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Spoken and Signed Languages Hand in Hand

Parallel and Directly Comparable Corpora of French Belgian Sign Language (LSFB) and French

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Linguistics as a discipline only began to consider signed languages as legitimate, fully-fledged linguistic systems from the 1960s onwards. However, comparative work of signed and spoken languages made so far has struggled to draw on similar methodologies. In this paper, we seek to fill in this gap by presenting a recently built set of multilingual corpora, allowing scholars to conduct comparative studies of French Belgian Sign Language (LSFB), and its ambient spoken language, French. This article outlines the theoretical developments which have led to the creation of these corpora, highlighting two breakthroughs in the understanding of human communicative practices, i.e., the emergence of signed language linguistics and the development of comparative semiotics. We show that combining these recent theoretical insights with the new methodological tools holds potential for future research avenues that could broaden and improve our understanding of language use.

Keywords: Comparative Semiotics, Corpus Linguistics, Signed Languages, Gesture, Spoken Languages, Multimodality

1. Introduction

Since Stokoe's (1960) ground-breaking work on the linguistic status of ASL (American Sign Language), a growing body of research has demonstrated that signed languages (SLs) are fully-fledged linguistic systems. In the first decades of the field, many studies have shown that all levels of linguistic structure found in spoken languages (SpLs), primarily phonology, morphology, and syntax, are also attested in SLs. From the mid-1980s onwards, new research questions have been under the radar of scholars interested in the ways speakers and signers make meaning using and combining different strategies to communicate, including: How do speakers' and signers' diverse communicative practices compare? What kinds of factors can be brought to the foreground to account for observed similarities and differences (Ferrara and Hodge, 2018; Lepeut and Shaw, 2022; and Vandenitte, 2022)?

Despite long-standing reflections on the comparisons of SLs and SpLs, few studies to date have addressed these questions adopting similar methodological conditions and even fewer using large and authentic data. One recently developed approach to this issue relies on the comparison of a SL and its ambient SpL by using corpora built with the same collection method. The construction and use of such a comparable corpus across a SL and a SpL were first undertaken by Hodge *et al.* (2019) who describe a bilingual, multimodal corpus project allowing for the comparison of Auslan (Australian SL) and Australian English (AusE).

After discussing the state of studies investigating similarities and differences across SLs and SpLs (Section 2), the present paper builds on Hodge *et al.*'s (2019) proposal and introduces a new and more extensive set of multilingual (parallel and comparable) corpora of French Belgian SL (LSFB) and Belgian French (BF) collected at the University of Namur to carry out cross-linguistic comparative work (Section 3). Finally, several perspectives for the use of these tools in future research are presented (Section 4).

2. Theoretical framework: From Comparative Linguistics to Comparative Semiotics

Linguistics has largely relied on the use of written, non-spontaneous language data retrieved from speakers of Western languages (Vermeerbergen, 2006). This sampling method has had an impact on linguistic theory. For instance, the principle of arbitrariness of the sign, inherited from Saussure's legacy, has often been conceived of as a design feature of language. As a result, (contrastive) language research has often focused on the lexical and morphosyntactic levels, highlighting elements which are subject to community-specific conventionalisation (Ferrara and Hodge, 2018). This paradigm was shaken by two recent breakthroughs in the understanding of human communication.

First, since the 1960s, pioneering works, such as Stokoe's (1960), demonstrated that SLs were fully-fledged linguistic systems on an equal footing with SpLs. Subsequently, SL linguists first set to show linguists and other stakeholders that SLs, like SpLs, deserved recognition as legitimate languages (Vermeerbergen, 2006). This meant that SLs were analysed with the conceptual categories and tools developed from linguistic enquiry as it was performed then, to reveal that they patterned in ways similar to SpLs (Woll, 2003). A different tendency emerged as the multimodality of SpL was brought under the spotlight and visible bodily action was described as playing a key communicative role in SpLs (e.g., McNeill, 1992; and Kendon, 2014). This led researchers such as Liddell (2003) to ask whether theoretical models derived from gesture research may be better equipped than those of traditional linguistics to account for some SL phenomena because of their shared modality (Kendon, 2014).

Second, communication, both spoken and signed, has been shown to be composite, that is, to display different methods of signaling (Clark, 1996; Enfield, 2009; Kendon, 2014; and Ferrara and Hodge, 2018). SL linguists had initially emphasised the arbitrariness and conventionality of SLs to distinguish them from speakers' bodily actions, as conceived in the early stages of the field. Indeed, so-called gestures were construed as mostly iconic, and iconicity was perceived as inferior in communicative status compared to arbitrariness (Kendon, 2014). Yet, a better understanding of the semiotics of visible bodily action brought to light that gestures are not exclusively iconic and can notably be categorised following Peirce's (1955) trichotomy of symbols, icons, and indices. The use of these types of signs corresponds to three means of signaling: description, depiction and indication (see Clark, 1996; and Ferrara and Hodge, 2018). While it is gradually being recognised that a broader, semiotically diverse, perspective on language is needed, studies tackling this issue by carrying out comparative work remain scarce.

As underlined by Hodge *et al.* (2019), works comparing SpLs and SLs rarely draw on multimodal data, and directly comparable corpora of SL – ambient SpL pairs are only just being collected. In the same vein as Hodge *et al.* (2019), we undertook to collect a set of three

related corpora allowing us to compare LSFB and BF on a large scale. The LSFB Corpus, gathers the interactions of a hundred signers filmed in pairs. The utterances found in the LSFB Corpus serve as a source text for the second corpus, a parallel and aligned translation corpus in written French. Finally, the FRAPé Corpus aims at documenting the multimodal use of BF using the same procedure and tasks as those used for the LSFB Corpus. Each of these three datasets is presented below. Taken together, they make up a useful combination of multilingual and multimodal corpora, whose use and benefits for research are detailed in the following sections.

3. Methodological setting: a set of multilingual and multimodal corpora

3.1. The LSFB Corpus

The recent building of large corpora has marked an important step in the development of SL linguistics. Corpus linguistics is particularly suited to the analysis of SLs considering their particular sociolinguistic ecologies. As put by Fenlon *et al.* (2015:158):

[SLs] are young, minority languages, with few native signers and with an interrupted pattern of intergenerational transmission. As a consequence, it is often difficult even for native signers to be certain about what is and is not an acceptable construction in their language. [P]rocessing [...] large amounts of annotated texts can reveal patterns of language use and structure not available to everyday user intuitions, or even to expert detailed analysis.

The LSFB Corpus was published in 2015. It is the first online, large scale and machine-readable corpus of LSFB (Meurant, 2015), providing a representative sample of the SL used by signers from Brussels and Wallonia. In its conception and methodology, the LSFB corpus was able to benefit from the experience gained through the creation of the first modern SL corpora, specifically the Auslan and NGT corpora, two datasets designed to collect language data of Auslan (Johnston, 2010), and of NGT, the SL of the Netherlands (Crasborn *et al.*, 2008). It also directly benefited from the insights of and collaboration with Pr. Onno Crasborn, who acted as a mentor to Laurence Meurant at the University of Namur from 2013 to 2016. The LSFB corpus aims to document LSFB use and variation for research, professional, and individual purposes, and constitutes a linguistic and cultural heritage testimony for the LSFB community. It is available as an open access website containing video data, annotations, translations, and metadata¹. The corpus is also paired to an online lexical database that lists sign types corresponding to annotated tokens.

Out of an estimated total number of 4,000 signers in the Wallonia-Brussels Federation (*Fédération Wallonie-Bruxelles*) (FFSB, 2017), 100 signers participated in the data collection. Together, they make up a diverse sample of the LSFB deaf community that spans different age categories (18-25, 26-45, 46-65, and 66 and over), regional variants (across Brussels and Wallonia) and gender. The corpus also features diverse acquisition profiles, namely native, near-native (LSFB exposure before the age of seven), and late signers (LSFB exposure after the age of seven).

¹ <https://www.corpus-lsfb.be>

Participants were invited in pairs and were asked by a deaf moderator to perform nineteen tasks. These tasks aimed at eliciting various genres such as narratives, explanations, descriptions, argumentations, and conversations. For instance, signers discussed issues related to the deaf community such as one's first encounter with a deaf adult, important family celebrations, school life, relationships with hearing people, and a variety of non-deaf issues and topics to foster lexical diversity².

The annotation process has been carried out using the open-source multimedia annotation tool ELAN³. Thus far, out of the eighty-eight hours of video data available online, twenty-six hours have been manually glossed sign by sign using the ID-glossing principle (see Johnston, 2010), and following the basic annotation conventions from the Auslan Corpus annotation guidelines (Johnston, 2014, 2016). This represents 220,000 glosses (tokens) and 3,621 signs (types). As with many SL corpora, there was no pre-existing lexicon on which to base the ID-glossing annotation process for the LSFB corpus. Therefore, a lexical database referencing the ID-glosses has been progressively collected as the annotation process took place. In the lexical database, each gloss is associated with the various translation equivalents of the sign in written French and with an animated image of the sign⁴. The lexical database is accessible online through the corpus website itself. Following the method described by Crasborn *et al.* (2016, 2020), the lexical database is integrated with the ELAN annotation software as an external controlled vocabulary (ECV). This setup provides annotators with a drop-down list containing existing ID-glosses from the database, along with their translations, as they type. This approach speeds up the annotation process, reduces typing errors, and enables annotators to select the correct ID-glosses more easily.⁵ Additionally, we have translated fifteen hours of data at the sentence level, amounting to a total of 10,200 sentences, or 140,300 words.

The first goal of the LSFB-Lab at the University of Namur was to collect a machine-readable corpus of LSFB that represents its varied uses across diverse signers and discourse genres. From the outset, however, the aim was not only to develop research on LSFB, but also to enable cross-linguistic and cross-modal research, thereby informing general linguistics and providing support to the applied fields of bilingual education, translation, and interpretation. To that end, the LSFB Corpus was used to build a multilingual dataset made up of a parallel and a comparable corpus (Meurant *et al.*, 2016b).

While the use of similar multilingual datasets, complemented with alignment and search tools, is new to comparative research on SLs and SpLs, their theoretical and practical importance for SpL cross-linguistic research and applications is already well-attested. Thanks

² More details about the sampling method as well as a complete description of the tasks used can be found on the LSFB Corpus website (<https://www.corpus-lsfb.be/content.php?lang=En>).

³ <http://tla.mpi.nl/tools/tla-tools/elan>. ELAN is used by most SL corpus projects today but some projects use other tools, like iLex (<http://www.sign-lan.uni-hamburg.de/ilex>) or SignStream (<http://www.bu.edu/asllrp/signstream>), which both have been especially developed for SL annotation.

⁴ See <https://www.corpus-lsfb.be/lexique.php>. In contrast to other lexical databases such as the Auslan lexical database (Johnston, 2001) or SignBank (Crasborn *et al.*, 2016, 2020), the compositional parameters of the sign such as handedness, hand configuration, or sign location are not systematically described.

⁵ However, pending the development of automated assistance tools, annotation is currently still entirely manual and time-consuming: experience shows that it takes at least 200 times the real time duration of a video to carry out the basic annotation process (Crasborn, 2015) described by Johnston (2014, 2016). The resulting challenges are significant for the development of SL documentation, particularly in terms of cost, recruitment and personal retention.

to the large amount of language correspondences in context, these datasets can serve as testbeds for linguistic theories and related hypotheses. These tools have also largely contributed to the fields of lexicography, natural language processing, automatic or machine-assisted translation, and language teaching (Granger and Lefer, 2020). These tools are divided into two main categories, namely parallel and comparable corpora. The parallel and comparable corpora built around the LSFB Corpus will now be presented.

3.2. An aligned and searchable parallel corpus of LSFB and French

Most machine-readable SL corpora, such as the LSFB Corpus, are bilingual. Indeed, they include, alongside video recordings and annotations (ID-glosses) of the signs, written translations of the filmed signed discourse into SpL. Owing to this bilingual component, SL corpora can be converted into searchable (unidirectional) translation corpora, also known as parallel corpora (Granger and Lefer, 2020).

On the basis of the available data described in Section 1, i.e., the time-aligned ID-glosses, the lexical database and the written translations, we have developed the first of its kind concordancer, in order to align the LSFB and the French data, both at the sign- and word-levels (Meurant *et al.*, 2016b). Thanks to this alignment, the LSFB Corpus and its French translation is the only multilingual dataset including a SL that can be exploited as a searchable translation corpus. This opens up new opportunities for linguistic research, in particular by offering an effective solution to the current challenge of identifying valuable data within large SL corpora (see Meurant *et al.*, 2016a). The parallel data can be searched in order to bring out the various ways to express a specific meaning in LSFB based on a French word. Similarly, the many French translation equivalents of an LSFB sign across different contexts of use can also be found. The usefulness of this kind of query also extends beyond the translation equivalents of isolated lexical items. For instance, one can analyse the equivalents of the French passive forms, the ways in which LSFB signers express what is translated into French as prepositions, or how partly-lexicalised signs (Johnston and Schembri, 2010) and tokens of constructed action (Cormier *et al.*, 2015) are translated from LSFB into French.

Beyond the scope of linguistic research, the aligned data has enabled us to develop a contextual bilingual dictionary offering an unprecedented resource for students, teachers, translators, interpreters, the deaf community and the general public. Designed like Linguee or Reverso, this open-access online dictionary can be used by either typing a word in French or by producing a LSFB sign in front of a webcam (Fink *et al.*, 2021)⁶. The user is then provided with the LSFB or the BF equivalents of the searched word or sign, as well as bilingual examples in context (SL videos and SpL text extracts) retrieved from the LSFB Corpus.

Parallel corpora have the advantage of providing texts or discourses that have been made semantically equivalent through translation. The topic, the specific content, the objective, the discourse function, the register, and the audience of original texts are by principle kept identical in target texts. While the degree of comparability of the matching texts is subsequently high in terms of lexicon, structures, and discourse organisation, it is counterbalanced by the bias of the translating activity itself. Indeed, the target texts may always be suspected to reflect the

⁶ <https://dico.corpus-lsfb.be/>

transfers of features from the source language to the target language (Gellerstam, 1986), as well as of individual variations specific to the translators. In a complementary way, a comparable corpus makes it possible to compare spontaneous and conversational productions in the two languages.

3.3. A comparable corpus of LSFB and BF

Comparable corpora consist of a collection of (non-translated) texts in different languages that share the same type, topic, and communicative function. The gathered texts may be restricted to a specific domain (e.g., newspaper articles about ecology in English and French) or may represent a wide range of text types (e.g., balancing general news with economic, legal, medical, and political texts). Therefore, comparable corpora are free of any influence of the translation process or of another linguistic source. The degree of comparability also lies at a more general level than in parallel corpora, allowing, for example, to compare trends related to the use of lexicon, grammatical structures, and discourse organisation rather than to local correspondences (Granger and Lefer, 2020).

With this in mind, we have set up a third piece in our multilingual dataset, which consists in a multimodal corpus of videotaped interactions between BF speakers: the FRAPé Corpus (*Corpus de Français Parlé*) (Meurant *et al.*, Under Construction). Designed as the BF counterpart to the LSFB Corpus, the FRAPé Corpus is collected according to the same protocol, comprises the same set of nineteen tasks and covers the same variety of text types (narratives, explanations, descriptions, argumentations, and conversations). Regarding data diversity, especially the participants' profiles, we aim to be able to compare signers and speakers by gender and age group, as well as according to their linguistic profile (e.g., other languages used). Like for the LSFB Corpus, each session includes a pair of participants whose interactions are moderated by a native speaker. The only changes in the protocol, compared to the LSFB Corpus, concern the topic of certain tasks. For example, the conversation task about the relations between deaf and hearing people has been replaced by a task about the relations between Flemish and Walloon people in Belgium. To date, twelve complete sessions have been recorded (plus three shorter sessions conducted with elderly participants). Hence, the FRAPé Corpus comprises the interactions of thirty speakers, amounting to roughly twenty hours of video in total⁷.

3.4. The LSFB Corpus in a parallel and a comparable dataset

Together, the LSFB Corpus, its parallel and aligned French translations, and the FRAPé Corpus provide a rich variety of possible comparisons, indicated by the arrows in Figure 5: comparison of original discourses in LSFB and their translation in written French (i.e., relation ①); comparison of original, face-to-face and multimodal productions in LSFB and in BF (i.e.,

⁷ By way of comparison, the data from the Auslan and AusE comparable corpus (Hodge *et al.*, 2019) contains recordings of five pairs of participants for each language carrying out a series of six tasks, including narrations, argumentations and free conversations. Our aim is to collect data from at least fifty French speakers (i.e., twenty-five pairs).

bidirectional relation ②); comparison of original and translated texts in the same language, combined with the difference between multimodal of face-to-face communication and unimodal written expression (i.e., relation ③). These three types of corpus-based comparisons have a heuristic power in that they offer the opportunity to discover features of the languages in contrast that could not be expected without the automatic comparison of large amount of parallel and comparable data (Granger and Lefer, 2020). In this perspective, the next section highlights potential research avenues enabled by these new tools.

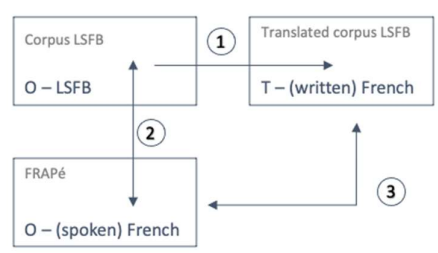


Figure 1: LSFB-French multilingual and multimodal datasets.

4. Perspectives for a multimodal understanding of language

The use of the body for communication is pervasive in both speaking and signing communities around the world. Over the past decades, inroads have been made as regards the composite nature of the human ability to do language in both SpLs and SLs following recent Neo-Peircean approaches. Provided less conventional semiotic strategies have received less attention, much remains to be understood about composite language use and its diversity across different human ecologies, including signing and speaking communities. Since all communities use description, indication and depiction as methods of communication (Clark, 1996), how much do they rely on them? Do they combine them and if so, how and with which channels, i.e., bodily and/or vocal articulators? To what communicative ends (Ferrara and Hodge, 2018)?

In line with Hodge *et al.* (2019)’s proposal to carry out comparative work between signers’ and speakers’ communicative practices, the comparability of the LSFB and the FRAPé corpora sets the stage for a renewed perspective on properties that have often been considered as specificities of SLs in the absence of comparable multimodal datasets of SpLs, like depiction, as well as the simultaneous use of manual and non-manual (e.g., eye gaze movements, mouth actions, or use of facial expression) resources. Results of these comparisons could also raise the question of the legitimacy of the distinction traditionally drawn, in particular by projecting the distinction between oral and bodily articulators, between what is ‘linguistic’ and what is ‘non-linguistic’ (see Ferrara and Hodge, 2018: 10).

Various projects conducted at the LSFB-Lab of the University of Namur rely on the dataset presented in Section 3. They focus on the comparison of interactive visible bodily actions (Lepeut, 2022), constructed action (Vandenitte, 2023), prosody (Lombart, 2021), and reformulation (Meurant *et al.*, 2022) in LSFB and BF. These projects provide a testbed for this innovative method and show how such a tool can be used to investigate similarities and differences in several areas of interest of linguistics across a SL and its ambient SpL: interaction management, depictive meaning-making, suprasegmental phonology, and the speakers’

investment and effort in the discourse process and in interaction. By applying the same annotation scheme for the analysis of both languages, we aim at enabling the comparison of human multimodality on a large scale.

A better understanding of the diversity of SpLs and SLs can be reached by building additional directly comparable corpora (complementing bilingual corpora as the Auslan-AusEN or the LSFB- BF ones). Another interesting direction for future research lies in the three-way comparison between the ways deaf signers or hearing monolingual speakers sign/speak and those of hearing bimodal bilinguals, i.e., hearing individuals who regularly use both a SL and a SpL.

Moreover, the possibility to compare SL productions with their written translations fosters a better understanding of the semiotics found in print and may have applications in translation studies as well as in the field of literacy, language teaching and acquisition. Indeed, virtually all of LSFB signers are bilingual: although they have varying degrees of deafness, they are exposed to French through lip-reading and inevitably interact with written French in their everyday lives. Writing is an important manifestation and source of contact with their SpL(s) (Quinto-Pozos and Adam, 2015). A better understanding of how LSFB and written French compare can be put to use in a variety of settings. This LSFB-written French bilingualism is notably the cornerstone of bilingual education settings (Ghesquière and Meurant, 2019).

In addition, our algorithm for aligning signed and written data has been successfully tested (Meurant *et al.*, 2016a) on data from the NGT Corpus (Crasborn *et al.*, 2008). This indicates that it can be applied to all datasets that have the same format as the LSFB Corpus, namely: annotations in ELAN (or html) format, a lexical database including translation equivalents, and translations aligned with the videos and annotations. The principle of our contextual bilingual dictionary (see Section 3.2) can therefore be extended to other SL-SpL pairs. Only the sign recognition module for querying the dictionary from the webcam (Fink *et al.*, 2021) needs to be trained on data specific to each SL.

Drawing on datasets such as the ones presented for LSFB and French, we will be able to better understand the diversity of language as used by signers and speakers. Ultimately, adopting a cross-modal and cross-linguistic approach toward language use in interaction will enable us to advance our understanding of the inherently social and multimodal nature of language in its diverse manifestations.

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