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Abstract

This paper describes the functions and variation in the use of PALM-UP in bidirectional French - LSFB (French Belgian Sign Language) interpreting. Data from final-year students of the Master's degree in Sign Language Interpreting at UCLouvain (Belgium) were analysed. Results show that PALM-UP is polyfunctional in both datasets of interpreted productions. PALM-UP was used as co-speech gesture and in signing by all participants, but some variation is observed across individuals. One of the most frequent functions in the dataset is planning (i.e., PALM-UP is used as a filler while preparing upcoming discourse or while making a cognitive effort in editing a term). PALM-UP was articulated while preparing upcoming discourse in LSFB target productions, whereas it was also used for this purpose and in combination with repairs, repetitions, word lengthening and pause fillers (i.e., while a cognitive effort was being made) in French target productions. When interpreting from French into LSFB, PALM-UP was sometimes articulated in the interpreter's non-dominant hand while the dominant hand was articulating one-handed signs. This phenomenon allows interpreters to keep the non-dominant hand active and to have shorter transitions between one- and two-handed signs in order to save time in their renditions.

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Keywords: PALM-UP; Bimodal interpreting; Functions; Interpreter variation; French; LSFB (French Belgian Sign Language)

1. INTRODUCTION

Signers and speakers have the same anatomical resources available and use them to communicate while signing or speaking (Kendon, 2014). If we understand language as multimodal, its description should not only include the aspects traditionally called "linguistic" such as speech and sign, but also the aspects which have been considered "non-linguistic" such as gesture, facial expression and body movement (Perniss, 2018). Studying all semiotic repertoires available to signers and speakers can let us gain "a more sophisticated understanding of the relationship across and between modalities" (Kusters et al., 2017: 229). However, the comparison between speech and gesture versus sign

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should not only involve the productions of speakers and signers but it should also include the productions of bimodal interpreters, i.e., interpreters who work with (at least) one spoken and one signed language (Nicodemus and Emmorey, 2013). Interpreted discourse constitutes a specific type of speech (Galvão, 2009) and a specific type of signing that is present in different situations in the daily life of many deaf and hearing people. Comparing co-speech gesture and signs produced by bimodal interpreters can provide us with new insights on how interpreters produce meaning and how their bodily resources are employed to do so.

This paper aims to contribute to this endeavour by focusing on the use of PALM-UP in bimodal interpreting. This gesture can be found in many spoken and signed languages (Cooperrider et al., 2018), and in interpreted discourse from a spoken language into another spoken language (Galvão, 2009, 2020). As the first study of this kind, this paper investigates whether interpreters use PALM-UP similarly to speakers and signers or if they also exhibit other uses of this gesture, related to interpretation. PALM-UP is articulated with one or with both hands, fingers (loosely) extended and palms facing upwards, as in Fig. 1.

The languages under study are French (Belgian variety) and LSFB (*langue des signes de Belgique francophone*, i.e. French Belgian Sign Language), for which interpreted multimodal data are available. LSFB is the natural language of deaf and deafblind people living in Wallonia (the Southern Belgian region) and some deaf and deafblind people living in Brussels. Similarly to other sign languages, LSFB is transmitted from one generation to the next within the Deaf Community without any written tradition. LSFB is also an understudied minority language whose presence in society is still scarce. The existing interpreting services are limited and do not cover all demands, which makes it harder for deaf and deafblind people to have access to information in many different daily situations.

The choice of PALM-UP is motivated by its wide range of possible functions and its high frequency in both spoken and signed discourse (cf. Cooperrider et al., 2018; Gabarró-López, 2019; Kendon, 2004; Lepeut, 2020). Both these characteristics make it a good candidate to observe possible correspondences and divergences between a language pair where one is signed and one is spoken. The case of PALM-UP is particularly interesting to study because it can shed light on how gesture conveys meaning or alleviates cognitive load in simultaneous bimodal interpreting.

In the literature on simultaneous spoken language interpreting, it has been acknowledged that, while interpreting, interpreters do produce gestures which can have varied functions (Galvão, 2009, 2020; Galvão and Rodrigues, 2010). One of these functions could be reducing cognitive load, as it has been reported for (non-interpreted) spoken discourse (Cook and Fenn, 2017; Goldin-Meadow et al., 2001). Cognitive load represents one of the main challenges of simultaneous interpreting, as interpreters must listen to a text, understand it, store it in memory and produce another text concurrently at the speaker's rate (Gile, 2018). Furthermore, recent research has found that cognitive load may be heavier depending on the language pair as "greater differences between the source and target languages may result in greater cognitive effort because working memory is taxed to a higher degree in order to reformulate the text in the target language" (Swabey et al., 2016: 52).

Beyond the interest of examining PALM-UP in interpreted French and LSFB data, this paper adds to existing research on signed-to-spoken language interpreting, which is still scarce if compared to extensive work on spoken-to-signed language interpreting and spoken-to-spoken language interpreting (Wang, 2021). Moreover, this work contributes to the description of the role of gesture in interpreting. Although gestures have been frequently observed in interpreted discourse, they have largely been overlooked in research. One of the reasons may be that conduit models of interpretation have considered that the interpreter had to convey information impartially and be invisible (Solow, 1981). However, more recent models see interpreters as cultural mediators who are part of the interaction (Roy, 2000). Gesture research may be complementary to the latter model because interpreters, as human beings, also use language in a multimodal way. Also, both deaf and hearing people receivers of interpreted discourse rely not only on the interpreter's use of language, but also on their bodily actions to construct meaning. This incipient interdisciplinary approach may uncover

Fig. 1. Example of one-handed and two-handed PALM-UP gestures.

specificities of interpreting that have been overlooked because previous research focused only on sign or speech, but not on the combination of the different semiotic resources available to interpreters.

The objectives of this paper are fourfold: (i) to examine the functions of PALM-UP in the target productions of French > LSFB and LSFB > French interpretations using a protocol for the annotation of pragmatic gestures (Bolly and Crible, 2015), (ii) to compare the most frequent functions in these two datasets, (iii) to observe whether PALM-UP gestures produced in target texts are the result of something which was expressed by the speaker/signer or if they were generated by the interpreter when elaborating their own discourse, and (iv) to describe some intra- and inter-interpreter differences and similarities (i.e., variation between the two target languages used by each interpreter and variation across participants) to offer a broader picture of the use of PALM-UP. In order to contextualise the study, the following section provides an overview of existing research about PALM-UP in spoken and signed languages (with a focus on French and LSFB) and in simultaneous interpreting.

2. BACKGROUND ON PALM-UP

PALM-UP has attracted the attention of many scholars who have studied it from different perspectives and used different terminology to name and classify this gesture. According to Cooperrider et al., (2018:3), some of the names that PALM-UP has received in the gesture research literature include "hand shrugs" (Johnson et al., 1975), "palm up open hand" (PUOH) gestures (Müller, 2004) or the "open hand supine" gesture family (Kendon, 2004). PALM-UP gestures have been classified as "emblems" (Johnson et al., 1975), "recurrent gestures" (Müller, 2017) or "pragmatic gestures" (Kendon, 2004), among others. In the sign language literature, different glosses have been used to annotate PALM-UP. For instance, it has been glossed as PALM-UP in the Auslan (Australian Sign Language) Corpus (Johnston, 2012), as WELL in the BSL (British Sign Language) Corpus (Fenlon et al., 2014), or PU in the STS (Swedish Sign Language) Corpus (Mesch, 2016). It has been described as a discourse marker (Amundsen and Halvorsen, 2011; Engberg-Pedersen, 2002), as a particle of indefiniteness (Conlin et al., 2003), as an interrogative marker (Zeshan, 2004), as a marker of (dis)fluency (Notarrigo, 2017) or as an interactive marker (Lepeut, 2020; Van Herreweghe, 2002), among others. PALM-UP "can be observed in all kinds of discourse types, and it has been documented for a wide range cultures" (Müller, 2004: 234). Interestingly, it is polyfunctional and, although its meanings seem quite distinct from each other, "the same cluster of meanings [e.g., absence of knowledge, concern or ability, uncertainty, interrogatives, hypotheticals, obviousness and exclamatives] pops up in culture after culture" (Cooperrider et al., 2018: 2).

In spoken languages, PALM-UP is one of the most frequently used gestures (Cooperrider et al., 2018; Müller, 2004). Kendon's (2004) work on PALM-UP is one of the best-known descriptions of the gesture in the literature. Following the idea of gesture family proposed by Müller (2004), Kendon (2004) divided PALM-UP gestures into three groups based on motion: *palm presentation gestures* (moving the hand in front of the speaker as if presenting something), *palm addressed gestures* (directed to the addressee) and *lateral palm gestures* (moving hands apart). They have different pragmatic functions. For instance, *palm presentation gestures* are used while explaining the meaning of a term or to give a comment, *palm addressed gestures* are used to pointing or to acknowledge someone as source of something, and *lateral palm gestures* express unwillingness or obviousness, among other functions. Unlike the *palm presentation* and the *palm addressed gestures*, the *lateral palm gesture* is usually combined with a shoulder shrug and facial expressions. Although the PALM-UP gesture has been described in a variety of spoken languages (see Cooperrider et al., 2018), Lepeut (2020) is the first to compare how it is used in spoken French on the one hand, and by LSFB signers on the other (see also Lepeut and Shaw, 2022).

In signed languages, PALM-UP is also frequently used by signers. The gesture has been investigated from diverse perspectives in many Western sign languages such as DTS (Danish Sign Language) (Engberg-Pedersen, 2002), ASL (American Sign Language) (Conlin et al., 2003; Hoza, 2011), TİD (Turkish Sign Language) (Zeshan, 2006), NGT (Sign Language of the Netherlands) (van Loon, 2012), NZSL (New Zealand Sign Language) (McKee and Wallingford, 2011) and STS (Mesch, 2016). Its use has also been reported in village sign languages (i.e., languages used in fairly isolated populations with a high incidence of deafness) by Nyst (2012) and in homesigners (i.e., deaf people who use a family communication system) by Franklin et al. (2011). Although functions described by Kendon (2004) have also been found in some signed languages, the association of a particular articulation of the gesture with a specific function has not always been systematic.

In LSFB, PALM-UP has been described from the perspective of connective and non-connective discourse markers (Gabarró-López, 2019, 2020). Its functions can be grouped into different domains or categories, including ideational (functions that connect real-world events including cause, consequence, etc.), rhetorical (functions that express subjective discourse relations or the signer's metacomment including hedging, specification, etc.), sequential (functions which organise discourse segments including punctuation, planning, etc.) and interpersonal (functions which are used to man-

age the exchange between signers including agreeing, monitoring, etc.). These domains and functions can be found in all discourse genres studied so far, namely argumentative, explanatory, metalinguistic and narrative conversations (Gabarró-López, 2019), and be used by adult signers from all age groups (Gabarró-López, 2020).

The interactional dimension of PALM-UP has also been investigated in comparative studies that draw on American English and ASL data (Shaw, 2019) and on Belgian French and LSFB data (Lepeut, 2020). Shaw (2019) compared PALM-UP in two multi-party interactions, one of deaf signing participants and another of hearing non-signing participants. Following Bavelas (1994) typology of interactive gestures, Shaw (2019) found that speakers of English used PALM-UP for delivering information, citing and seeking help. ASL signers also used it for these three functions and as a turn-regulator. Shaw (2019) also found that speakers and signers use the gesture as an evaluative marker and as a discourse marker similar to 'well', concluding that participants produce gesture just as they produce verbal/signed utterances.

Lepeut (2020) studied the use of PALM-UP by native French speakers and deaf LSFB signers in interviews and semi-spontaneous conversations guided by a moderator. PALM-UP tokens were identified and afterwards annotated using a multimodal annotation protocol for pragmatic gestures developed by Bolly and Crible (2015), which is further detailed in section 3. In line with previous studies, Lepeut (2020) found that PALM-UP is polyfunctional in LSFB and French. Some functions overlap in both languages, but while LSFB signers tend to use PALM-UP to regulate turn exchange and to provide feedback, French speakers tend to use it for marking new or shared information. Interestingly, no statistically significant differences in frequency were observed between the two languages, despite the different modalities. Nevertheless, interpersonal variation was found, as some signers and speakers showed a preference towards the use of this gesture, whereas others did not.

In interpreting studies, PALM-UP has scarcely been examined and there is no known study about its use by bimodal interpreters. Galvão (2009, 2020) explored the use of gesture in simultaneous interpreting from English into European Portuguese. Galvão (2020) recorded the interpreted productions of four simultaneous interpreters (two students and two professionals) in the booth in an experimental setting. The interpreters were given videos to interpret, and a camera was placed to capture their renditions. Following Kendon's (2004) classification of gestures, Galvão (2020) found that the interpreters produced referential gestures (such as pointing and descriptive gestures) and pragmatic gestures (with modal, performative and parsing functions), and they did so to different extents. In the microanalyses performed, one case in which the interpreter uses PALM-UP while producing repairs is described. The interpreter is not satisfied with her first lexical choice and repairs it twice. "Each repair initiation is accompanied by a stroke, [which] seems to be accompanying the effort of the utterance so that the correct option can be uttered", and by a head movement (Galvão, 2020: 167-168). PALM-UP and head movements were used for repair by the four interpreters, but Galvão (2020) acknowledges that results need further investigation.

3. A FRAMEWORK FOR THE ANALYSIS OF GESTURE

Previous research on gesture in (non-interpreted) French and LSFB discourse has drawn on Bolly and Crible's (2015) annotation protocol of pragmatic gestures. Beyond the convenience of using a tool that has already worked for a pair of languages and which may allow future comparisons, the interest of using this protocol is that it is divided into different levels. Therefore, the results of the analysis move from more general categories to more fine-grained functions. This is very convenient when comparing a polyfunctional gesture such as PALM-UP across two languages, as the diversity of fine-grained functions may give an impression of difference which is nuanced when grouping these functions under larger categories. Bolly and Crible's (2015) protocol is inspired by Halliday's categorisation of language (1970), which distinguishes three main functions of language: ideational (content-oriented), structuring (text-oriented), and interpersonal (including expressive: speaker-oriented, and interactive: addressee-oriented).

Halliday's main functions of language correspond to four *domains*[1] in Bolly and Crible's (2015) protocol. They are further divided into seven *sub-domains*: connective, referential, sequential, rhetorical, modal, interpersonal and parsing (see Table 1). Domains and sub-domains of this protocol are defined as follows:

- The *ideational domain* contains functions linked to states of affaires in the world, which can be of relational nature (i.e., *connective sub-domain*) or refer to objects, either concrete or abstract (i.e., *referential sub-domain*).
- The *structuring domain* is related to the organisation of discourse and marks the status of information. It is the only domain which has one sub-domain (i.e., *sequential*).

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[1] There is another domain called "instrumental", which has a sub-domain and a function called "activity" (Bolly and Crible, 2015). They are used to describe concrete actions that have an instrumental function such as taking a glass of water. In the present study, these values are not considered as PALM-UP is not a gestural action used for this purpose.

Table 1
Annotation protocol by Bolly and Crible (2015), produced by permission from the authors.

Domain	Sub-domain			Functions	
Ideational	Connective	Alternative		Condition	Temporal
		Cause		Consequence	Exception
		Concession		Contrast	
	Referential	Abstract deixis		Concrete deixis	Representational
Structuring	Sequential	Addition		Digression	Continuity
		Abstract anaphora		Elliptical	Quoting
		Closing boundary		List	Textual deixis
		Topic delivery		Opening boundary	Topic shift
Expressive	Rhetorical	Conclusion		Motivation	Opposition
		Reformulation		Relevance	
	Modal	Approximation		Mitigation	Uncertainty
		Attitude		Emotion	
		Comment		Emphasis	
Interactive	Interpersonal	Agreeing		Disagreeing	Monitoring
		Common-ground		Face-saving	
	Parsing	Self-adaptor		Planning	Punctuation
Other	Other			Other	

Voilà madame	*du point de vue hormonale*	*etcetera*
'So madame	from the point of view of your hormones	etcetera

vous êtes	*au stade trois*
you are	in stage three'

Fig. 2. Example of PALM-UP in conversational French data.

- The *expressive domain* applies to signs or gestures that work on the metadiscursive level of language (i.e., *rhetorical sub-domain*) or that are used to express the speaker's epistemic stance (i.e., *modal sub-domain*).
- The *interactive domain* is concerned with the management of the conversation. The functions in this domain contribute to either the cooperation between speakers during an exchange (i.e., *interpersonal sub-domain*) or to elaborating and holding their turn (i.e., *parsing sub-domain*).

\<PALM-UP\>	**\<PALM-UP\>**	[EXPLAIN]	\<END\>
PALM-UP	**PALM-UP**	EXPLAIN	END
'That's right.	Then	they explained the celebration.	That was it.

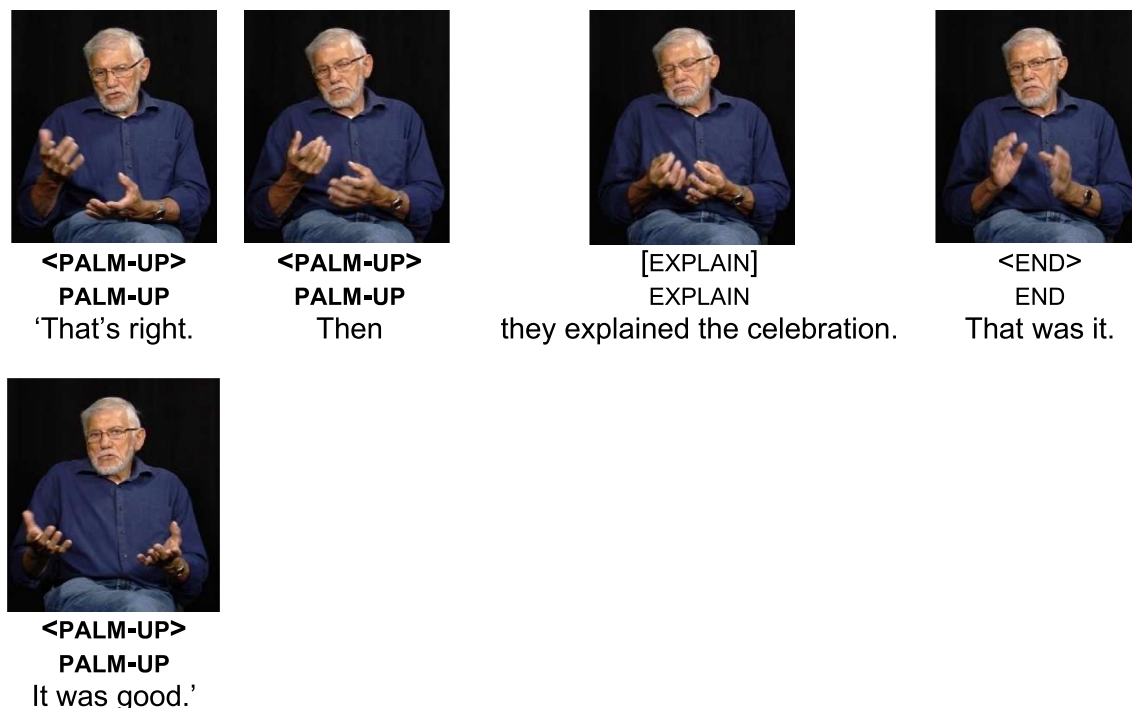
\<PALM-UP\>
PALM-UP
It was good.'

Fig. 3. Example of PALM-UP in conversational LSFB data.

The sub-domains comprise 44 *functions* (i.e., the specific roles of tokens in a given context) sharing some properties. These functions are the result of an overview of previous literature on gesture including Bavelas (1994) and Kendon (2004), among others. A final category of the protocol is "other", which is used when none of the previous values apply to a particular gesture.

For the reader's convenience, the following examples of conversational data (Bolly et al., 2015) illustrate how PALM-UP tokens are assigned a function, a sub-domain and a domain according to the protocol. In Fig. 2,[2] the speaker is telling her daughter what her doctor told her in a previous appointment. The first PALM-UP is used to introduce a *conclusion* after previous speech. That is, this token belongs to the *rhetorical sub-domain* and to the *expressive domain*. The second PALM-UP is used to *deliver a new topic* and the third one reinforces the general extender 'etcetera' (i.e., *elliptical function*). Despite the different functions, the second and third tokens both belong to the *sequential sub-domain* and to the *structuring domain*. The fourth PALM-UP is used to point to a referent in space (i.e., function of *abstract deixis*): the speaker is embodying the doctor pointing towards her. This function belongs to the *referential sub-domain* and to the *ideational domain*. Finally, the last PALM-UP is used to *punctuate* the end of the clause. This function belongs to the *parsing sub-domain* and to the *interactive domain*.

In Fig. 3,[3] two signers are discussing family celebrations. The signer of the example is unsure about the date of the Candlemas. His interlocutor says that it takes place on 2nd February. The signer of the example articulates the first PALM-UP to show *agreement*, which belongs to the *interpersonal sub-domain* of the *interactive domain*. Afterwards, he produces another PALM-UP meaning 'at that moment' (i.e., *temporal function*). This function belongs to the *connective*

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[2] Examples of French productions are written in italics. Translations in English are given below. When pictures are not provided, PALM-UP gestures are written below the word(s) with which they were uttered.

[3] As established by convention, signed language examples are written in small capital letters. The first line underneath the pictures contains the glosses for the right hand and the second line contains the glosses for the left hand. In the following examples, PT:PRO1 stands for the first person singular pronoun and PT:DET stands for a pointing sign used as a determiner. When more than one word is used in a gloss, such as in PALM-UP, a hyphen separates them. A dotted line is used to mark the perseveration of a form. For the reader's better understanding of LSFB glosses, square brackets are used to delimit clauses and angle brackets to delimit elements which are independent from the clause. Brackets are only written in the right hand's line because some signs articulated with the left hand spread over more than one clause. Translations in English are provided below.

sub-domain of the *ideational domain*. Finally, the signer produces the last PALM-UP to express that the Candlemas celebration was a good thing (i.e., function of *attitude*). This function is found within the *modal sub-domain* and, more broadly, within the *expressive domain*.

After having outlined previous research on PALM-UP and the framework of analysis, the following hypotheses are formulated:

1. Interpreters are expected to express a range of meanings using PALM-UP.
2. PALM-UP is to be used to express discourse-parsing functions in both languages and as a device to support speech when interpreting into French.
3. Interpersonal variation in the frequency of use of PALM-UP is expected.

The next section describes the methodology (including the data source, the participants and the annotation procedure) used in the present study.

4. METHOD

This study draws on data from four last-year students of the Master's degree in Sign Language Interpreting at UCLouvain, three women and one man aged 22–36, who participated in the CorMILS pilot corpus project (Gabarró-López, 2018). By the time of the recordings, participants had all completed almost two years of training, but had different backgrounds, which are presented in Table 2. Participants can be split into two groups: those who are very familiar with the interpreting task (I002 and I006) because they have practiced it for years, and those who have only practiced it as part of their studies (I001 and I003) but have had regular contact with the Deaf Community in French-speaking Belgium.

The four participants are French native speakers born in Belgium, where they have spent most of their lives. None were native signers (that is, no one was born into a family of deaf signers), and all learnt LSFB after the age of 18 at different moments. Three of the participants (I001, I002 and I006) have the UF12 diploma, which is the highest officially recognised non-university diploma that can be obtained for some spoken languages and for LSFB in French-speaking Belgium. Although I003 does not have this diploma, her LSFB level is equivalent to UF12 as it is the required LSFB level to follow the Master's programme.

All participants signed an authorisation written in French in which they agreed to be recorded and allowed their videos to be used for research purposes. They were given the opportunity to ask for clarifications (if needed) and were informed about the possibility of accessing, modifying or withdrawing their participation at any moment. Furthermore, participants also filled a metadata form in which they gave their personal, family, linguistic and educational background, and professional details. Because video data cannot be anonymised (i.e., faces cannot be blurred because they also convey linguistic information), all participants were given a code.

Participants sat in a chair and were shown the same four videos on a screen placed in front of them. Two of the videos were taken from the LSFB Corpus (Meurant, 2015) and the other two were taken from the FRAPé Corpus (Meurant et al., ongoing).[4] From each corpus, a conversation about a past memory and a conversation about cultural issues were selected. The goal of having the same two topics represented in both sets of source videos was to make sure that there would not be a lot of variation motivated by the topic of the dialogue from one language to another. Participants were told that they would watch the video twice. The first time they had to take a look at the content of the video and the second they had to interpret it into LSFB or French. Since neither signers nor speakers could be stopped if there was a problem in understanding the source productions, participants could ask the researcher who was present questions about signs or words in the videos after the first time they watched it. Participants asked questions about the signs for some small villages in Belgium mentioned in the French source conversations and about the proper names for name-signs which were mentioned by signers in the LSFB source conversations. One steady camera took a shot of each participant from the knees to just above their heads. One standing microphone was also used to capture speech in the interpretations from LSFB into French.

The analysed dataset resulting from the experiment contains one hour of LSFB target interpretations and 40 minutes of French target interpretations. The duration of the source conversations is presented in Table 3. These data were annotated using ELAN (Sloetjes and Wittenburg, 2008), which is the most widely used software for linguistic research on video data. Speech was only annotated in two of the files which contain interpretations into French. Manual activity

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[4] The LSFB Corpus is a monolingual reference corpus for the signed language used in French-speaking Belgium. It contains the dialogues produced by 50 pairs of signers, who were recorded at the University of Namur studio and conversed about a battery of topics provided by deaf moderators. The FRAPé Corpus is a comparable corpus which is being collected with data from French native speakers using the same studio setting and tasks (guided by hearing moderators).

Table 2
Professional and linguistic profiles of participants in the sample prior to entering the Master's programme.

Code	Professional profile	Linguistic profile			
		Started learning LSFB	Type of training	LSFB level	Contact with deaf people
I001	Professional experience as a speech pathologist (10 years)	2003	Social advancement courses[1]	UF12 diploma in 2014	Daily since 2006.
I002	Professional experience as a LSFB interpreter in the educational domain (6 years)	2008	Social advancement courses	UF12 diploma in 2014	Daily since 2011.
I003	Bachelor's degree in Translation and Interpreting (English and LSFB programme)	2014	Bachelor courses	Equivalent to UF12	Daily since 2015.
I006	Professional experience as a LSFB interpreter in the educational domain (5 years)	2011	Social advancement courses	UF12 diploma in 2014	Daily since 2013.

[1] Social advancement education is financed by the French Community of Belgium. Despite some non-official and non-funded options, most people who want to learn LSFB attend social advancement courses.

was not annotated (i.e., neither signs in LSFB nor gestures in French) because of the time investment required by these annotation tasks, only PALM-UP tokens (one-handed and two-handed forms) were annotated. Every token was closely examined in context, that is, taking into account surrounding signs and speech as well as other semiotic repertoires such as nonmanual behaviour (including facial expressions, eye gaze directions, head movements and body movements).

A common annotation template including eight tiers was created (see Fig. 4). Each tier was preceded by the code given to the interpreter. Four of these tiers were independent and were used to annotate PALM-UP gestures articulated by the right hand (RH), PALM-UP gestures articulated by the left hand (LH), whether the gesture was one-handed or two handed (Item) and comments about specific tokens such as potential variation in function (Comment). From the Item tier, a hierarchy of four dependent tiers (for the domain, sub-domain, function and PALM-UP source) was deployed. For the first three dependent tiers, a controlled vocabulary containing the values of Table 1 was created. For the fourth tier, a controlled vocabulary with two values – IG for "interpreter-generated" and SS for "speaker/signer-generated") – was used.

As for the annotation procedure, I first annotated all PALM-UP tokens. Second, I annotated the domain, sub-domain and function, and wrote comments (if necessary). I reviewed the annotations at least twice, and in some cases, three times. I started with the annotation of all videos containing French target data, and afterwards I did the same for the videos containing LSFB target data. The use of Bolly and Crible's (2015) protocol, instead of inductively assigning functions, significantly reduced potential subjectivity. Lepeut (2020) measured the inter-annotator agreement for the annotation of functions using this protocol and found it moderate (Cohen's kappa values range from 0.46 to 0.60), in line with other studies on the use of gesture in a signed language (Ferrara, 2020). Therefore, the protocol provides a robust framework because of its "detailed descriptions of the various functional categories, including paraphrases and thorough examples drawn from corpus data" (Lepeut, 2020: 98).

Assigning a function to PALM-UP tokens always relied on the context, the movement of the hands and the combination of nonmanuals that co-occurred with the gesture. These three features were particularly relevant for distinguishing between the functions of attitude, uncertainty and planning, which are the three most difficult functions to tease apart in LSFB (Lepeut, 2020). The movement of the hands apart, which may be observed when PALM-UP expresses attitude and uncertainty, does not occur when PALM-UP is articulated while planning takes place. Nonmanual marking also differs in that PALM-UP expressing attitude and uncertainty have more prominent nonmanual marking (including movements of the head and of the body) than PALM-UP tagged as planning. Furthermore, uncertainty differs from attitude in that the former involves movements of the cheeks (usually puffed cheeks) and shoulder shrugs. In addition to movement and nonmanual marking, context is key for determining which function applies. The context includes the surrounding manual activity in LSFB and speech in French. Thus, PALM-UP expressing attitude or uncertainty in French co-occurs with words or sentences related to these functions, whereas PALM-UP articulated while planning co-occurs with pause fillers, repairs, repetitions and word lengthening, or when no sound is uttered.

In contrast to previous studies that assigned two functions to some PALM-UP tokens (Gabarró-López, 2017, Lepeut, 2020), all PALM-UP tokens have been tagged with a single function. Unclear cases where closely inspected and were split

Table 3
Duration of the source conversations.

Topic of conversation	French	LSFB
Past memory	4′15″	4′53″
Cultural issues	9′50″	4′46″

into two different tokens. The separation was based on movement and change in nonmanual marking. As can be seen in Figs. 2 and 3, there is almost no difference between the PALM-UP gestures in the pictures. However, the gesture was segmented when there was a stroke (and also a change in nonmanual marking in Fig. 3). Following this procedure for the interpreted data allowed me to have different tokens with a single function in target French and LSFB data. Once all annotations were completed, they were extracted in Excel files in order to analyse them.

5. RESULTS

A total of 504 PALM-UP tokens were found in the dataset, 153 in French target productions (3.8 PALM-UP tokens/minute) and 351 in LSFB target productions (5.8 PALM-UP tokens/minute). In target French, 137 PALM-UP gestures are interpreter-generated (i.e., not expressed in the source text) and 16 – signer-generated (i.e., the PALM-UP gesture is a rendition of something that was said or expressed in the source text). By contrast, 133 PALM-UP gestures are interpreter-generated and 218 – speaker-generated in target LSFB.

5.1. Distribution of functions

Similarly to what was attested in French and LSFB conversations, in interpreted data PALM-UP is a polyfunctional gesture. The four domains appear in both languages. Despite the analysed data being monological, the interactive and the expressive domains are the most represented in both datasets. In target LSFB, the expressive domain corresponds to 47% of tokens (*n* = 165) and the interactive domain – to 36% (*n* = 126). In target French, the expressive domain takes up 26% of the total of tokens (*n* = 40), the structuring domain takes up 33% (*n* = 51), and the interactive domain – 38% (*n* = 58). The ideational domain is less represented in both languages (3% in target French, i.e., *n* = 4, and 6% in target LSFB, i.e., *n* = 22), and the structuring domain is also infrequent in LSFB (*n* = 14). In target LSFB, there are 24 cases which were not assigned a domain (see Table 4). They were labelled as "other" and are described in Section 5.2.6.

The rhetorical and modal sub-domains (which belong to the expressive domain) have a similar number of tokens in target French (18 and 22, respectively). However, there is a big difference between these two sub-domains in target LSFB. As for the interactive domain, the parsing sub-domain is more represented than the interpersonal sub-domain in the two languages. Parsing functions are concerned with elaborating one's discourse, either because the source speaker/signer elaborated their own discourse and the interpreter reproduced it, or because the interpreter elaborated her own discourse. However, interpersonal functions are almost exclusively used when the interpreter is reproducing a change of turn between the source speakers or signers, and they use a turn management word, sign or gesture expressing agreement or monitoring. Of the seven sub-domains, there are almost no tokens of the referential sub-domain (only one in target French). This is not surprising, as two of the three functions belonging to this sub-domain usually involve pointing (i.e., abstract and concrete deixis). In line with Cooperrider et al. (2018), both pointing signs and pointing gestures with a handshape that resembles PALM-UP (i.e., palm facing upwards and fingers together, but a movement is directed to the addressee or to another element) were excluded from the analysis, because they were considered "false friends". That is, they share the handshape with PALM-UP, but the directed movement towards another entity for reference purposes does not exist in the other PALM-UP tokens which were analysed. The third function of the referential sub-domain is called representational and applies to gestures used to metaphorically or iconically represent a referent (e.g., hands forming a circle to represent the earth), which is not the case of PALM-UP gestures either.

Twenty functions were identified in each dataset of target productions (see Table 5). Fourteen functions appeared in both datasets, while six additional functions were used exclusively in target French, and six in target LSFB. In target French, the function of planning (i.e., PALM-UP is articulated while planning upcoming discourse or while the interpreter is making a cognitive effort in editing a term) amounts to 28% (43 out of a total of 153 tokens). In target LSFB, the function of planning is the second most frequent one (83 tokens out of 351, i.e., 24%) after the function of uncertainty (88 tokens, i.e., 25%), which is used for those items that indicate the lack of certainty or the lack of knowledge on the part of the speaker/signer about the propositional content conveyed.

In French target productions, only 10% (*n* = 16) of PALM-UP gestures are a copy of the manual activity of the source signer. The functions expressed by these tokens, and distributed in decreasing order, are the following: planning (*n* = 9),
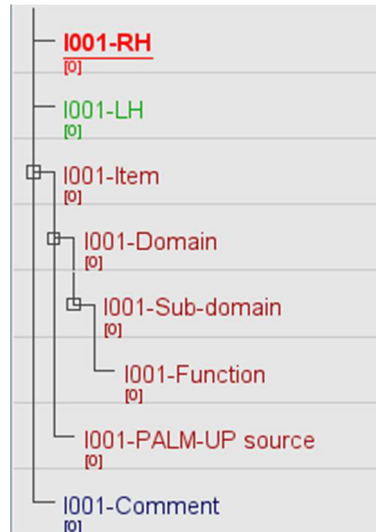
Fig. 4. Tier hierarchy in the annotation template.

Table 4
Distribution of domains and sub-domains expressed by PALM-UP per language.

Domain	Sub-domains	Target French	Target LSFB
Ideational	Connective	3 (2%)	22 (6%)
	Referential	1 (1%)	0 (0%)
Structuring	Sequential	51 (33%)	14 (4%)
Expressive	Rhetorical	18 (12%)	12 (3%)
	Modal	22 (14%)	153 (44%)
Interactive	Interpersonal	3 (2%)	7 (2%)
	Parsing	55 (36%)	119 (34%)
Other	Other	0 (0%)	24 (7%)
		153 (100%)	351 (100%)

punctuation (*n* = 3), opening boundary (*n* = 3) and specification (*n* = 1). These four functions can also be interpreter-generated in the French target dataset, this is why the numbers for each function do not match those of Table 5. The opposite trend can be observed in LSFB target productions, that is, most PALM-UP gestures (*n* = 218, i.e., 62%) are ascribed to the source speaker. The functions expressed by these PALM-UP gestures are either exclusively source speaker-generated (* in Table 5) or both interpreter- and source speaker-generated (^ in Table 5). In the latter case, the functions of source speaker-generated PALM-UP gestures include, in decreasing order, planning (*n* = 21), concession (*n* = 9), punctuation (*n* = 6), consequence (*n* = 5), opening boundary (*n* = 5), monitoring (*n* = 5), opposition (*n* = 4), closing boundary (*n* = 3), specification (*n* = 2) and mitigation (*n* = 2).

5.2. Description of functions

The three most frequent shared functions in both datasets – planning, punctuation and attitude – are presented in the following three sub-sections (from Sections 5.2.1–5.2.3), including differences and similarities between both languages. The last three sub-sections (from Sections 5.2.4–5.2.6) are devoted to occurrences which were (almost) exclusively found in French or in LSFB target data, namely topic delivery, uncertainty and "other".

Table 5
Distribution of functions expressed by PALM-UP per language.[1]

Domains	Sub-domains	Functions	Target French	Target LSFB
Ideational	Connective	Alternative	1 (1%)	0 (0%)
		Cause	0 (0%)	1 (0%)^
		Concession	0 (0%)	10 (3%)*
		Consequence	1 (1%)	6 (2%)*
		Contrast	1 (1%)	3 (1%)^
		Temporal	0 (0%)	2 (1%)
	Referential	Abstract deixis	1 (1%)	0 (0%)
Structuring	Sequential	Abstract anaphora	7 (5%)	0 (0%)
		Closing boundary	1 (1%)	7 (2%)*
		Opening boundary	5 (3%)*	7 (2%)*
		Textual deixis	1 (1%)	0 (0%)
		Topic delivery	37 (24%)	0 (0%)
Expressive	Rhetorical	Conclusion	6 (4%)	1 (0%)^
		Opposition	1 (1%)	5 (1%)*
		Reformulation	2 (1%)	2 (1%)^
		Specification	9 (6%)*	3 (1%)*
	Modal	Attitude	12 (8%)	51 (14%)^
		Emotion	0 (0%)	7 (2%)^
		Emphasis	9 (6%)	3 (1%)^
		Mitigation	0 (0%)	5 (1%)*
		Uncertainty	1 (1%)	88 (25%)^
Interactive	Interpersonal	Agreement	2 (1%)	0 (0%)
		Monitoring	1 (1%)	7 (2%)*
	Parsing	Planning	43 (28%)*	83 (24%)*
		Punctuation	12 (8%)*	36 (10%)*
Other	Other	Other	0 (0%)	24 (7%)
			153 (100%)	351 (100%)

[1] The asterisks signal the number of functions which combine interpreter- and speaker/signer-generated PALM-UP gestures. The numbers followed by a circumflex accent relate to the functions of PALM-UP that were exclusively speaker/signer-generated, whereas the stand-alone numbers relate to the functions of PALM-UP which were exclusively interpreter-generated.

5.2.1. Planning

The function of planning, defined above, is exemplified in Fig. 5 with one excerpt of a LSFB target production. I002 is interpreting how one of the speakers used to spend her birthday parties. I002 articulates three PALM-UP tokens (the first two are speaker-generated and the last one is interpreter-generated). The first and the third are used as fillers while planning what signs I002 is going to produce, whereas the second PALM-UP is used as a punctuator, i.e., marking the end of a discourse segment.

In the dataset of French target productions, the function of planning has some nuances not found in LSFB target productions. Similar to Fig. 5, interpreters may use PALM-UP as a filler when planning upcoming speech, and no word or sound is uttered in the meantime. In example (1),[5] I006 is interpreting how one of the deaf signers felt the first time she went camping with the Scouts. Despite being supported by a friend, the signer cried because she wanted to see her parents. After an enumeration stating what her friend did for her (which is preceded by a silent pause), I006 produces the pause filler *euh*, then makes another silent pause and continues his speech. This second silent pause is partially filled with an interpreter-generated PALM-UP.

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[5] (sp) is used to signal silent pauses within the excerpt. In the following examples, the words which are partly in parenthesis indicate that only the part outside the parenthesis was uttered while PALM-UP was being articulated.

(1)   *malgré euh* (sp) *la protection de mon ami son entourage sa bienveillance euh*   (sp)
       'despite erm (sp) my friend's protection her closeness her kindness erm'   (sp)
                                                                                               PALM-UP

       j'ai pleuré tous les jours
       I cried everyday'

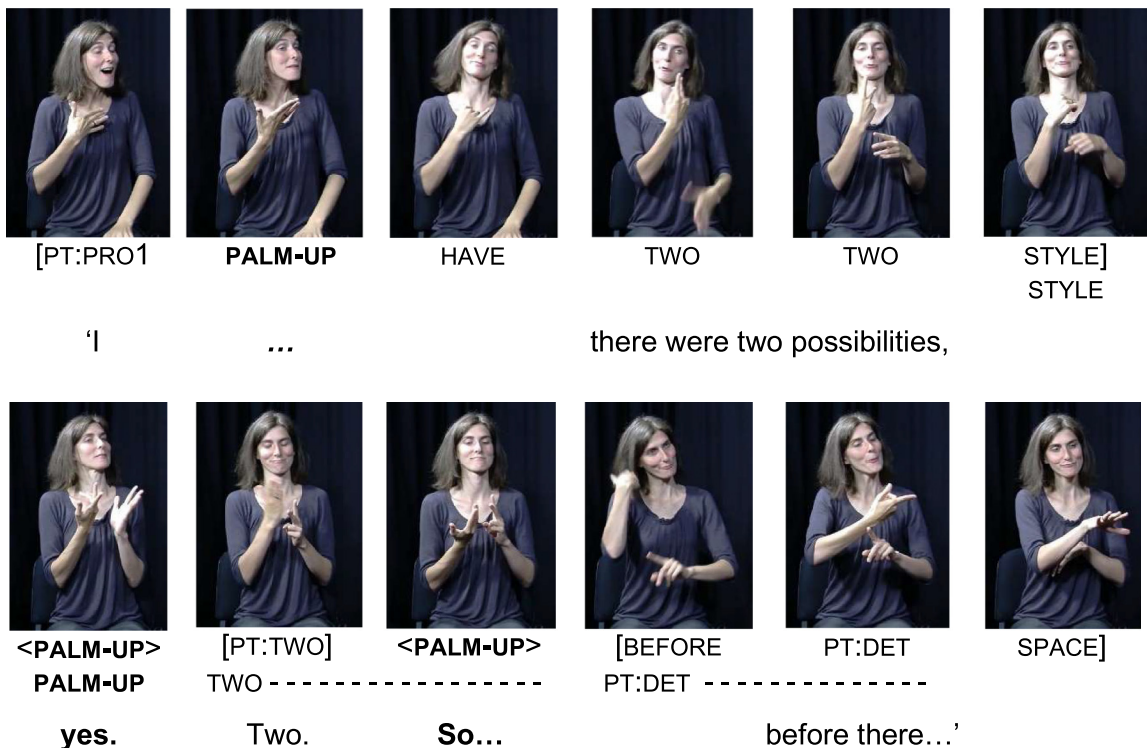   I006-003-TR FR, 01:06–01:13

PALM-UP is also used while a pause filler is being uttered, as in example (2). This excerpt is also related to the memory about camping with the Scouts. The signer thinks that the reason why she felt so poorly while camping is that nobody (neither her friends nor the guides) was deaf and she could not communicate in LSFB. When interpreting this excerpt, I003 utters the pause filler *euh* while she produces an interpreter-generated PALM-UP which continues until the beginning of the next word being uttered.

(2)   *je pense que c'est pour ça je me sens mieux*   *euh a(vec)*   *les sourds*
           'I think that this is the reason why I feel better   erm w(ith)   deaf people
                                                                PALM-UP

           dans ma langue
           communicating in my language'

                                                                              I003-003-TR FR, 01:37–01:40

There are other instances in which PALM-UP is used to support a cognitive effort in editing a term including repairs, repetitions and cases of word lengthening. The excerpt in example (3) comes after a school memory of one of the signers. She remembers when she went outdoors with other deaf children and their teacher. For her, it was a nice experi-

[PT:PRO1	**PALM-UP**	HAVE	TWO	TWO	STYLE]
					STYLE

'I   *…*   there were two possibilities,

<PALM-UP>	[PT:TWO]	<PALM-UP>	[BEFORE	PT:DET	SPACE]
PALM-UP	TWO - - - - - - - - - - - - - -		PT:DET - - - - - - - - - - - - -		

yes.   Two.   **So…**   before there…'

                                                                  I002-003-TR LSFB, 01:04 - 01:10

Fig. 5. Example of PALM-UP gestures expressing planning and punctuation in target LSFB.

ence and she will not forget it. When I001 interprets this last part, she uses the relative pronoun *que* (which is incorrect in this context) and afterwards produces a repair by uttering *qui* (which is the correct relative pronoun to be employed in this context). An interpreter-generated PALM-UP is used while this repair takes place.

(3)   et c'est vrai que c'est quelque chose que   qui   me restera gravé
        'and it's true that this is something that   which   will stick in my mind'
                                                            PALM-UP

                                                            I001-003-TR FR, 04:40–04:44

Example (4) illustrates the use of an interpreter-generated PALM-UP while a repetition is being made. The repetitions supported by PALM-UP in the dataset only involve one or two words as shown in the example, not larger chunks of discourse. Although repetitions may have stylistic effects, the cases referred to are always produced because an additional cognitive effort is being made.

(4)   *aujourd'hui euh*   *je m*   *je m'interroge encore euh sur le pourquoi*
        'today erm   I   I still wonder erm why I felt that way'
                            PALM-UP

                            I006-003-TR FR, 01:17–01:21

Example (5) contains a case of word lengthening, which is the last nuance identified for the function of filler while planning in French target productions. This example is also related to the camping experience with the Scouts in which the signer felt bad because communication was exclusively in spoken French. During the interpretation, I001 lengthens a reflexive pronoun while an interpreter-generated PALM-UP is produced.

(5)   *j'avais euh j'étais dans le français oral ce qui ce qui*   *mmme*
        'I had erm I was using spoken French which which didn't make   mmme
                                                                              PALM-UP

        provoquait un mal-être
        feel comfortable'

   I001-003-TR FR, 01:38–01:44

When PALM-UP is used as a filler while planning or while cognitive effort is heightened, the one-handed or two-handed forms are usually articulated in front of the interpreter in the LSFB and French target productions. The gesture has no motion in target LSFB, whereas an up-and-down movement can be observed in target French when there is a repair, a repetition or a word lengthening. Interestingly, this pattern was also observed for English to European Portuguese interpreting, as interpreters accompanied each repair with a PALM-UP stroke (Galvão, 2020).

5.2.2. Punctuation

Another function found in both datasets is punctuation (it is the third most frequent function in French target productions and the fourth in LSFB target productions, see Table 5). This function is defined as separating, articulating and/or stressing the beginning or ending of discourse units (without any information-structuring nor modal function). In Fig. 5, a case of punctuation was illustrated with an excerpt of a LSFB target production. The second PALM-UP token separates the first and the second clause.

In Fig. 6, the same function is exemplified in target French. The excerpt contains two tokens of PALM-UP. The first is interpreter-generated and used for topic delivery, and the second is signer-generated and expresses punctuation. I001 is interpreting how difficult one of the signers thinks communicating with hearing people is. The two PALM-UP tokens are articulated consecutively and, when paying attention to the prosody of the clause, the second one could be understood as a (gestural) full stop. The phase of preparation to articulate the first PALM-UP occurs in the middle of the word *confronte* and the stroke comes in the middle of the word *obstacles*. Afterwards, there is a movement of retraction and preparation of the second PALM-UP. Retraction occurs at the end of *obstacles* and preparation at the beginning of the word *fréquemment*. The stroke comes at the end of this word. PALM-UP is held during the silent pause which follows *fréquemment* and during the monosyllabic word which follows, i.e., *et* (meaning 'and').

lorsque je suis avec des entendants je je me con(fronte)
'when I'm with hearing people I I'm fac(ing)
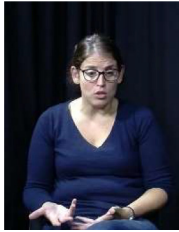
(con)fronte à des obsta(cles)   *(obsta)cles fréquemment*
(fac)ing obsta(cles)   (obsta)cles constantly'

I001-004-TR FR, 00:57 - 01:02

Fig. 6. Example of PALM-UP expressing topic delivery and punctuation in target French.

When PALM-UP expressed punctuation, it was articulated in both languages with a one handed or a two-handed form either in the space in front of the interpreter or with a movement of the hands apart. In LSFB target discourse, punctuating PALM-UP tokens were articulated with a head or body movement as it has been reported for LSFB non-interpreted data (Gabarró-López, 2017). In target French discourse, the same nonmanuals can be observed in some cases. Punctuating PALM-UP tokens are articulated when there is a falling pitch or a short pause. The gesture can also accompany punctuating markers such as *bon* ('well'), *voilà* ('that's it'), *en fait* ('in fact') or *ok*.

5.2.3. Attitude

The function of attitude is one of the most frequent in both datasets. It is defined as the expression of a subjective attitude from the speaker, including evidentials, epistemic or cognitive stance or positioning (Bolly and Crible, 2015). In example (6), an excerpt extracted from a LSFB target production about Belgian culture is presented. The two speakers are talking about the languages they learnt at school, and one of them expresses her stance (regret) about not knowing Dutch. I002 interprets the speaker's stance by articulating the last PALM-UP of example (6), which is speaker-generated. The gesture is produced with a body tilt, the head is moved backwards, eyes are closed and lips are tensed mirroring the speaker's feeling. The second PALM-UP is interpreter-generated. It was annotated as "other" (see Section 5.2.6) as it did not fulfil any function of the protocol.

(6)   [NOW   PT:PRO1   PERSPECTIVE   **PALM-UP**

         NOW - - - - - - - - -- - - - - - - - -   **PALM-UP**

         'Now that I step back,   I regret

         PITY   PT:PRO1   NO   KNOW]

         PITY - - - - - - - - - - - - - - - -   **PALM-UP - - - - - - - - - - - - - - - - - -**

         not knowing Dutch.'

I002-004-TR LSFB, 02:49–02:54

In example (7), the same function is illustrated with an excerpt extracted from a French target production. The signer acknowledges that integration with hearing people is not something easy. When I006 interprets this excerpt, he produces a speaker-generated PALM-UP while he utters the word *effectivement* – which expresses that the signer's positioning is the same as the other signer's positioning – and holds it during the following word.

(7)   *et par rapport à ce que tu dis*   *effectivement l'intégration*   *avec les*
           'and concerning what you said   indeed integration   with
                                                  PALM-UP

           entendants est difficile
           hearing people is difficult'

                                                                              I006-004-TR FR, 01:04–01:08

The articulation of PALM-UP expressing attitude in both languages of the dataset included one-handed and two-handed forms which were articulated in front of the interpreter or with a movement of the hands apart. Similarly to the function of punctuation, the meaning of attitude was conveyed prominently with nonmanual marking in LSFB. Although some expressions and body movements can be observed when some interpreters interpret into French, the content of speech and prosody are the most prominent aspects to assign the function of attitude in this modality.

5.2.4. Topic delivery

The function of topic delivery is defined as presenting a topic as new or salient for the interlocutor (Bolly and Crible, 2015). Topic delivery is the second most frequent function of PALM-UP in French target productions, and it was not found in LSFB target productions. Similar results were found in French non-interpreted dialogues by Lepeut (2020), who claimed that French speakers rely on speech to convey information and on the hands to mark that this information is new or salient, the two layers making communication "doubly efficient" (Shaw, 2019).

The function of topic delivery was exemplified in Fig. 6. Two PALM-UP tokens were articulated, and the first one was used for this purpose. In line with Kendon's (2004) *palm presentation gestures*, it was a one-handed form extended in front of the interpreter which presents the topic of discourse, i.e., the obstacles faced by a deaf person. From the functions described in this paper, it is the only one with which this specific motion is observed. The function of delivery frequently appears after disfluent discourse, as if the interpreter was presenting the right word after a repetition or a repair, as in example (8). I002 is interpreting a piece of a dialogue in which signers discuss how important communication is for deaf children. I002 produces a one-handed interpreter-generated PALM-UP after the repetition of the definite article *la* (meaning 'the').

(8)   *Oui c'est vrai la la*   *la communication*   *en fait n'y est pas*
           'Yes, that's right. The the   the communication   in fact is not there.'
                                              PALM-UP

                                                                              I002-004-TR FR, 02:34–02:37

5.2.5. Uncertainty

The function of uncertainty was underrepresented in target French with only one case, but it is the most frequent one in target LSFB. The excerpt in example (9) is also extracted from one of the interpreted renditions about Belgian culture. This time, speakers are talking about political issues. One of them says that she does not know much about this topic. I003 expresses the speaker's lack of knowledge by articulating two speaker-generated PALM-UP tokens. The first is articulated with puffed cheeks and the second one with a shoulder shrug, similarly to what has been reported for LSFB conversational data (Gabarró-López, 2017).

(9)   [TOPIC   POLITICS   PT:PRO1   **PALM-UP**]
      TOPIC - - - - - - - - - - - - - - - -- - - -   **PALM-UP**
      'Concerning political issues,   I don't know.
      [A-LITTLE   UNDERSTAND-NOTHING]   [PT:PRO1   **PALM-UP**]
                       UNDERSTAND-NOTHING   **PALM-UP**
      This topic escapes me a little bit.   I don't know.'

                                                                              I003-004-TR LSFB, 03:51–03:58

[ADVANCE]
ADVANCE
'We continued.

[LEARN   OH-REALLY   PT:DET   HAVE   DISPUTE]
PALM-UP -   DISPUTE
Then, I learnt that there were tensions between Flanders and Wallonia.'

I002-004-TR LSFB, 00:56 - 01:01

Fig. 7. Example of PALM-UP annotated as "other" in target LSFB.

PALM-UP gestures expressing uncertainty in LSFB target discourse can be articulated with a movement of the hands apart or keeping them in front of the interpreter. Nonmanual marking seems to be more prominent than motion when assigning the function of uncertainty. Puffed cheeks and shoulder shrugs are also produced with PALM-UP when it expresses uncertainty in conversational data from other signed languages, such as NZSL (McKee and Wallingford, 2011) and NGT (van Loon, 2012). Hence, the use of these nonmanuals is a typological similarity in the expression of uncertainty across signed languages.

5.2.6. Other

There were 24 cases in LSFB target productions (out of 351) which did not fall into the list of functions. They were labelled as "other". Most of these tokens (22 in total) were articulated by the interpreters' non-dominant hand while the dominant hand was producing other one-handed signs. This is an affordance of the language modality, which has two main articulators (i.e., the hands), one of which can produce one-handed tokens while the other articulates another/other token/s or is in rest position. These interpreter-generated cases do not fit any category of the protocol because they do not fulfil a discourse function *per se*. Fig. 7 depicts an example in which the interpreter is interpreting a part of the conversation about Belgian culture from French into LSFB. After articulating the sign ADVANCE, which includes a circular movement alternating both hands, she holds a PALM-UP in her left hand. Simultaneously, she articulates four one-handed signs with her right hand. The PALM-UP gesture disappears when the interpreter articulates the two-handed sign DISPUTE.

In this example and in the other cases, PALM-UP is held for the interpreters' convenience (while the other hand articulates from one to four signs), as it would take a longer time and effort to put the hand down. The gesture does not add any meaning to discourse in the studied productions, it is a purely phonetic phenomenon. Similarly, existing studies on PALM-UP produced by deaf signers in ASL (Conlin et al., 2003) and in NGT (van Loon, 2012) mention the existence of PALM-UP tokens which are the result of perseveration, that is, after the articulation of this gesture, the handshape is maintained on one hand to be used again later. Conlin and colleagues, as well as van Loon, do not assign any specific function to these tokens and see them as a phonetic phenomenon which is an affordance of the modality.
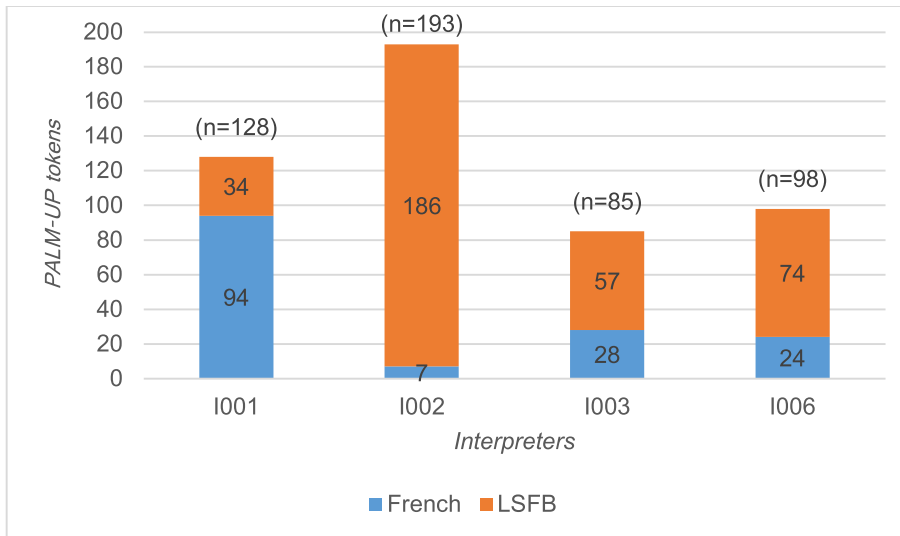
Fig. 8. Number of ᴘᴀʟᴍ-ᴜᴘ tokens per interpreter.

Finally, there are three cases (one with a one-handed form and the other two with a two-handed form) in which ᴘᴀʟᴍ-ᴜᴘ was used as a frame to mouth the words *c'est*, 'it is'. The LSFB lexicon has one sign that is glossed as such and conveys this meaning (it is one-handed and is articulated with an open flat hand placed on the chest).[6] ᴘᴀʟᴍ-ᴜᴘ does not serve any specific discourse function in these cases either. Once again, it is easier for interpreters to maintain hands up as a transition between signs while they utter this word than putting hands down. Similarly to the cases of perseveration, existing literature on ᴘᴀʟᴍ-ᴜᴘ in NZSL (McKee and Wallingford, 2011) and in NGT (van Loon, 2012) describes these type of occurrences as "frame for mouthings" which are used by deaf signers belonging to different age groups. These cases are assigned a function based on the function of the mouthing, so the three ᴘᴀʟᴍ-ᴜᴘ tokens in question would have a syntactic function in target LSFB.

5.3. Variation across participants

The four participants used ᴘᴀʟᴍ-ᴜᴘ repeatedly when interpreting into both modalities. However, we can observe some variation in the overall frequency of use of this gesture among participants and variation between the two target languages (see Fig. 8). I001 and I002 present the two most different patterns of use in the dataset. Both articulated an overall higher number of ᴘᴀʟᴍ-ᴜᴘ tokens as compared to I003 and I006. While I001 produced the highest number of ᴘᴀʟᴍ-ᴜᴘ tokens in French target discourse, I002 did so for LSFB target discourse. The difference in the number of tokens from one modality to the other produced by I002 is also striking: she produced 186 ᴘᴀʟᴍ-ᴜᴘ gestures in target LSFB and only 7 in target French. Such a frequent use of this gesture when interpreting into LSFB may be a mannerism of her signing style, while the low number of ᴘᴀʟᴍ-ᴜᴘ gestures when interpreting into spoken French is the result of self-controlling her gestures. She spent most of the time of the recordings with her hands between her legs. When the recording was over and she was asked for her insights about the session, she said that she always tried to control her amount of gesturing when interpreting into the spoken modality in order to direct the attention towards the signer and avoid distracting the audience.

Despite the differences across interpreters, I002 and I006 (the two participants with previous experience in the field of signed language interpreting) produced a higher number of ᴘᴀʟᴍ-ᴜᴘ tokens when interpreting into LSFB than I001 and I003. I hypothesize that this higher frequency may be a strategy to make LSFB target productions more "deaf-like". LSFB signers employ ᴘᴀʟᴍ-ᴜᴘ for different purposes and very frequently in their conversations (Gabarró-López, 2017). In fact, this is the fifth most frequent gloss in the LSFB Corpus (Meurant, 2015). On the other hand, the reason why I001 (one of the non-experienced interpreters) used many more ᴘᴀʟᴍ-ᴜᴘ tokens in French target discourse than her colleagues may be to support her speech when difficulties for understanding the source LSFB discourse arose and

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[6] http://www.lsfb.be/dicto/page/fichier/video/va/ss/c_est_1.mp4.

when cognitive effort was being heightened (Cook and Fenn, 2017; Galvão, 2009, 2020; Goldin-Meadow et al., 2001), as exemplified in (3) and (5). These hypotheses remain to be confirmed and no clear-cut difference in the use of PALM-UP can be observed between experienced and non-experienced interpreters in the dataset, as I003 and I006 present quite similar results (χ^2 (df = 3, n = 504) = 179.456, p <.001).

In a nutshell, the use of PALM-UP is not only highly idiosyncratic in (semi-)spontaneous discourse produced by speakers and signers but also in interpreted discourse – which is constrained by cognitive load (among other factors) – produced by bimodal interpreters. This is interesting because all interpreters of the dataset worked with the same source discourses, and gesture is closely tied to speech. Furthermore, we saw that the use of PALM-UP by the same interpreter varies depending on the modality. To the best of my knowledge, this type of intra-personal research on the use of PALM-UP has not been done before.

6. DISCUSSION

The three hypotheses presented at the beginning of the paper were supported by the analyses carried out in this study. The first hypothesis was that the gesture would be as polyfunctional in interpreted data as it had been said to be in conversations between French speakers and LSFB signers. The 153 PALM-UP tokens found in French target productions expressed 20 functions (out of a total of 44 in the protocol), and the 351 PALM-UP tokens identified in LSFB target productions also expressed 20 functions. Second, I hypothesised that the most frequent type of functions would be discourse-parsing and, particularly, the function of planning (i.e., PALM-UP is used as a filler while preparing upcoming speech or while making a cognitive effort to edit a term). Indeed, this function was the most frequent in target French (43 PALM-UP tokens out of a total of 153) and the second most frequent function in target LSFB (83 tokens out of 351) after the function of uncertainty (88 tokens). Third, the hypothesis about intra- and inter-interpreter variation was also supported. The total number of PALM-UP tokens varied across interpreters, and the distribution of tokens in the two languages was also different across participants.

As for the most frequent functions of PALM-UP in the datasets of French and LSFB target productions, it should be noted that planning and punctuation differ from attitude and uncertainty in that the latter two are only ascribed to the source text speaker/signer. That is, interpreters are not expressing their stance or experiencing uncertainty as to what the message is or how it should be framed in the target production. Conversely, planning and punctuation can be ascribed to the source text speaker/signer or to the interpreter. This is exemplified in (10), which contains the transcription of an excerpt of a source text speaker (in italics, first line, left alignment) and how it was interpreted into LSFB by I002.[7] The interpreter's rendition (in small capitals) can be found in the second and third line. The second line (left alignment) illustrates the text which is ascribed to the speaker and the third line (right alignment) illustrates the text which is ascribed to the interpreter.

(10) ***Il y a il y a** plutôt deux types*
      [PT:PRO1 **PALM-UP** HAVE TWO TWO STYLE] < **PALM-UP**>

                                                        [ONE TWO] < **PALM-UP**>

      'There are. . . there are sort of two types.'

                                                        I002-003-TR LSFB, 01:04–01:13

The first and second PALM-UP tokens represent the source speaker's intended meaning. I002 produces the first PALM-UP when the speaker is making a cognitive effort repeating three words (i.e., function of planning), and the second one when the speaker ends the first sentence (i.e., function of punctuation). The third PALM-UP is ascribed to the interpreter. She repeats that there are two types of celebration and produces a PALM-UP while she is thinking how to phrase what the speaker says (i.e., function of planning).

Interestingly, the eye gaze direction co-occurring with these three PALM-UP tokens changes in connection to whom the meaning is ascribed to. That is, the eye gaze is directed to the camera (i.e., the audience in the recordings) during the first and second PALM-UP tokens, whereas the eye gaze is directed to the floor during the third PALM-UP (see Fig. 5). This finding contrasts with PALM-UP tokens used by deaf LSFB signers to hold the floor while preparing upcoming discourse. In this case, PALM-UP tokens are always accompanied by a floating eye gaze (i.e., not directed to the addressee) (Gabarró-

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[7] The rendition of I002 is an excerpt of the example in Fig. 5. The time code at the end of the example refers to the interpreter's rendition.

López, 2017). This difference in eye gaze direction calls for further research about nonmanual marking in signed language interpreting.

Moreover, the function of planning uncovers some differences across French and LSFB target productions (see Section 5.2.1). When interpreting into spoken French, PALM-UP was used as a filler while planning upcoming speech while no sounds were uttered. It was also used when spoken pause fillers, repairs and repetitions were produced, and when a word was being lengthened. However, when interpreting into LSFB, PALM-UP was only used as a filler while planning upcoming speech. If a signer wants to utter another pause filler, they may raise their hands and wiggle their fingers (which in LSFB is the equivalent of the French *euh*). Repairs and repetitions are expressed articulating again the signs which are being repaired or repeated, and sign lengthening requires to hold a sign for a longer duration.

Despite the different main channels of expression, namely speech in French and the hands in LSFB, articulators act in tandem in both modalities. In French target discourse, speech expresses a message while gesture, be it manual or nonmanual, supplements it. In LSFB signers also use different layers of information at the same time. For instance, the manual channel acts in tandem with the nonmanual channel. Similarly, the two hands also supplemented each other when the non-dominant hand had a PALM-UP and the dominant hand continued signing.

Interpreting requires an important cognitive workload and strategies allowing interpreters to save time while producing their discourse can be very useful, especially in dense interactions such as the videos presented to elicit the data. Shortening the transition between one-handed and two-handed signs by holding PALM-UP can be seen as a phonetic strategy that allows interpreters to gain some milliseconds in their productions. It may also be economical in terms of effort, as they avoid the costly movement of proximal articulators such as the shoulders. Similarly, other phonetic strategies, such as articulating a one-handed form as a two-handed sign or a two-handed form as a one-handed sign, have also been described in the literature about LSQ (Quebec Sign Language) interpreting as a means of avoiding the physical overload of sign language articulators (Villeneuve and Parisot, 2007).

In non-interpreted LSFB discourse produced by deaf signers, cases of perseveration of PALM-UP in the non-dominant hand have been reported. That is, after the articulation of a two-handed PALM-UP, the handshape can be kept in one hand while the other hand continues producing one-handed signs (Gabarró-López, 2017). However, there is no study yet on whether deaf LSFB signers use PALM-UP to keep the non-dominant hand active without producing the gesture before, as in Fig. 7. This type of research would cast light on whether this is only an interpreting strategy or if it is a feature of LSFB used in interpreting.

7. CONCLUSIONS AND FURTHER RESEARCH

This paper investigated the use of PALM-UP in bidirectional bimodal interpreting including the French – LSFB (French Belgian Sign Language) pair of languages. The study aimed to examine the functions of PALM-UP in target productions of both languages, to compare the most frequent functions from a cross-linguistic perspective, to observe whether PALM-UP tokens were interpreter- or speaker/signer-generated, and to describe variation across interpreters. For this purpose, a dataset of one hour and 40 minutes was analysed including interpreted data of four semi-spontaneous dialogues, two between a pair of deaf LSFB signers and another two between a pair of hearing French speakers (Belgian variety). These exchanges were interpreted by four final-year students from the Master's degree in Sign Language Interpreting at the UCLouvain (Belgium). All PALM-UP tokens were identified and annotated using a protocol for the annotation of pragmatic gestures (Bolly and Crible, 2015).

The use of this protocol captured the polyfunctionality of PALM-UP in bidirectional bimodal interpreting. The protocol is a good tool to describe pragmatic gestures, but it may fail to describe other gestures which do not (always) belong to the discourse level. This was the case when PALM-UP was used to shorten the transition between signs (phonetic function) or as a frame for mouthing the pronoun and verb *c'est*, meaning 'it is' (syntactic function). When examining the variety of discourse functions that can be expressed by PALM-UP in both languages, one can see that there are some functions which are more stable than others in terms of frequency and distribution across interpreters. The most frequent function, i.e., using PALM-UP as a filler while planning, is involved in the management of cognitive load. All interpreters used PALM-UP for this purpose, which suggests that the use of the gesture is tied to cognitive load processing. However, the use of other frequent functions (e.g., attitude and uncertainty in LSFB) are the result of linguistic competence. That is, interpreters, as L2 signers, have learnt the use of these functions from LSFB signers. As for more idiosyncratic uses, further research is required as LSFB signers do also produce idiosyncratic uses of the gesture (Gabarró-López, 2019).

The fine-grained description of PALM-UP supports the idea that spoken languages are not unimodal and sequential as they make use of multiple modalities and are semiotically diverse (Kendon, 2014). Furthermore, this study has also shown that PALM-UP can be used when interpreting into LSFB to shorten transitions between signs. This strategy, together with other strategies such as the lowering of some signs (Hanquet, 2019), seem to be useful for LSFB interpreters in different settings to gain time when interpreting from the spoken to the signed modality. Although the cognitive

effort is always present, uttering words seems to be more "economical" than producing signs in terms of physical effort, so interpreters compensate for this difference, possibly in an unconscious way.

To the best of my knowledge, this paper is the first attempt to describe PALM-UP in interpreted spoken and signed data. Because the study focused on the canonical form of PALM-UP, cases of the gesture used for pointing or "reduced" forms (e.g., "Gun Handshape Palm Up", Shaw, 2019) were excluded. This decision prevented "false friends" from being included in the analysis but may have limited the spectrum of functions of PALM-UP. Future avenues for research include studying other semiotic resources which are used alongside PALM-UP to achieve its functions. Another avenue for research is annotating all signs and gestures produced in the dataset, so that a quantitative analysis of the frequency of PALM-UP as compared to the total of signs or gestures can be carried out, or a quantitative analysis of the overall frequency of the gesture across the two modalities.

This research project on PALM-UP, and more broadly the comparative study of gesture and signs, "has potential implications for interpreter education, which should foster informed critical reflection on all communicative modalities" (Galvão, 2020: 174). So far, gesture has been seen as something that interpreters need to avoid in most (Western) cultures. Traditionally, this is also the message that interpreter trainers have transferred to trainees. However, gesturing is something that comes up naturally to human beings. If interpreters try to avoid gesturing, their cognitive load may therefore be heavier. The uses of PALM-UP in the two languages cannot be explicitly taught in interpreting courses as they occur naturally, but the uses of the gesture could be presented to students so that they are aware of "how gestures can help them", e.g., shortening the transition between signs (Galvão, 2020: 174).

In conclusion, more research drawing on interpreted multimodal data is necessary to foster our knowledge on the role of gesture in interpreting across different modalities, as it remains an underexplored issue to date. This knowledge will not only shed light on the properties of spoken and signed languages, but it will allow future and professional bimodal interpreters to increase metalinguistic self-awareness on their daily practice.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Sílvia Gabarró-López: Writing – review & editing, Writing – original draft, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Data availability

The data that has been used is confidential.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Amundsen, G., Halvorsen, R.P., 2011. Sign or gesture? Two discourse markers in Norwegian Sign Language (NSL). *33rd Annual Conference of the German Linguistic Society (DGfS)*. Göttingen.

Bavelas, J.B., 1994. Gestures as part of speech: Methodological implications. Res. Lang. Soc. Interact. 27 (3), 201–221.

Bolly, C., Crible, L., 2015. From context to functions and back again: disambiguating pragmatic uses of discourse markers. 14th International Pragmatics Conference (IPrA), Panel 'Anchoring Utterances in Co(n)Text, Argumentation, Common Ground'. Antwerp.

Bolly, C., Gabarró-López, S., Meurant, L., 2015. Pragmatic gestures at the gesture-sign interface. Nonmanuals and palm-up gestures among older Belgian French speakers and French Belgian Sign Language signers. *Workshop on Nonmanuals at the Gesture Sign Interface (NaGSI)*. Göttingen.

Conlin, F., Hagstrom, P., Neidle, C., 2003. A particle of indefiniteness in American Sign Language. Ling. Discov. 2 (1), 1–21.

Cook, S.W., Fenn, K.M., 2017. The function of gesture in learning and memory. In: Church, R.B., Alibali, M.W., Kelly, S.D. (Eds.), Why gesture?: How the hands function in speaking, thinking and communicating. John Benjamins Publishing Company, Amsterdam, Philadelphia, pp. 129–153.

Cooperrider, K., Abner, N., Goldin-Meadow, S., 2018. The palm-up puzzle: Meanings and origins of a widespread form in gesture and sign. Front. Commun. 3. https://doi.org/10.3389/fcomm.2018.00023.

Engberg-Pedersen, E., 2002. Gestures in signing: The presentation gesture in Danish Sign Language. In: Schulmeister, R., Reinitzer, H. (Eds.), Progress in Sign Language Research. In Honor of Siegmund Prillwitz. Signum, Hamburg, pp. 142–162.

Fenlon, J., Schembri, A., Rentelis, R., Vinson, D., Cormier, K., 2014. Using conversational data to determine lexical frequency in British Sign Language: the influence of text type. Lingua 143, 187–202. https://doi.org/10.1016/j.lingua.2014.02.003.

Ferrara, L., 2020. Some interactional functions of finger pointing in signed language conversations. *Glossa: a journal of general linguistics* 5 (1), 1–26. https://doi.org/10.5334/gjgl.993.

Franklin, A., Giannakidou, A., Goldin-Meadow, S., 2011. Negation, questions, and structure building in a homesign system. Cognition 118 (3), 398–416. https://doi.org/10.1016/j.cognition.2010.08.017.

Gabarró-López, S., 2017. Discourse markers in French Belgian Sign Language (LSFB) and Catalan Sign Language (LSC): buoys, PALM-UP and SAME. Variation, functions and position in discourse. University of Namur, Namur, PhD thesis.

Gabarró-López, S., 2018. CorMILS: Pilot multimodal corpus of French – French Belgian Sign Language (LSFB) interpreters. Department of Linguistics, Stockholm University, Sweden, LSFB-Lab, University of Namur, Belgium.

Gabarró-López, S., 2019. What can discourse markers tell us about genres and vice versa? A corpus-driven study of French Belgian Sign Language (LSFB). *Revue de linguistique et de didactique des langues* (J. Ling. Didactics Lang.) 60. https://doi.org/10.4000/lidil.6768.

Gabarró-López, S., 2020. Are discourse markers related to age and educational background? A comparative account between two sign languages. J. Pragmat. 156. https://doi.org/10.1016/j.pragma.2018.12.019.

Galvão, E.Z., 2020. Gesture functions and gestural style in simultaneous interpreting. In: Salaets, H., Brône, G. (Eds.), Linking up with Video: Perspectives on Interpreting Practice and Research. John Benjamins Publishing Company, Amsterdam, Philadelphia, pp. 151–179.

Galvão, E.Z., Rodrigues, I.G., 2010. The importance of listening with one's eyes: a case study of multimodality in simultaneous interpreting. In: Díaz Cintas, J., Matamala, A., Neves, J. (Eds.), New Insights into Audiovisual Translation and Media Accessibility. Media for All 2. Brill, Leiden, pp. 241–254.

Galvão, E.Z., 2009. Speech and gesture in the booth – A descriptive approach to multimodality in simultaneous interpreting. In: De Crom, D. (Eds.), Translation and the (Trans)formation of Identities. Selected Papers of the CETRA Research Seminar in Translation Studies. https://www.arts.kuleuven.be/cetra/papers/files/galvao.pdf.

Gile, D., 2018. Simultaneous interpreting. In: Sin-wai, C. (Ed.), An Encyclopedia of Practical Translation and Interpreting. The Chinese University Press, Hong Kong, pp. 531–561.

Goldin-Meadow, S., Nusbaum, H., Kelly, S.D., Wagner, S., 2001. Explaining math: gesturing lightens the load. Psychol. Sci. 12 (6), 516–522. https://doi.org/10.1111/1467-9280.00395.

Halliday, M.A.K., 1970. Language structure and language function. In: Lyons, J. (Ed.), New Horizons in Linguistics. Penguin Books, Harmondsworth, pp. 140–165.

Hanquet, N., 2019. Interpréter la métaphore. *Stratégies d'interprétation du français vers la langue des signes de Belgique francophone (LSFB) en contexte de conférence*. Université catholique de Louvain, Louvain-la-Neuve, Master thesis.

Hoza, J., 2011. The discourse and politeness functions of HEY and WELL in American Sign Language. In: Roy, C.B. (Ed.), Discourse in Signed Languages. Gallaudet University Press, Washington, D.C., pp. 70–95.

Johnson, H.G., Ekman, P., Friesen, W.V., 1975. Communicative body movements: American emblems. Semiotica 15, 335–353. https://doi.org/10.1515/semi.1975.15.4.335.

Johnston, T., 2012. Lexical frequency in sign languages. J. Deaf Stud. Deaf Educ. 17, 163–193. https://doi.org/10.1093/deafed/enr036.

Kendon, A., 2004. Gesture. Visible Action as Utterance. Cambridge University Press, Cambridge.

Kendon, A., 2014. Semiotic diversity in utterance production and the concept of 'language'. Philos. Trans. R. Soc. B 369, 20130293. https://doi.org/10.1098/rstb.2013.0293.

Kusters, A., Spotti, M., Swanwick, R., Tapio, E., 2017. Beyond languages, beyond modalities: transforming the study of semiotic repertoires. Int. J. Multiling. 14 (3), 219–232. https://doi.org/10.1080/14790718.2017.1321651.

Lepeut, A., 2020. Framing language through gesture. Palm-up, index finger-extended gestures, and holds in spoken and signed interactions in French-speaking and signing Belgium. University of Namur, Namur, PhD thesis.

Lepeut, A., Shaw, E.P., 2022. Time is ripe to make interactional moves: bringing evidence from four languages across modalities. Front. Commun. 7. https://doi.org/10.3389/fcomm.2022.780124.

McKee, R., Wallingford, S., 2011. 'So, Well, Whatever' Discourse functions of palm-up in New Zealand Sign Language. Sign Lang. Ling. 14 (2), 213–247.

Mesch, J., 2016. Manual backchannel responses in signers' conversations in Swedish Sign Language. Lang. Commun. 50, 22–41.

Meurant, L., 2015. Corpus LSFB. First digital open access corpus of movies and annotations of French Belgian Sign Language (LSFB). University of Namur, Belgium.

Meurant, L., Lepeut, A., Tavier, A., Vandenitte, S., Lombart, C., Gabarró-López, S., Sinte, A. Ongoing. The multimodal FRAPé Corpus: Towards building a comparable LSFB and Belgian French corpus. University of Namur, Belgium.

Müller, C., 2004. Forms and uses of the palm up open hand: A case of a gesture family? In: Müller, C., Posner, R. (Eds.), The Semantics and Pragmatics of Everyday Gestures. Weidler, Berlin, pp. 233–256.

Müller, C., 2017. How recurrent gestures mean: Conventionalized contexts-of-use and embodied motivation. Gesture 16, 276–303. https://doi.org/10.1075/gest.16.2.05mul.

Nicodemus, B., Emmorey, K., 2013. Direction asymmetries in spoken and signed language interpreting. Biling. Lang. Congn. 16 (3), 624–636. https://doi.org/10.1017/S1366728912000521.

Notarrigo, I., 2017. Les marqueurs de (dis)fluence en langue des signes de Belgique francophone (LSFB). University of Namur, Namur, PhD thesis.

Nyst, V., 2012. Shared sign languages. In: Pfau, R., Steinbach, M., Woll, B. (Eds.), Sign Language: An International Handbook. Mouton de Gruyter, Berlin, pp. 552–574.

Perniss, P., 2018. Why we should study multimodal language. Front. Psychol. 9, 1109. https://doi.org/10.3389/fpsyg.2018.01109.

Roy, C.B., 2000. Interpreting as a Discourse Process. Oxford University Press, New York, Oxford.

Shaw, E.P., 2019. Gesture in Multiparty Interaction. Gallaudet University Press, Washington, DC https://doi.org/10.2307/j.ctv2rh2917.

Sloetjes, H., Wittenburg, P., 2008. Annotation by category - ELAN and ISO DCR. In: Calzolari, N., Choukri, K., Maegaard, B., Mariani, J., Odijk, J., Piperidis, S., Tapias, D. (Eds.), Proceedings of the 6th International Conference on Language Resources and Evaluation (LREC'08), 28–30 May. Marrakech, Morocco, pp. 816–820.

Solow, S.N., 1981. Sign Language Interpreting: A Basic Resource Book. The National Association of the Deaf, Silver Spring, Maryland.

Swabey, L., Nicodemus, B., Taylor, M.M., Gile, D., 2016. Lexical decisions and related cognitive issues in spoken and signed language interpreting: a case study of Obama's inaugural address. Interpreting 18 (1), 34–56.

Van Herreweghe, M., 2002. Turn-taking mechanisms and active participation in meetings with deaf and hearing participants in Flanders. In: Lucas, C. (Ed.), Turn-taking, Fingerspelling, and Contact in Signed Languages, Vol. 8. Gallaudet University Press, Washington DC, pp. 73–103.

van Loon, E., 2012. What's in the palm of your hands? Discourse functions of palm-up in Sign Language of the Netherlands. Universiteit van Amsterdam, Amsterdam, Master thesis.

Villeneuve, S., Parisot, A.-M., 2007. Profil phonologique de l'interprète français/langue des signes québécoise : l'interprète débutant et l'interprète expert (The phonological profile of French/Quebec Sign Language interpreters: the novice interpreter and the experienced interpreter). *Silexicales* 5*, Syntaxe, interprétation, lexique des langues signées* (Syntax, interpreting and lexicon in sign languages), 134–153.

Wang, J., 2021. Simultaneous Interpreting from a Signed Language into a Spoken Language. Quality, Cognitive Overload, and Strategies. Routledge, London, New York.

Zeshan, U., 2004. Interrogative constructions in signed languages: crosslinguistic perspectives. Language 80, 7–39. https://doi.org/10.1353/lan.2004.0050.

Zeshan, U., 2006. Negative and interrogative structures in Turkish Sign Language (TID). In: Zeshan, U. (Ed.), Interrogative and Negative Constructions in Sign Languages. Ishara Press, Nijmegen, pp. 128–164.