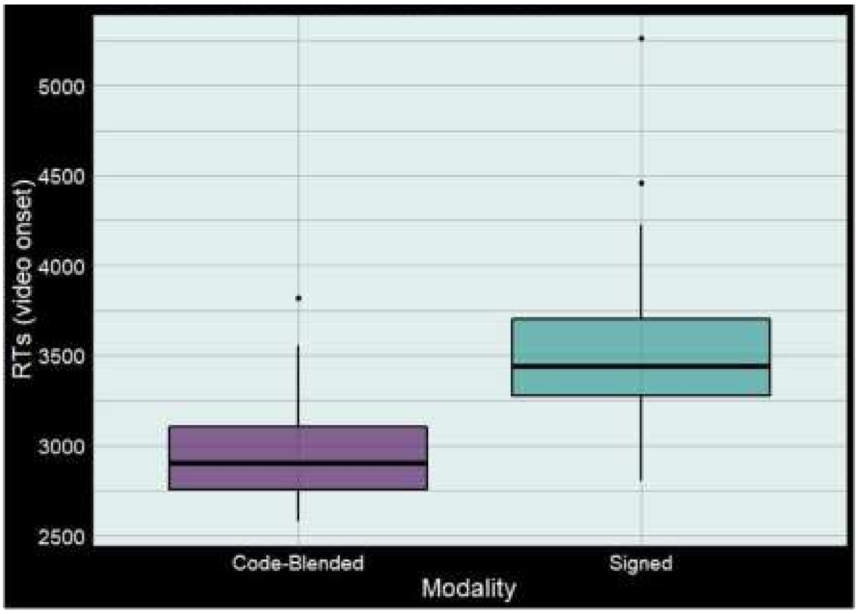


Figure 62 *CB vs SL: RTs from video onset (LSF-French, SYN).*

The difference in RTs from video onset between CB and SL is **-588 ms**, the advantage for code-blends is significant.

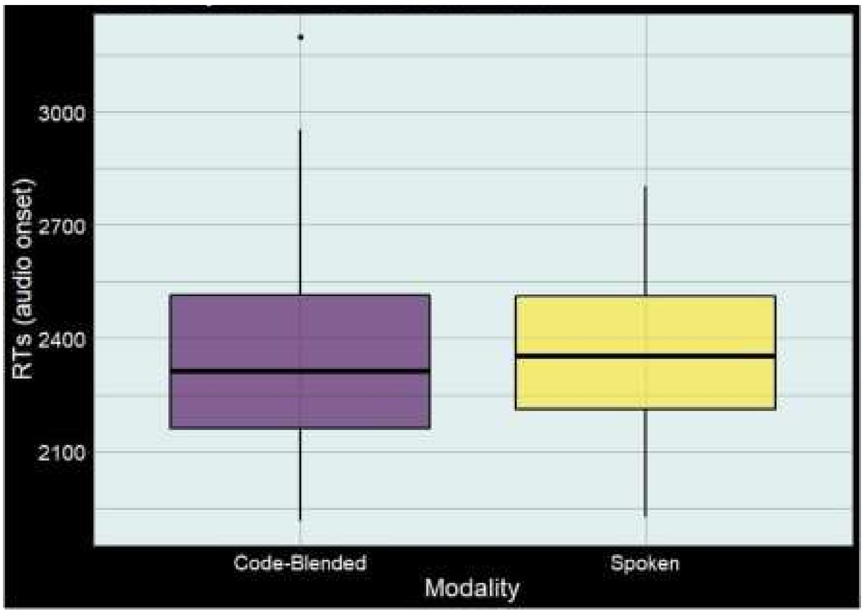


Figure 63 *CB vs SpL: RTs from audio onset (LSF-French, SYN).*

The difference in RTs from audio onset between CB and SpL is **8 ms**, there is no advantage for code-blends nor for spoken language, as they are very similar.

Mean RTs in **LIS-Italian bilingualism** in milliseconds:

- Code-blend (CB): 3903 (SD 0815) *video onset*
- Sign Language (SL): 4414 (SD 1063) *video onset*
- Code-blend (CB): 3220 (SD 0784) *audio onset*
- Spoken Language (SpL): 3085 (SD 0613) *audio onset*

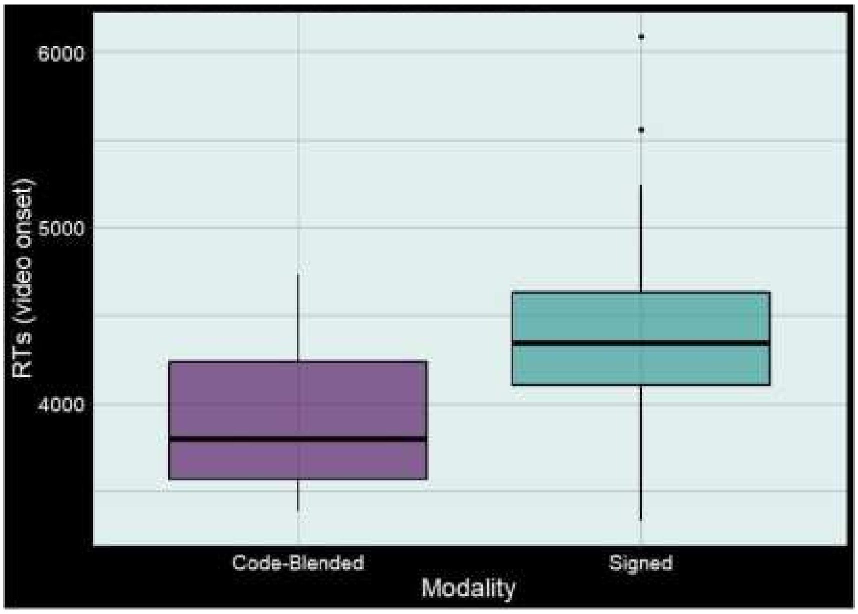


Figure 64 *CB vs SL: RTs from video onset (LIS-Italian, SYN).*

The difference in RTs from video onset between CB and SL is **-511 ms**, the advantage for code-blends is significant.

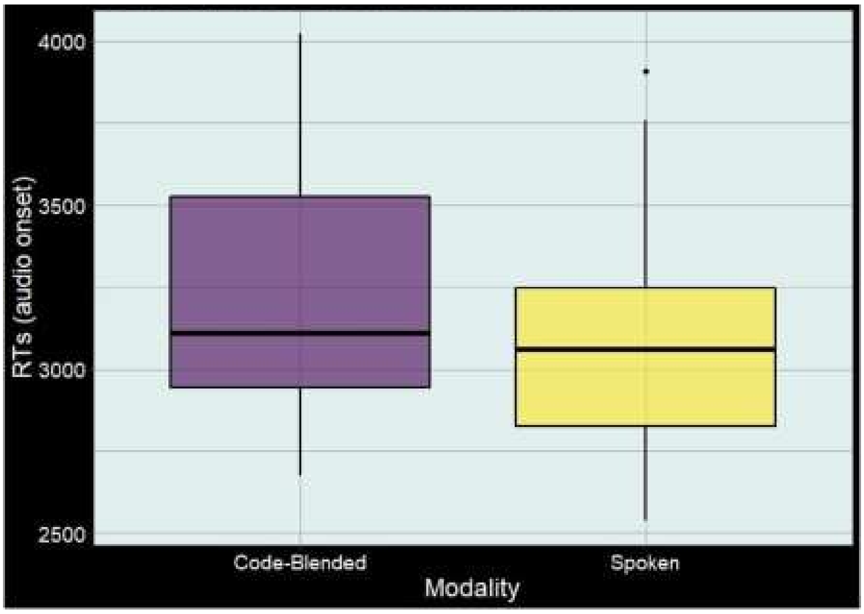


Figure 65 *CB vs SpL: RTs from audio onset (LIS-Italian, SYN).*

The difference in RTs from audio onset between CB and SpL is **135 ms**, there is no advantage for code-blends.

Can we observe the same advantage found by Emmorey et al. (2012a) beyond the lexicon, at the clausal level?

At the clausal level, response to code-blends is faster than to sign only, but not faster than to speech only. Apparently, the advantage for bimodal stimuli found in lexical tasks is only mirrored in syntactic tasks with respect to the sign only condition, but not to the speech only condition. These data show an overall preference for the spoken language at the clausal level.

4.5 Discussion

The data analysis of the lexical experiment results confirms that the advantage for code-blended stimuli over sign language only and spoken language only is extended to other language pairs besides ASL-English (Emmorey et al., 2012a). The presentation of a blended lexical item has been proven to be advantageous in processing when compared to sign or speech alone. This implies that processing factors are not language-dependent, but universal and that processing two modalities simultaneously always allows for a faster retrieval of the lexical meaning than if accessing only one lexical database at a time. A consideration on these results could lead one to think that having open access to two lexical databases at the same time allows for faster processing. Whatever semantics is retrieved first, the stimulus can be processed to produce a response. Under the code-blend condition, the brain undergoes only one task that is to retrieve the needed information in the fastest way. On the contrary, when the stimulus is only provided in one language, the bilingual brain undergoes a double task by suppressing the language not in use, while trying to retrieve the necessary information as fast as possible. Not only the suppression of the language not in use requires a certain effort that results in longer times for processing, but it might slow down the retrieval of information which might be less accessible in the language in use, than it would have been in the suppressed language, perhaps for reasons related to the use of that language. In Jaber, Branchini, Donati, Geraci and Giustolisi (in preparation) no analysis has been provided yet on the frequency of the lexical items. Considering the frequency-lag hypothesis developed by Emmorey et al. (2012b) a rising question would be if, and in which way, the frequency of use of the selected lexical items affects the results. Are high-frequency words/signs faster to retrieve in any condition? Does code-blending affect positively or negatively the processing of low-frequency words/signs?

The data analysis of the syntactic experiment only partially meets the research predictions. In fact, these results show that an advantage for blended utterances can indeed be found also at the clausal level, but only in the case of congruent code-blends. If the presented stimulus is an incongruent code-blend, namely, the two languages display a different word order, it is processed faster than in the sign language only condition, but slower than in the speech only condition. This result suggests that, within the clause, lexical items which compose the sentence are not individually processed as atoms, but, rather, they are processed hierarchically, as constituents of a sentence, hence processed in two independent syntactic structures. Another possibility is that full blended sentences take longer to process and therefore the advantage is not found.

Among the possible explanations for the outcome of the syntactic test, some may concern the experimental structure, specifically, the response measurements and participants. As for the measurements of reaction times, perhaps the measurement system adopted to identify the latter did not provide proper accuracy and data collected could be better analysed after proper recalculation. A different task could be used, perhaps one that allows for self-pace processing, and different measurement techniques might be implemented. For example, the eye-tracking, a procedure that can measure eye movements through eye-gaze position (the direction towards which one is looking) and pupil dilation. This procedure is usually used in psycholinguistics as pupil dilatation is associated with increased processing in the brain: the human pupil responds with large dilation to effortful tasks. In this study, response times were calculated in relation with video and audio onset times.

As for the participants involved in this project, they were adult CODAs and therefore native bimodal bilinguals. Notwithstanding their native competence, their competence in the sign language, mirrored in the reaction times to the SL stimuli, is significantly lower than the spoken language. Technically, this could be considered a case of unbalanced bilingualism, in which one language (the oral language in this case) is dominant and the other one is less developed. This unbalanced competence obviously affects the accuracy of any study on bilingualism. We should however point out that it is not rare for adult CODAs to become unbalanced bilinguals as the hearing society makes up the biggest part of their lives and socio-cultural interactions. As soon as they become aware of their hearing condition, they start moving towards the hearing community and, also thanks to the existence and use of a written form only for the oral language, the spoken language easily becomes the dominant language. In this respect, young kids are expected to be more balanced bilinguals, as they experience less pressure from society to rely more on the spoken language, or to separate the context in which the two languages should be used. For this reason, it would be interesting to test KODAs and verify whether the results match the ones collected from adults. To this end, it would be important to understand at what age the linguistic competence is mature and it is possible to reach a balance in the bilingual competence.

Furthermore, the choice of not allowing any NMMs in the input of the sign only condition, although opted for in order to avoid any interference from the spoken language, may have represented an obstacle in the comprehension of the SL data, as many signers rely on some sort of partial or total mouthing. From this point of view, the stimuli might have been perceived as not natural, or at least less natural than the language in use.

It is important to keep looking into full sentence blending and keep researching in this field because, as already mentioned, the code-blend condition allowed by bimodal bilingualism makes it possible to reach a better understanding of the way in which the bilingual mind processes the two simultaneously active languages. Syntactic investigation in this field is important because only at the clausal level the debate between the existence of only one syntactic structure and two lexical outputs with word order being post-syntactic (the one-structure theory) can be addressed.

4.6 Conclusions and future perspectives

This chapter presented the results of the study conducted by Jaber, Branchini, Donati, Geraci and Giustolisi (in preparation) on bimodal bilingualism in France and Italy. The aim of the research was to verify whether the advantage for adult CODAs in processing blended stimuli found by Emmorey et al (2012a) at the lexical level is confirmed in different language pairs, and to test whether the same advantage can be found at the clausal level. The results revealed that there is an advantage in the code-blend condition at the lexical level.

At the syntactic level, the pairs of languages object of investigation display different conditions, as LSF-French bilingualism represents a case of congruent word order, while LIS-Italian bilingualism presents an incongruent word order. Notwithstanding such difference, the data collected from the two language pairs were not so different, as in both cases an advantage for the blended condition over the sign only condition was detected. The spoken only condition, on the other hand, registers quicker reaction times when compared to the code-blend condition, as it was processed in parallel times in France, and even faster in Italy. These results can be explained in different ways. Surely bimodal bilingualism offers a unique opportunity to understand the bilingual brain due to the peculiarity of the simultaneity of the two languages in use, thanks to the independent articulatory channels used by the two languages involved.

Future research on syntactic aspects of bimodal bilingualism might take into account the different articulation times code-blending requires to be produced, as well as introduce different techniques in the experiment itself to ensure that the length and times of the stimuli in all three conditions match.

Assuming that it would not be easy to make the articulation times in different conditions perfectly match, perhaps a different way to determine the response times could be used. An hypothesis could be to calculate the “third element offset time”. With the third element we intend the last constituent produced between subject, verb and object. This offset time would correspond to the moment in which all three elements necessary to process the meaning of the sentence are available. It should be calculated as follows:

- Sign language only condition:
  The third element offset time in sign language only condition matches the video offset of the sentence.

- Spoken language only condition:
  The third element offset time in spoken language only condition matches the audio offset of the sentence.

- Congruent code-blend condition:
  The third element offset time in congruent code-blend condition matches the earlier offset of the sentence between audio and video offsets.

- Incongruent code-blend condition:
  The third element offset time in incongruent code-blend condition does not match any of the sentence offsets (audio/video), but rather should be identified with the ending of the second element production (between subject, verb, and object), taking into account the latter value between the measured time for speech and sign.

With the identification of the "third element offset time" it would be possible to measure the response time to any given stimulus not from the beginning of the stimulus itself (as in this case the articulation times may vary for each condition, and therefore affect the resulting measurements), but from the moment in which all the necessary elements to process the sentence become fully available. A significant difference retrieved in the incongruent code-blend condition would mean that, in this condition, the sentence is not processed with elements provided by both languages, which would make the processing possible after the second elements are produced, but rather with elements provided by only one dominant language, limiting the processing until the last element is produced in that language.

Another possible goal for future research could be to test the processing time of bimodal bilinguals to the stimuli provided in a blended blending condition (See Branchini and Donati, 2016). In this case, no language could prevail over the other, as each one expresses only some constituents and therefore carries only part of the meaning of the entire sentence. Bilinguals would therefore be forced to activate both linguistic structures in order to fully process the received stimuli and provide a coherent response. By analysing reaction times in the blended blending condition as compared to the sign only or to the speech only conditions could reveal whether simultaneous processing is indeed convenient for bilinguals, or rather only disadvantageous. Also, in the case of a blended blending condition investigation, it would be necessary to consider the offset time (be it video or audio) in calculating the response times from the data collected, as the stimuli duration in the three given conditions would likely not match.

Conclusions

This thesis focuses on the processing of bimodal inputs in CODAs. To better understand the research topic, the first chapter of this thesis provides an introduction on bilingualism, with a brief explanation of its characteristics, of the phenomenon of multilingual expressions, and of bimodal bilingualism. In the second chapter previously conducted studies on bimodal bilingualism in different language pairs are presented. The third chapter provides some grammatical differences between Italian and LIS which are necessary to fully comprehend the aim and implications of the results' analysis of the experiment conducted by Jaber, Branchini, Donati, Geraci, And Giustolisi (in preparation) displayed in the fourth chapter.

The aim of the study was to verify whether the advantage for code-blend observed by Emmorey et al. (2012a) at the lexical level could be also found in the language pairs Italian-LIS and French-LSF, and if a similar advantage could be also observed at the clausal level. To do so, Jaber et al. (in prep.) structured an experiment to retrieve processing times of CODAs to linguistic stimuli presented in three different conditions: sign language only condition, spoken language only condition, and code-blend condition. At the lexical level, participants were requested to provide an edibility judgement, while at the syntactic level they were requested to provide a truth value judgement.

According to the data collected, at the lexical level the advantage for code-blend previously attested in ASL-English bilingualism by Emmorey et al. (2012a) is confirmed, as in both language pairs the response times to the code-blend condition are faster than to the sign language only condition, or to the spoken language only condition.

At the syntactic level, the results are slightly different than expected. In both language pairs, reaction times to stimuli provided in the code-blend condition are faster than reaction times to stimuli provided in the sign language only condition. The spoken language only condition, instead, seems to be processed in parallel with the code-blend condition when the language pair presents a congruent word order (namely, LSF-French where both languages follow the unmarked word order SVO), and even faster than the code-blend condition when the language pairs presents an incongruent word order (LIS-Italian, where LIS follows a SOV unmarked word order, and Italian follows the unmarked word order SVO).

Several are the possible explanations for this outcome, going from the methodology used for the measurement of reaction times, to the balance of the participants' bilingualism (notwithstanding their native competence in both languages, one language might be more used than the other on a daily basis, therefore qualifying as the dominant language).

Future research should consider using more advanced measurement techniques (i.e. eye-tracking), and perhaps address the research to KODAs, younger native bimodal bilinguals who might be less influenced by social constraints over the use of one language over the other (which usually favour the widespread spoken language over the minority sign language).

Moreover, future research might include in the analysis blended-blending utterances. In fact, these peculiar multilingual expressions provide only part of the meaning in each language, and solely the simultaneous access to both linguistic tanks can allow for the successful semantic retrieval. In this condition, no language prevails over the other, because isolating one of the two languages would prevent a complete semantic retrieval.

Only the simultaneous production of two languages allowed by bimodal bilingualism can provide evidence for a better understanding of the way in which the bilingual mind processes the two simultaneously active languages. It is important to keep researching in the field of full sentence blending because only at the clausal level the structural representation of the two languages in the bilingual brain can be fully understood.

As for now, the question remains open: *is the simultaneous production of two languages an advantage or a load for bilinguals? And to what extent?*

References

Abu Rabia S., and Saintsky E. (2010), “Advantages of Bilinguals Over Monolinguals in Learning a Third Language”, in *Bilingual Research Journal*, 33, 2, pp. 73-199.

Abutalebi J, and Green D. (2008), *Controls Mechanisms in Bilingual Language Production: Neural Evidence for Language Switching Studies*, in “Language and Cognitive Processes”, 23, 4, pp. 557-582.

Adamou E., Crasborn O., Webster J., and Zeshan U. (2020), “Force shaping sign multilingualism”, in Zeshan U., and Webster J. (eds.), *Sign Multilingualism*, Walter de Gruyter, pp. 1-21.

Bak T. et al. (2014), “Does Bilingualism Influence Cognitive Aging?”, in *Annals of Neurology*, 75, 6, pp. 959-963.

Baker A. E., and van den Bogaerde B. (2008), “Codemixing in signs and words in input to and output from children”, in Plaza-Pust C., and Morales Lopéz E. (eds.), *Sign Bilingualism: Language Development, Interaction, and Maintenance in Sign Language Contact Situations*, Amsterdam: John Benjamins, pp. 1-27.

Baker A. E., and van den Bogaerde B. (2014), “KODAs: A Special Form of Bilingualism”, in Quinto-Pozos D., *Multilingual Aspects of Signed Language Communication and Disorder*, Bristol, UK, Tonawanda, USA, Ontario, Canada: Multilingual Matters, pp. 211-234.

Bates E., D’Amico S., Jacobsen T., Szekely A., Andova E., Devescovi A. et al. (2003), “Timed picture naming in seven languages”, in *Psychonomic Bulletin & Review*, 10, pp. 344-380.

Bathia T., and Ritchie W. C. (2004), *The handbook of bilingualism*, Oxford: Blackwell.

Baum S. R., and Titone D. (2004), “Moving Toward a Neuroplasticity View of Bilingualism, Executive Control and Aging”, in *Applied Psycholinguistics*, 35, pp. 857-894.

Berry J. W. (1980), “Acculturation as varieties of adaptation.”, in Padilla A. (ed.) *Acculturation: Theory and Models*, Washington: AAAS.

Bertone C: (2011), *Fondamenti di Grammatica della Lingua dei Segni Italiana*, Milano: FrancoAngeli.

Bialystok E., Craik F. I. M., and Luk G. (2008), “Cognitive Control and Lexical Access in Younger and Older Bilinguals”, in *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 34, 4, pp. 859-873.

Bialystok E., and Herman J. (1999), “Does Bilingualism Matter for Early Literacy?”, in *Bilingualism: Language and Cognition*, 2, pp. 35-44.

Bishop M., and Hicks S. (2005), “Orange Eyes: Bimodal bilingualism in hearing adult users of American Sign Language”, in *Sign Language Studies*, 5(2), pp. 188-230.

Bishop M., Hicks S., Bertone A., and Sala R. (2006), “Capitalizing on Simultaneity: Features of Bimodal Bilingualism in Hearing Italian Native Signers”, in Lucas C. (ed.), *Multilingualism and sign languages: From the Great Plains to Australia*, Washington, DC: Gallaudet University Press.

Block D. (2003), *The Social Turn in Second Language Acquisition*, Washington, D.C.: Georgetown University Press.

Bloomfield L. (1935), *Language*, London: Allen and Unwin, p. 56.

Branchini C. (2011), “Fenomeni di simultaneità negli enunciati mistilingui: bilingui e bimodali a confronto”, in Cardinaletti A., Cecchetto C., and Donati C., *Grammatica, lessico e dimensioni di variazione nella LIS*, Milano: FrancoAngeli, pp. 219-235.

Branchini C., and Donati C. (2015), “Gli enunciati misti bimodali: un “esperimento naturale”, in Favilla M. E., and Nuzzo E. (eds.), *Grammatica Applicata: apprendimento, patologie, insegnamento*, Bologna: AItLA, pp. 153-164.

Branchini C., and Donati C. (2016), “Assessing lexicalism through bimodal eyes”, in *Glossa: a journal of general linguistics* 1(1): 48, pp. 1-30.

Branchini C., and Geraci C. (2011), “L’ordine dei costituenti in LIS: risultati preliminari”, in Cardinaletti A., Cecchetto C., and Donati C., Grammatica, lessico e dimensioni di variazione nella LIS, Milano: FrancoAngeli, pp. 113-126.

Branchini C., and Mantovan L. (eds.) (2020), *A Grammar of Italian Sign Language (LIS)*, Venezia: Edizioni Ca’ Foscari.

Brunelli M. (2006), *The Grammar of Italian Sign Language , with a Study about ist Restrictive Clauses*, Master’s Degree Thesis, Venezia: Università Ca’ Foscari, academic year 2005/2006.

Celo P. (2004), “Essere figli di genitori Sordi; modalità di comunicazione”, atti del Convegno *Comunicazione e Linguaggi: essere figlio udente di genitori Sordi*.

Checchetto A., Fornasiero E., Mantovan L., and Branchini C. (2020), “Lexicon”, in Branchini C., and Mantovan L. (eds.), *A Grammar of Italian Sign Language (LIS)*, Venezia: Edizioni Ca’ Foscari, PART III, pp. 211-352.

Chen Pichler D., Reynolds W., Palmer J. L., Müller de Quadros R., Kozak L. V., and Lillo-Martin D. (2017), “Heritage signers: Bimodal bilingual children from deaf families”, in Choi J., Demirdache H., Lungu O., and Voeltzel L. (eds.), *Language acquisition at the infances: Proceedings of GALA 2015*, pp. 247-269.

Chomsky N. (1995), *The Minimalist Program*, Cambridge, Mass: The MIT Press.

Comrie B. (1981), *Language Universals and Linguistic Typology*, Chicago & Oxford: University of Chicago Press.

De Houwer A. (1990), *The Acquisition of Two Languages from Birth: A Case Study*, Cambridge: Cambridge University Press.

Del Maschio N., and Abutalebi J. (2019), "Language Organization in the Bilingual and Multilingual Brain", in Schwieter J. W. (ed.), *The Handbook of the Neuroscience of Multilingualism*, Hoboken: John Wiley & Sons Ltd., pp. 199-213.

Ding G. (2016), "Code-blending and language control in bimodal bilinguals", in *Bilingualism: Language and Cognition*, 19(2), pp. 246-247.

Dodson K. (1981), "A reappraisal of bilingual development and education.", in Baetens Beardsmore A. (ed.), *Elements of Bilingual Theory*, Brussels: Vrije Universiteit te Brussel.

Donati C. (2021), "Bimodal bilingual grammars: theoretical and experimental perspectives", in Quer J., Pfau R., and Hermann A., *The Routledge Handbook of Theoretical and Experimental Sign Language*, Routledge, pp. 614-635.

Donati C., and Branchini C. (2012), "Challenging linearization: Simultaneous mixing in the production of bimodal bilinguals", in Biberauer T., and Roberts I. (eds.), *Challenges to linearization*, Berlin/Boston: Mouton de Gruyter, pp. 93-128.

Emmorey K., Borinstein H., and Thompson R. (2005), "Bimodal Bilingualism: Code Blending between Spoken English and American Sign Language", in Cohen J. (eds.), *ISB4: Proceedings of the 4th International Symposium on Bilingualism*, Cascadilla Press, pp. 663-673.

Emmorey K., Borinstein H. B., Thompson R., and Gollan T. H. (2008), "Bimodal bilingualism", in *Bilingualism: Language and Cognition*, 11(1), pp. 43-61.

Emmorey K., Giezen M. R., and Gollan T. H. (2016), “Psycholinguistic, cognitive, and neural implications of bimodal bilingualism”, in *Bilingualism: Language and Cognition*, 19(2), pp. 223-242

Emmorey K., Petrich J. A. F., and Gollan T. H. (2012a), “Bilingual processing of ASL-English code-blends: The consequences of accessing two lexical representations simultaneously”, in *Journal of Memory and Language*, 67, pp. 199-210.

Emmorey K., Petrich J. A. F., and Gollan T. H. (2012b), “Bimodal Bilingualism and the Frequency-Lag Hypothesis”, in *Journal of Deaf Studies and Deaf Education*, 18, pp. 1-11.

Ervin S. M., and Osgood C. E. (1954), “Second language learning and bilingualism.”, in *Journal of Abnormal and Social Psychology*, Supplement, 49, pp. 139-46.

Finger H., Goeke C., Diekamp D., Standvoß K., and König P. (2017), “LabVanced: A Unified JavaScript Framework for Online Studies”, paper presented at *International Conference on Computational Social Science* IC^2S^2, July 10-13, 2016, Cologne, Germany.

Garraffa M., Sorace A., and Vender M. (2020), *Il cervello bilingue*, Roma: Carocci editore.

Genesee F. (1989), “Early bilingual development: one language or two?”, in *Journal of Child Language*, 16, pp. 161-179.

Genesee F., Nicoladis, E., and Paradis J. (1995), “Language differentiation in early bilingual development”, in *Journal of Child Language*, 22, pp. 611-631.

Geraci C. (2002), *L’ordine delle Parole nella LIS*, Bachelor Degree Thesis, Milano: Università Statale.

Geraci C. (2006), “Negation in LIS (Italian Sign Language)”, in Bateman L., Ussery C. (eds.) *Proceedings of NELS 35*, University of Connecticut, Amherst, Mass: BookSurge Publishing, pp. 217-229.

Geraci C., and Bayley R. (2011), “Chi, cosa, dove, perché, quando: la distribuzione dei segni wh- in LIS”, in Cardinaletti A., Cecchetto C., and Donati C., Grammatica, lessico e dimensioni di variazione nella LIS, Milano: FrancoAngeli, pp. 127-143.

Geraci C., and Chesi C. (2009), *Segni al computer. Manuale di documentazione della lingua italiana dei segni e alcune applicazioni computazionali*, Siena: Cantagalli.

Gollan T. H., and Acenas L. A. (2004), “What is a TOT: Cognate and translation effects on tip-of-the-tongue states in Spanish-English and Tagalog-English bilinguals”, in *Journal of Experimental Psychology: Learning, Memory, and Cognition”*, 30, pp. 246-269.

Gollan T. H., Montoya R., Cera C., and Sandoval T. (2008), “More use almost always means a smaller frequency effect: Aging, bilingualism, and the weaker links hypothesis”, in *Journal of Memory and Language*, 58, pp. 787-814.

Gollan T. H., and Silverberg N. B. (2001), “Tip-of-the-tongue state in Hebrew-English bilinguals”, in *Bilingualism: Language and Cognition*, 4, pp. 63-83.

Gollan T. H., Slattery T., Goldenberg D., van Assche E., Duyek W., and Rayner K. (2011), “Frequency drives lexical access in reading but not in speaking: The frequency-lag hypothesis”, in *Journal of Experimental Psychology: General*, 140(2), pp. 186-209.

Greenberg J. (1963), “Some Universals of Grammar with Particular Reference to the Order of Meaningful Elements”, in Greenberg J. (ed.), *Universals of language*, Cambridge, Mass.: MIT Press, pp. 37-113.

Grosjean F. (1989), “Neurolinguists beware! The bilingual is not two monolinguals in one person”, in *Brain Lang.*, 36, pp. 3-15.

Grosjean F. (2012), “Bilingualism: A Short Introduction”, in Grosjean F., and Li P. (eds.), *The psycholinguistics of bilingualism*, Hoboken, NJ: John Wiley & Sons, pp. 5-25.

Haegeman L. (1996), *Manuale di grammatica generativa*, Milano: Hoepli.

Hamers J. F., Blanc M. H. A. (1989), *Bilinguality & Bilingualism*, Cambridge University Press.

Harris M. (1992), *Language experience and early language development. From input to uptake*, Hove: Lawrence Erlbaum.

Hawkins J. A. (1983), *Word order universals*, London: Academic Press.

Hemmi C. (2014), “Dual identities perceived by bilinguals”, in Mercer S., and Williams M., *Multiple perspectives on the self in SLA*, Multilingual Matters, pp. 75-91.

İşsever S., Makaroğlu B., Ergenç İ., and Dikyuva H. (2020), “A minimalist perspective on code blending in TİD-Turkish bimodal bilingualism”, in Zeshan U., and Webster J. (eds.) (2020), *Sign Multilingualism*, Boston/Berlin: Walter de Gruyter, and Lancaster, UK: Ishara Press, pp. 171-199.

Jaber A., Branchini C., Donati C., Geraci C., and Giustolisi B. (in preparation), *Is code blending and advantage beyond the lexicon?*

Kovács A. M. (2009), “Early Bilingualism Enhances Mechanisms of False-Belief Reasoning”, in *Developmental Science*, 12, pp. 48-54.

Kuno, S. (1978) *Japanese: A Characteristic OV Language*, in Lehmann W. P. (ed.).

Lambert W. E. (1955), "Measurement of the linguistic dominance of bilinguals.", in *The journal of abnormal and social psychology*, 50(2), p. 197.

Laudanna A. (1987), “Ordine dei segni nella frase”, in Volterra V. (ed.) *La Lingua Italiana dei Segni*, Bologna: il Mulino, pp. 211-230.

Mackey W. F. (1962), "The description of bilingualism.", in *Canadian Journal of Linguistics/Revue canadienne de linguistique* 7(2), pp. 51-85.

Macnamara J. (1967), “Bilingual’s linguistic performance: A psychological overview”, in *Journal of Social Issues, 23*, pp. 59-77.

Maestas y Moores J. (1980), “Early linguistic environment: Interactions of deaf parents with their infants”, in *Sign Language Studies*, 26, pp. 1-13.

Mallory B., Schein J. D., and Zingle H. W. (1993), “Intergenerational communication modes in deaf-parented families”, in *Sign Language Studies*, 78, pp. 73-92.

Mantovan L. (2010), *La distribuzione degli aggettivi nella lingua dei segni italiana: un’analisi quantitativa*, Master’s Degree Thesis, Venezia: Università Ca’ Foscari, academic year 2009/2010.

Mantovan L. (2020), “Syntax”, in Branchini C., and Mantovan L. (eds.), *A Grammar of Italian Sign Language (LIS)*, Venezia: Edizioni Ca’ Foscari, PART V, pp. 465-686.

Mc Swann J. (2001), “The architecture of the bilingual language faculty: evidence from intrasentential code-switching”, in *Bilingualism, Language and Cognition*, 8, pp. 1-22.

Meadow-Orleans K., Erting C. J., ans Spencer D. P. (1987), “Interactions of deaf and hearing mothers of deaf and hearing infants”, paper presented at the *Tenth World Congress of the World Federation of the Deaf*, Helsinki, Finland, July 24, 1987.

Meisel J. (1989), “Early differentiation of languages in early bilingual children”, in Hyltenstam K., and Obler L. (eds.), *Bilingualism Across the Lifespan*, Cambridge: Cambridge University Press.

Meuter R. F. I, and Allport A. (1999), “Bilingual language switching in naming: Asymmetrical costs in language selection”, in *Journal of Memory and Language*, 40, pp. 25-40.

Moores J. M., and Moores D. F. (1982), “Interaction of deaf children with children in the first months of life”, in Gross J (ed.), *Proceedings of the International Congress on Education of the Deaf*, Heidelberg, pp. 718-721.

Müller de Quadros R., Lillo-Martin D., and Chen Pichler D. (2020), “Blending languages: Bimodal bilinguals and language synthesis”, in Zeshan U., and Webster J. (eds.), *Sign Multilingualism*, Walter de Gruyter, pp. 201-226.

Müller de Quadros R., Lillo-Martin D., Polinsky M., and Emmorey K. (2016), *Heritage signers: bimodal bilingual structures*, Ms., Harvard University.

Muysken P. (2000), *Bilingual Speech. A Typology of Code Mixing*, Cambridge: Cambridge University Press.

Myers-Scotton C. (1997), *Dueling languages: Grammatical structure in codeswitching*, Oxford: Oxford University Press.

Myers-Scotton C. (2002), *Contact linguistics: Bilingual encounters and grammatical outcomes*, Oxford: Oxford University Press.

Panda S. (2020), “A community profile of ‘sign-speakers’ at the Indore Deaf Bilingual Academy”, in Zeshan U., and Webster J. (eds.), *Sign Multilingualism*, Walter de Gruyter, pp. 267-272.

Paradis J., Nicoladis E., and Genesee F. (2000), “Early emergence of structural constraints on code-mixing: Evidence from French-English bilingual children”, in *Bilingualism: Language and Cognition*, 3(3), pp. 245-261.

Pavlenko A. (ed.) (2006), "Bilingual selves", in *Bilingual minds: Emotional experience, expression, and representation*, Multilingual Matters.

Pavlenko A., and Lantolf J. P. (2000). "Second language learning as participation and the (re) construction of selves", in *Sociocultural theory and second language learning*, 3, Oxford University Press, pp. 155-78.

Petitto L. A., Katerlos M., Levy B. G., Gauna K., Tetreault K., and Ferraro V. (2001), "Bilingual signed and spoken language acquisition from birth: implications for the mechanisms underlying early bilingual language acquisition", in *Journal of Child Language*, 28, pp. 453-496.

Poplack S. (1987), "Contrasting patterns of code-switching in two communities", in Wande E., Anward J., Nordberg B., Steensland L., and Thelander M. (eds.), *Aspects of multilingualism*, Uppsala: Borgströms, pp. 51-77.

Preston P. M. (1995), "Mother, father deaf: The heritage of difference", in *Social Science & Medicine*, 40(1l), pp. 461-467.

Redlinger W., and Park T. (1980), "Language mixing in young bilinguals", in *Journal of Child Language*, 7, pp.337-352.

Rinaldi P., Sanalitro C., and Caselli M. C. (2019), "Bilinguismo tra lingue vocali e lingue dei segni", in Levorato M. C., and Marini A. (eds.), *Il bilinguismo in età evolutiva. Aspetti cognitivi, linguistici, neuropsicologici, educativi*, Trento: Erickson, pp. 161-176.

Rodriquez Y. (2001), *Todlerese: Conversations between deaf Puerto Rican parents and hearing toddlers*, Ph.D. dissertation, Lamar University, Beaumont, Tex.

Romaine S. (1989), *Bilingualism*, Oxford, UK, and New York: Blackwell.

Sacks O. (1989), *Seeing Voices. A Journey Into the World of the Deaf*, University of California Press.

Schiff N., and Ventry I. (1976), “Communication problems in hearing children of deaf parents”, in *Journal of Speech and Hearing Disorders*, 41, pp. 348-358.

Singleton J. L., and Tittle M. D. (2020), “Deaf parents and their hearing children”, in *Journal of Deaf Studies and Deaf Education*, 5(3), pp. 221-235.

Stokoe W. (1960), *Sign Language Structure: An outline of the visual communication system of the American deaf*, Studies in Linguistics, Occasional Papers, 8, University of Buffalo.

Székely A., D’Amico S., Devescovi A., Federmeier K., Herron D., Iyer G., et al. (2003), “Timed picture naming extended norms and validation against previous studies”, in *Behavioral Research Methods, Instruments, and Computers*, 35, pp. 621-633.

Titone R. (1972), *Early bilingualism*, Bruxelles: Charles Dessart, p.11.

Van den Bogaerde B. (2000), “Input and interaction in deaf families”, in *Sign Language and Linguistics*, 3, 143-150.

Van den Bogaerde B., and Baker A. E. (2006), “Code mixing in mother-child interaction in deaf families”, in *Sign Language and LInguistics*, 8(½), pp. 155-178.

Van den Bogaerde B., and Baker A. E. (2008), “Bimodal language acquisition in kodas”, in Bishop M., and Hicks S. L. (eds.), *HEARING, MOTHER FATHER DEAF: Hearing people in Deaf families*, Washington, DC: Gallaudet University Press, pp. 99-131.

Volterra V. (ed.) (1987), *La lingua dei segni italiana. La comunicazione visivo-gestuale dei sordi*, Bologna: il Mulino.

Volterra V., and Taeschner T. (1978), “The Acquisition and Development of Language by Bilingual Children”, in *Journal of Child Language*, 5, pp. 311-326

Vygotsky L. S. (1978), *Mind in society: Development of higher psychological processes*, Cole M., John-Steiner V., Scribner S., and Souberman E. (eds.), Cambridge, MA: Harvard University Press.

Weinreich U. (1953), *Languages in Contact; Findings and Problems*, New York: Publications of the Linguistic Circle of New York 1.

Wenger E. (1998). “Communities of practice: Learning as a social system”, in *Systems thinker*, 9(5), pp. 2-3.

Zeshan U., and Panda S. (2015), “Two languages at hand: Code-switching in bilingual deaf signers”, in *Sign Language & Linguistics*, 18(1), pp. 90-131.

Zeshan U., and Panda S. (2018), “Sign-speaking: The structure of simultaneous bimodal utterances”, in *Applied Linguistics Review*, 9(1), pp. 1-34.

Zeshan U., and Webster J. (eds.) (2020), *Sign Multilingualism*, Boston/Berlin: Walter de Gruyter, and Lancaster, UK: Ishara Press.

Zucchi S. (2009), “Along the Time Line. Tense and Time Adverbs in Italian Sign Language”, in *Natural Language Semantics*, 17, pp. 99-139.

Index of Figures

Index of Tables

Attachments

A. List of lexical elements for the Italian-LIS test

TRAINING PHASE	
Stimulus	**Edibility**
BINOCOLO	Non-edible
POMODORO	Edible
SCOPA	Non-edible
SPAGHETTI	Edible

LIST A	
Stimulus	**Edibility**
ACQUA	Edible
ALBERO	Non-edible
BANANA	Edible
BORSA	Non-edible
CANCELLO	Non-edible
CAROTE	Edible
CILIEGIA	Edible
FILM	Non-edible
FOGLIA	Non-edible
FOGLIO	Non-edible
GAMBERETTO	Edible
GATTO	Non-edible
GELATO	Edible
GNOCCHI	Edible
INSALATA	Edible
ISTITUTO	Non-edible
LAGO	Non-edible
LATTE	Edible
LIBRO	Non-edible

LIST A	
Stimulus	**Edibility**
LUNA	Non-edible
MAMMA	Non-edible
MELA	Edible
OROLOGIO	Non-edible
PANE	Edible
PAPA	Non-edible
PATATA	Edible
SOLE	Non-edible
UVA	Edible
VINO	Edible
ZUPPA	Edible

LIST B	
Stimulus	**Edibility**
ANANAS	Edible
ASCENSORE	Non-edible
BIRRA	Edible
CALZINO	Non-edible
CANE	Non-edible
CAPPELLO	Non-edible
CARAMELLA	Edible
CARCIOFI	Edible
FAGIOLI	Edible
FIORE	Non-edible
FRUTTA	Edible
LIMONE	Edible
MACCHINA	Non-edible
MOZZARELLA	Edible
PANNA	Edible
PEPERONI	Edible
PIZZA	Edible
RISO	Edible
SCARPE	Non-edible

LIST B	
Stimulus	**Edibility**
SEMAFORO	Non-edible
SOLDATO	Non-edible
SPAGHETTI	Edible
STATUA	Non-edible
STELLA	Non-edible
TÈ	Edible
TEATRO	Non-edible
TELEFONO	Non-edible
TRENO	Non-edible
UOMO	Non-edible
VODKA	Edible

LIST C	
Stimulus	**Edibility**
BICICLETTA	Non-edible
BUSTA	Non-edible
CAPPUCCINO	Edible
CARNE	Edible
CASA	Non-edible
CEROTTO	Non-edible
CIPOLLA	Edible
COCA COLA	Edible
CORNETTO	Edible
DONNA	Non-edible
DOTTORE	Non-edible
ERBA	Non-edible
FINESTRA	Non-edible
FORMAGGIO	Edible
FUNGHI	Edible
GIORNALE	Non-edible
GRANCHIO	Edible
LETTERA	Non-edible
NONNO	Non-edible

LIST C	
Stimulus	**Edibility**
OCCHIALI	Non-edible
OLIO	Edible
OSPEDALE	Non-edible
PANINO	Edible
PASTA	Edible
PESCE	Edible
PROSCIUTTO	Edible
SPUMANTE	Edible
UOVA	Edible
VENTO	Non-edible
VESCOVO	Non-edible

B. List of lexical elements for the French-LSF test

TRAINING PHASE	
Stimulus	**Edibility**
ARTICHAUT	Edible
DIAMANT	Non-edible
ELASTIQUE	Non-edible
GLACE	Edible

LIST A	
Stimulus	**Edibility**
ANANAS	Edible
ASCENSEUR	Non-edible
BIERE	Edible
BRIOCHE	Edible
CHAISE	Non-edible
CHAMPAGNE	Edible
CHAUSSETTE	Non-edible
CHIEN	Non-edible
CHOCOLAT	Edible
CREVETTES	Edible
CROISSANT	Edible
EAU	Edible
ENVELOPPE	Non-edible
ETOILES	Non-edible
FENETRE	Non-edible
FROMAGE	Edible
GATEAU	Edible
HOMME	Non-edible
MONTRE	Non-edible

LIST A	
Stimulus	**Edibility**
OIGNON	Edible
ORDINATEUR	Non-edible
PLAFOND	Non-edible
PORTABLE	Non-edible
RAISIN	Edible
RIDEAU	Non-edible
RIZ	Edible
SOUPE	Edible
TOMATE	Edible
VELO	Non-edible
VIDEO	Non-edible

LIST B	
Stimulus	**Edibility**
ARBRE	Non-edible
BANANE	Edible
CHAMPIGNON	Edible
CHAUSSONS	Non-edible
CITRON	Edible
COCA	Edible
CONFITURE	Edible
FEUILLE	Non-edible
JAMBON	Edible
JOURNAL	Non-edible
LETTRE	Non-edible
LIVRE	Non-edible
LUNE	Non-edible
LUNETTES	Non-edible
MAISON	Non-edible
PATES	Edible
PECHES	Edible
PIZZA	Edible
POISSON	Edible

LIST B	
Stimulus	**Edibility**
POULET	Edible
SALADE	Edible
SAUCE	Edible
SOLDAT	Non-edible
STATUE	Non-edible
THÉ	Edible
THEATRE	Non-edible
VALISE	Non-edible
VENT	Non-edible
VIN	Edible
VOITURE	Non-edible

LIST C	
Stimulus	**Edibility**
BALCON	Non-edible
BATEAU	Non-edible
CAFÉ	Edible
CAROTTES	Edible
CEINTURE	Non-edible
CERISE	Edible
CHAPEAU	Non-edible
CHAUSSURES	Non-edible
FEMME	Non-edible
FLEUR	Non-edible
FRITES	Edible
FRUIT	Edible
HERBE	Non-edible
HOPITAL	Non-edible
LAIT	Edible
LAMPE	Non-edible
LEGUMES	Edible
METRO	Non-edible
OEUF	Edible

LIST C	
Stimulus	**Edibility**
PAIN	Edible
PAPIER	Non-edible
POIRE	Edible
POMME	Edible
SANDWICH	Edible
SOLEIL	Non-edible
STYLO	Non-edible
TIMBRE	Non-edible
VIANDE	Edible
VODKA	Edible
YAOURT	Edible

C. List of Italian syntactic elements for preliminary test and edits

Num	Sentence	True/False	Total Errors
trial 1	Il sole è caldo	True	/
trial 2	Il pinguino è bianco e nero	True	/
trial 3	I conigli volano	False	/
trial 4	La banana può essere blu	False	/
1	I bambini bevono l'acqua	True	0
2	I bambini bevono il vino	False	2
3	I bambini non bevono la birra	True	3
4	I neonati bevono la birra	False	1
5	I leoni mangiano la carne	True	2
6	I leoni mangiano le brioche	False	4
7	Gli uccelli mangiano i vermi	True	0
8	Gli uccelli non mangiano i vermi	False	3
9 *ed.*	Un poliziotto può fare la multa *Il vigile urbano può fare la multa*	True	3
10 *ed.*	Un poliziotto non può fare la multa *Il vigile urbano non può fare la multa*	False	6
11	Le mucche non mangiano l'erba	False	5
12 *ed.*	Le mucche non mangiano le uova *Le mucche non mangiano le caramelle*	True	12

Num	Sentence	True/False	Total Errors
13 *ed.*	Ai giovani non piace lavare i piatti *Ai giovani non piace pulire la camera*	True	**18**
14 *ed.*	Ai giovani non piace giocare ai videogames *Ai bambini non piace giocare con la palla*	False	4
15	I bambini non guidano gli autobus	True	4
16 *ed.*	I bambini non mangiano le caramelle *I bambini non amano le caramelle*	False	4
17	Il falegname ripara le porte	True	4
18	Il falegname ripara le macchine	False	2
19	I giovani vanno all'asilo	False	4
20	I giovani vanno alla scuola superiore	True	3
21	Gli studenti possono leggere i libri	True	2
22	Gli elefanti possono leggere i libri	False	1
23	I nonni amano i nipoti	True	0
24	L'infermiere cura le persone	True	1
25	L'infermiere trucca le persone	False	4
26 *ed.*	Il giardiniere annaffia le piante *Il giardiniere pota le piante*	True	2
27 *ed.*	Il giardiniere lava le macchine *Il giardiniere pota le macchine*	False	4

Num	Sentence	True/False	Total Errors
28	Il parrucchiere taglia i capelli	True	0
29	Il parrucchiere vende la pizza	False	2
30	I panni sporchi si mettono in lavatrice	True	5
31	I panni sporchi si mettono nel cassetto	False	2
32	I dottori curano i bambini	True	1
33	I bambini curano i dottori	False	5
34	Il pittore non sa dipingere i quadri	False	2
35 *ed.*	Gli anziani non possono saltare gli ostacoli *Gli anziani non possono tornare giovani*	True	**35**
36	I bambini disegnano le case	True	4
37	Gli uccelli disegnano le case	False	0
38 *ed.*	L'avvocato consiglia i suoi clienti *L'avvocato consiglia i clienti*	True	4
39	Gli orsi catturano i pesci	True	2
40	Le scimmie catturano gli aeroplani	False	1
41	Il fornaio impasta il pane	True	1
42	Il fornaio stampa i libri	False	0
43	I preti credono in Dio	True	0
44	Le persone si fidano dei ladri	False	0
45 *ed.*	Si possono mangiare le sigarette *Il vetro si può mangiare*	False	**6**

Num	Sentence	True/False	Total Errors
46 *ed.*	Si possono mangiare le caramelle *Le caramelle si possono mangiare*	True	1
47	Il muratore costruisce case	True	1
48 *ed.*	Il muratore costruisce fiori *Il muratore vende fiori*	False	3
49 *ed.*	Il cuoco prepara dolci *Il cuoco cucina le torte*	True	4
50	Il poliziotto insegna matematica	False	2
51	I poliziotti arrestano le persone	True	2
52	Ai topi piace il formaggio	True	3
53 *ed.*	Ai topi piacciono i gatti *Ai topi piace il veleno*	False	**6**
54	Ai cani non piacciono i fuochi d'artificio	True	2
55 *ed.*	Ai cani non piace uscire *Ai cani non piacciono gli ossi*	False	1
56	I turisti visitano la Torre Eiffel	True	1
57 *ed.*	I cani visitano la Torre di Pisa *I cani comprano i libri*	False	**7**
58	I mostri fanno paura ai bambini	True	1
59	Le formiche fanno paura ai gatti	False	0
60	Il cuoco non deve cucinare la plastica	True	3

Num	Sentence	True/False	Total Errors
61	Il cuoco deve cucinare la plastica	False	0
62	I dentisti curano i piedi	False	0
63	I dentisti curano i denti	True	0
64	Le farmacie vendono benzina	False	1
65	Le farmacie vendono medicine	True	7
6 *ed.*	I genitori raccontano favole ai bambini *I genitori raccontano le favole ai bambini*	True	1
67 *ed.*	I gatti raccontano favole ai bambini *I gatti raccontano le favole ai bambini*	False	1
68	I bambini guardano i cartoni animati	True	0
69	Le giraffe guardano i cartoni animati	False	2
70	I francesi amano il formaggio	True	4
71	I francesi amano la baguette	True	1
72 *ed.*	Le mucche non bevono la vodka *Le mucche non bevono vodka*	True	2
73	Le mucche non bevono l'acqua	False	0
74 *ed.*	Agli orsi polari non piace il freddo *All’orso polare non piace il pesce*	False	4
75 *ed.*	Agli orsi polari non piace il caldo *All’orso polare non piace il caldo*	True	5
76	I pompieri non spengono il fuoco	False	2

Num	Sentence	True/False	Total Errors
77 *ed.*	I pompieri non catturano le farfalle *I pompieri non uccidono le persone*	True	**7**
78 *ed.*	I fisioterapisti non curano le distorsioni *Il fisioterapista non cura il corpo*	False	**7**
79 *ed.*	I fisioterapisti non curano i capelli *Il fisioterapista non opera le persone*	True	**6**
80 *ed.*	Le nonne regalano caramelle ai loro nipoti *Le nonne regalano caramelle ai loro nipoti*	True	1
81 *ed.*	Le nonne regalano vodka ai loro nipoti *Le nonne regalano vodka ai nipoti*	False	4
82 *ed.*	Gli insegnanti danno voti agli studenti *L'insegnante dà i voti agli studenti*	True	1
83	Il fornaio dà i voti agli studenti	False	1
84	Il postino porta le lettere alle persone	True	2
85	Il postino porta le lettere ai maiali	False	2
86 *ed.*	Le persone danno fiori ai loro amanti *L'uomo regala fiori alla fidanzata*	True	**7**
87 *ed.*	Le persone danno fiori alle scimmie *Le persone regalano fiori alle scimmie*	False	2
88 *ed.*	Le diete possono trasformare il corpo *La dieta può trasformare il corpo*	True	0

Num	Sentence	True/False	Total Errors
89 *ed.*	Il sapone può trasformare il corpo *Il neonato può scrivere una lettera*	False	**15**
90 *ed.*	I giovani sognano le avventure *I giovani sognano l'avventura*	True	0
91 *ed.*	I giovani sognano gli ospedali *I giovani sognano la prigione*	False	5
92	I pesci vivono nel mare	True	1
93	I pesci vivono nel deserto	False	2
94 *ed.*	La metropolitana trasporta le mucche *La metropolitana trasporta mucche*	False	3
95 *ed.*	I poliziotti controllano i manifestanti *La polizia controlla i manifestanti*	 True	 0
96 *ed.*	I poliziotti applaudono i manifestanti *La polizia applaude i manifestanti*	False	4
97	Le vespe pungono le persone	True	1
98	Le tigri salutano i turisti	False	4
99 *ed.*	Gli avvocati non vogliono andare in prigione *Gli avvocati non vogliono perdere il processo*	True	4
100	Gli avvocati non devono rispettare la legge	False	4

D. List of syntactic elements for the Italian-LIS test

TRAINING PHASE	
Sentence	**True/False**
Il sole è caldo	True
I conigli volano	False
Il pinguino è bianco e nero	True
La banana può essere blu	False

LIST A	
Sentence	**True/False**
I bambini bevono l'acqua	True
I bambini non bevono la birra	True
I leoni mangiano le brioche	False
Le mucche non mangiano le caramelle	True
Il falegname ripara le macchine	False
Gli elefanti possono leggere i libri	False
L'infermiere cura le persone	True
Il giardiniere pota le macchine	False
I panni sporchi si mettono nel cassetto	False
Gli anziani non possono tornare giovani	True
I bambini disegnano le case	True
Gli orsi catturano i pesci	True
Il fornaio stampa i libri	False
Il muratore costruisce case	True
I poliziotti arrestano le persone	True
I turisti visitano la Torre Eiffel	True
Le formiche fanno paura ai gatti	False
Il cuoco deve cucinare la plastica	False
Le farmacie vendono benzina	False

LIST A	
Sentence	**True/False**
I genitori raccontano favole ai bambini	True
Le giraffe guardano i cartoni animati	False
Le mucche non bevono vodka	True
I pompieri non uccidono le persone	True
Le nonne regalano vodka ai nipoti	False
Il postino porta le lettere alle persone	True
Il neonato può scrivere una lettera	False
I giovani sognano l'avventura	True
I pesci vivono nel deserto	False
La polizia applaude i manifestanti	False
Gli avvocati non devono rispettare la legge	False

LIST B	
Sentence	**True/False**
I bambini bevono il vino	False
Gli uccelli mangiano i vermi	True
Le mucche non mangiano l'erba	False
I bambini non guidano gli autobus	True
Il falegname ripara le porte	True
I giovani vanno all'asilo nido	False
Gli studenti possono leggere i libri	True
Il parrucchiere taglia i capelli	True
I dottori curano i bambini	True
Il pittore non sa dipingere i quadri	False
Gli uccelli disegnano le case	False
Le scimmie catturano gli aeroplani	False
I preti credono in Dio	True
Le caramelle si possono mangiare	True
Il muratore vende fiori	False
Ai topi piace il formaggio	True
I cani comprano i libri	False
I dentisti curano i piedi	False
Le farmacie vendono medicine	True

LIST B	
Sentence	**True/False**
I gatti raccontano le favole ai bambini	False
I francesi amano il formaggio	True
Le mucche non bevono l'acqua	False
I fisioterapisti non curano il corpo	False
L'insegnante dà i voti agli studenti	True
Il postino porta le lettere ai maiali	False
La dieta può trasformare il corpo	True
I giovani sognano la prigione	False
La metropolitana trasporta mucche	False
Le vespe pungono le persone	True
Gli avvocati non vogliono perdere il processo	True

LIST C	
Sentence	**True/False**
I neonati bevono la birra	False
Gli uccelli non mangiano i vermi	False
Il vigile urbano può fare la multa	True
Il vigile urbano non può fare la multa	False
I bambini non amano le caramelle	False
I nonni amano i nipoti	True
L'infermiere trucca le persone	False
Il giardiniere pota le piante	True
Il parrucchiere vende la pizza	False
I bambini curano i dottori	False
L'avvocato consiglia i clienti	True
Il fornaio impasta il pane	True
Le persone si fidano dei ladri	False
Il vetro si può mangiare	False
Il poliziotto insegna matematica	False
Ai topi piace il veleno	False
I mostri fanno paura ai bambini	True
Il cuoco non deve cucinare la plastica	True
I dentisti curano i denti	True

LIST C	
Sentence	**True/False**
I bambini guardano i cartoni animati	True
I francesi amano la baguette	True
I pompieri non spengono il fuoco	False
Il fisioterapista non opera le persone	True
Le nonne regalano caramelle ai nipoti	True
Il fornaio dà i voti agli studenti	False
L'uomo regala fiori alla fidanzata	True
Le persone regalano fiori alle scimmie	False
I pesci vivono nel mare	True
La polizia controlla i manifestanti	True
Le tigri salutano i turisti	False

E. List of syntactic elements for the French-LSF test

TRAINING PHASE	
Sentence	**True/False**
Le soleil est chaud	True
Les lapins volent	False
Les pingounis sont noir et blanc	True
Les bananes peuvent être bleues	False

LIST A	
Sentence	**True/False**
Les enfants boivent de l'eau	True
Les lions mangent des croissants	False
Un policier ne peut pas donner d'amende	False
Les enfants ne conduisent pas de bus	True
Les adolescents vont à la crèche	False
Les étudiants peuvent lire des livres	True
Les infirmiers maquillent les gens	False
Les coiffeurs coupent les cheveux	True
Les enfants soignent les médecins	False
L'avocat conseille ses clients	True
Le boulanger fait le pain	True
Les prêtres croient en Dieu	True
On peut manger des bonbons	True
Un ouvrier du bâtiment construit des maisons	True
Les souris aiment le fromage	True
Les dentistes soignent les pieds	False
Les Français aiment le fromage	True
Les grands-mères offrent de la vodka à leurs petits enfants	False
Les gens offrent des fleurs aux singes	False

LIST A	
Sentence	**True/False**
Les guêpes piquent les gens	True
Le Père Noël apporte des cadeaux aux enfants	True
Les vétérinaires soignent les légumes	False
La télévision cuit la nourriture	False
Les agences immobilières vendent des tambours	False
Les mouches veulent grandir	False
Les singes ont des poils	True
Les poules ont trois pattes	False
Les grenouilles aiment les bananes	False
Les soldats défendent le pays	True
Les canards ne mangent pas de pain	False

LIST B	
Sentence	**True/False**
Les enfants boivent du vin	False
Les oiseaux mangent des vers de terre	True
Les oiseaux ne mangent pas de vers de terre	False
Un policier peut donner une amende	True
Les grands-parents aiment leurs petits-enfants	True
Les jardiniers arrosent les fleurs	True
Les coiffeurs vendent des plantes	False
Les enfants dessinent des maisons	True
Les ours attrapent les poissons	True
Le boulanger imprime les livres	False
Un ouvrier du bâtiment vend des fleurs	False
Les enfants aiment les piqûres	False
Le cuisinier doit cuisiner du plastique	False
Les dentistes soignent les dents	True
Les parents racontent des contes aux enfants	True
Les kinés ne soignent pas les cheveux	True
Le facteur livre les lettres aux cochons	False
Les gens offrent des fleurs à leurs amoureux	True
Les jeunes rêvent d'aventure	True

LIST B	
Sentence	**True/False**
Des tigres saluent les touristes	False
Les avocats ne veulent pas perdre le procès	True
Les adolescents vont au lycée	True
Les végétariens mangent de la viande	False
Les policiers massent les clients	False
Les journalistes annoncent les informations	True
Les singes ont des ailes	False
L'eau brûle les arbres	False
Les grenouilles aiment nager	True
Les verts veulent détruire la planète	False
Les ours aiment les shorts	False

LIST C	
Sentence	**True/False**
Les enfants ne boivent pas de bière	True
Les bébés boivent de la bière	False
Le menuisier répare les voitures	False
Les infirmiers soignent les gens	True
Les jardiniers arrosent les voitures	False
Les médecins soignent les enfants	True
Les esthéticiennes ne peuvent pas opérer les malades	True
Les oiseaux dessinent des maisons	False
Les singes attrapent des avions	False
On peut manger des cigarettes	False
Le policier enseigne les mathématiques	False
Les monstres font peur aux enfants	True
Les pharmacies vendent des médicaments	True
Les chats racontent des contes aux enfants	False
Les vaches ne boivent pas d'eau	False
Les grands-mères offrent des cadeaux à leurs petits enfants	True
Les régimes peuvent transformer le corps	True
Les jeunes rêvent de prison	False
Les lions mangent de la viande	True

LIST C	
Sentence	**True/False**
Le Père Noël apporte des contraventions aux enfants	False
Les enfants punissent le directeur d'école	False
Les végétariens mangent des légumes	True
Les grands-mères préparent des gâteaux	True
Les agences immobilières vendent des maisons	True
Les soldats annoncent les informations	False
Les enfants veulent grandir	True
Les poules ont deux pattes	True
Les singes aiment les bananes	True
Les chats aiment nager	False
Les chiens encouragent les joueu	False

Acknowledgements

I would like to thank Prof.ssa Chiara Branchini for giving me the chance to collaborate in such an important research project, to be involved in structuring the experiments and watching the outcomes from the first line. I hope my contribution to the research was helpful enough to reciprocate for the opportunity you offered me. Thank you for the patience in supporting me in explaining all the stages that come into play when structuring a linguistic study, as well as during the process of writing this thesis.

Thanks to Prof.ssa Rita Sala for her willingness to collaborate on this work, and for providing me with new professional and educational perspectives as a sign language interpreter, both with her words and her example.

Thanks to Dr.ssa Beatrice Giustolisi for promptly providing all the information necessary to write this thesis, and patiently explaining it to us, while being busy carrying on the research itself.

A heartfelt thanks to all the research team in France: Angélique Jaber, Caterina Donati, and Carlo Geraci. Collaborating with you has been a true honour.

Thanks to CODA Italia APS and to all the participants whose contribution made this research possible.

I am forever grateful to Ca' Foscari University of Venice for believing in Italian Sign Language (LIS) an welcoming this language in academic classes, for being the first university in Italy to believe in academic education for Sign Language Interpreters, and the first to equalise the education and degree for Italian-LIS interpreters with those of other languages.