Nonmanuals and markers of (dis)fluency

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Abstract

This paper focuses on the analysis and annotation of non-manual features in the framework of a study of (dis)fluency markers in French Belgian Sign Language (LSFB). In line with Götz (2013), we consider (dis)fluency as the result of the combination of many independent markers ("fluencemes"). These fluencemes may contribute either positively or negatively to the efficiency of a discourse depending on their context of appearance, their specific combination, their position and frequency. We show that the non-manual features in LSFB make distinctions within pauses and palm-up signs in a consistent way and contribute to the value of the manual marker. The selection of a limited number of relevant combinations of nonmanuals, in the context of pauses and palm-up signs, proves to simplify the annotation process and to limit the number of features to examine for each nonmanual. The gaze and the head appear to be necessary and sufficient to describe pauses and palm-up signs accurately. Though these findings are limited to this pilot study, they will pave the way to the next steps of the broader research project on (dis)fluency markers in LSFB this work is part of.

Keywords: annotation, fluency, disfluency, nonmanuals, pauses, palm-up signs, stops, gaze, eyes, eyebrows, head, mouth

1. Introduction

This study focuses on fluency and disfluency in "normal", i.e. non-pathological, signing and sets apart the impressive amount of research on disfluency conducted in the areas of stuttering and aphasia (Marshall 2000; Atkinson et al. 2002). From a holistic perspective, fluency is associated with the impression of an overall discourse quality, a "smooth, rapid, effortless use of language" (Crystal 1987: 421), or "the rapid, smooth, accurate, lucid, and efficient translation of thought or communicative intention into language" (Lennon 2000: 26). However, "fluency does not always imply an uninterrupted flow of speech which is grammatically perfectly irreproachable" (Lehtonen 1978); in other words a successful communication or proficient/efficient speech does include disfluencies.

Götz (2013) noticed that disfluency can be considered not only as a signal of the speaker's difficulties to plan and encode his/her discourse, but also as a positive signal when speakers use disfluencies for rhetorical purposes for example. She pointed out that, depending on its context, its combination with other features, its position and frequency, the same feature can contribute either to the fluency or to the disfluency of a production. This study is in line with Götz's componential approach that sees (dis)fluency as the result of combinations of many independent markers ("fluencemes"), and is part of a PhD thesis that aims to identify fluencemes in French Belgian Sign Language (LSFB) and to observe their combinations within different contexts of speech. We expect to be able to identify fluency and disfluency profiles in terms of combinations of fluencemes, probably related to the type of speech context.

Two potential fluencemes of LSFB are focused on in this study, namely pauses and palm-up signs. Their non-referential contribution to the discourse makes them good (dis)fluency marker candidates. At a first glance, nonmanual features occurring with both pauses and palm-ups seem to convey important information related to (dis)fluency. A gaze can for instance interrupt communication temporarily, an 'erm' mouthing or head and eyebrows behaviours can express reflexion or hesitation. However, annotating each non-manual articulator (i.e. gaze, eyes, eyebrows, mouth, head) in detail is extremely time consuming; it may be worthwhile to test whether such precise annotation is relevant, i.e. whether non-manual information refines the information given by the manual marker (pause or palm-up). In this study, we address three main research questions: (1) What type of information do nonmanuals give about pauses and palm-up signs? (2) Is the annotation of each non-manual component needed for each pause and each palm-up sign? (3) How is it possible to code the potentially relevant nonmanuals?

2. Methodology

To answer these questions, we conducted a pilot study based on a 10-minute long corpus. The corpus consists of four excerpts of unprepared monologues produced by 2 native and 2 near-native signers of LSFB (see details in Table 1). The excerpts were selected from larger interviews or dialogues, but are considered as monologues because the interlocutor does not interrupt the signer's turns within the selected clips.

	Sex	Age	SL profile	Clip duration
Signer 1	M	33	Native	3 min
Signer 2	F	22	Native	2 min
Signer 3	M	25	near-native	2 min 30
Signer 4	F	28	near-native	2 min 30

Table 1: Signers and clips

Within these data, we first coded each pause and each palm-up sign. Then, we looked at their immediate context, and more precisely at the behaviour of the gaze, the eyes, the eyebrows, the head and the mouth, which were annotated in five separate tiers. In so doing, we

improved our annotation guidelines for the nonmanuals and finally applied a template that appeared to be suited and efficient for our subject (see section 4).

With a multi-layer search in ELAN we extracted for each occurrence of a pause or of a palm-up sign its overlapping non-manual features. We finally queried the data in Excel and generated information about the non-manual features co-occurring with each manual marker. We tried to see whether some (combinations of) nonmanuals behave regularly when a pause or a palm-up appears, and whether these regularities draw boundaries between consistent groups of pauses and palm-ups. The absence of any regularity would contribute to the assumption that the behaviour of nonmanuals is not related to the pauses or the palm-ups they occur with, and therefore does not have to be coded for its relation to each pause or palm-up occurrence. This pilot study alone can certainly not lead us to adopt this assumption conclusively, but it can determine the next steps of the investigation of the interaction between nonmanuals and manual markers of (dis)fluency.

3. Coding pauses and palm-ups

3.1 Pauses

In comparison with what is known about spoken language fluency, a first glance at our data reveals a strikingly small amount of unfilled pauses in the signing flow. In fact, this difference may be due to the breathing limits that constrain the speech flow, but above all it may be due to the scarce use of multimodal data for the description of spoken productions: access to the silent information conveyed by manual or non-manual components during speech productions would probably have led to giving up the concept of unfilled pause. From videotaped sign language (SL) data, it becomes clear that the stops of the hands are inevitably "filled" with non-manual information. So, instead of distinguishing between filled and unfilled pauses, we considered all the stops of the hands as (dis)fluency markers, since all may help the signer to plan or reorganize the discourse, be it in a fluent or in a disfluent way.

We drew a distinction between stops during a sign (S1) and stops between signs (S2). The first group (S1) includes stops at the beginning, in the middle or at the end of a sign; they are recognizable by the fact that handshape and location of the signs are held. We took these kind of stops into account when they lasted at least 5 frames[1], and we coded them S1:start, S1:middle and S1:end respectively. The second group (S2) covers all the cases of complete non-signing, or in other words cases where the hands do not show a meaningful handshape or movement. We divided S2 into three sub-groups depending on the position of the hands: crossed hands (S2:crossed), along the body (S2:body) and relaxed in the neutral space in front of the signer (S2:neutral). Table 2 provides an overview of these (sub-)groups and their respective tags.

Pauses	Stop in the hands flow
S1	Stop during a sign
S1:start	Stop at the beginning of a sign
S1:middle	Stop in the middle of a sign
S1:end	Stop at the end of a sign
S2	Stop between signs
S2:crossed	Stop with hands crossed
S2:body	Stop with hands along the body
S2:neutral	Stop with relaxed hands in the neutral space

Table 2: Pauses (sub-)groups and related tags

3.2 Palm-up signs

The "palm-up" sign is described in numerous sign languages (among others van der Kooij, Crasborn and Ros 2006 and van Loon 2012 for NGT). The form of the sign (an upward palm orientation sign articulated in the neutral space and resulting from a wrist location) and its various functions (expression of modality, backchannel signal, elicitation of evolvement, start or end of a turn, conjunction, interrogative particle or pause filler) are similar across sign languages. The spectrum of functions related to palm-ups prompted us to count them as a potential (dis)fluency marker.

Four groups of palm-ups have been distinguished, according to the hand(s) involved in the sign and to the handshape(s) taken by the hand(s). The canonical palm-up sign is articulated by the two hands in 5-handshape (PU). But the palm-up can also be articulated with only one hand in 5-handshape (PU-R for the right hand and PU-L for the left hand). In some cases, we saw a two-handed palm-up with one hand in 5-hanshape and one hand in I-handshape (PU-L (I)). See Table 3 for an overview of these groups.

Palm-up signs	Upward palm orientation sign in the neutral space resulting from a wrist rotation
PU	Palm-up sign with both hands in 5-handshape
PU-R	One 5-hanshape handed palm-up (right hand)
PU-L	One 5-handshape handed palm-up (left hand)
PU-L(I)	Palm-up sign with one hand in 5-handshape and one hand in L-handshape

Table 3: Palm-up groups and related tags

4. Coding nonmanuals

Once each pause (S) and each palm-up sign (PU) had been tagged, we coded the behaviour of the non-manual components occurring in the close context of each S and PU: the gaze, the eyes, the eyebrows, the head and the mouth. We deliberately began with a quite extensive annotation grid based on existing protocols (Neidle 2002; Nonhebel, Crasborn and van der Kooij 2004; Johnston 2011) and refined it during the annotation process. One of the main changes we applied corresponds to the time

[1] This length of 5 frames (one frame is 1/50 sec.) does not come from an upstream decision, but rather from the downstream observation that, below a length of 5 frames, we could not detect the stop.

intervals we considered for each nonmanual. For example, we started to code the gaze components from two signs before to two signs after the manual marker (S or PU). But this interval appeared to provide noise, namely information that was obviously not related to the marker we were focused on but to the previous or next signs. Annotating the gaze behaviour only one sign (300-500 milliseconds) before and one sign after the S or PU marker proved to be more accurate.

The annotation guidelines presented below are the final version we applied to all our data. In comparison with the first extensive guidelines, it represents a reduction of 66% of the time needed for annotation (from 150 min to 50 min for a 30-second video clip). The reduction might be due to transcribers getting used to the task, but the most important impact is due to the smaller number of non-manual elements to look at and of values for each non-manual element.

4.1 Gaze

As indicated above, the gaze component was taken into account from one sign before to one sign after the manual marker (S or PU). The tag set used distinguishes three behaviours and is based on Meurant (2008)'s study on gaze in LSFB.

First possibility: the gaze is tagged as "addressed". This means that the gaze addresses a real or a fictive interlocutor, namely a discourse participant to whom the signer may say 'I' or 'you'. Second possibility: the gaze is tagged as "spatial". This means that the gaze installs or designates meaningful positions in space, other than the positions of the real or fictive interlocutors. Third possibility: the gaze is tagged as "other". This means that the gaze is not addressed nor related to meaningful positions in space. It can for example be oriented to the floor, to the side or in the air, or be shifty.

When a change of gaze occurs and is accompanied by a blink, the blink is considered as the beginning of the new gaze behaviour.

In a previous version of the guidelines, the "spatial" tag was split into "spatial – out of a role" and "spatial – within a role". The former covered the gaze that installs or designates positions in the frontal space (Meurant 2006, pp. 407-408) without any relationship to the actualization of a character in a role-taking form. The latter covered the gaze that installs or designates positions in the space surrounding the signer (Meurant 2006, p. 409) in relation to the actualization of a character in a role taking form. We kept records of this previous tagging. The analyses of the data (section 5) suggest that the distinction between "out of a role" and "within a role" is relevant, especially within the PU and the S1:end categories. This means that the four-tag set (addressed / spatial – out of a role / spatial – within a role / other) will be re-introduced in our next guidelines.

4.2 Eyes

Like for the gaze, the eye component was taken into account from one sign before to one sign after the manual marker (S or PU). The tag set includes six features: "closed", "blink", "eyelid down", "wide open", "squint" and "other". The interval of a blink begins the frame before the closing position and ends at the opening of the eyes; the mean length of a blink is 5 frames as a whole. If the eyes are maintained in the closed position more than one image, they are considered as closed (Chételat-Pelé and Braffort 2010).

4.3 Eyebrows

Only two tags are used to describe the eyebrow movements: "raised" and "frown". To avoid noisy information, they are used strictly within the interval of the manual marker: the movement can appear after the beginning of the S or the PU, but it never goes beyond the end of the S or the PU. The eyebrows movement is coded from one frame before the beginning of the raising or frowning movement to one frame after the peak. The movement after the peak is not coded because it is often hard to see.

4.4 Head

Coding the head components proved to be quite difficult. We came to the conclusion that the more consistent principle (in order to avoid coding movements that are not related to S or PU, but rather to the surrounding context) was to code only the changes that occur during the manual marker. Moreover, we excluded from these the changes that overlap with the manual marker but that are due to the following context (e.g. a negation after the S or the PU that produces a head turn before the very end of the S or the PU). We used seven tags for the description of the head: "nod", "shake", "turn", "tilt", "chin up", "chin down" and "other". Sometimes it is hard to distinguish the turn from the tilt. We tagged "turn" if the chin goes to one side and the face is no longer facing the interlocutor. We tagged "tilt" if the top of the head moves without a change in the direction of the face. The idea is to annotate the most salient feature. For example when a turn occurs, it is only coded as "turn" and not for the movement of the chin that is unavoidably linked to the turn.

4.5 Mouth

In a first step, we used the tags described in the sign language transcription conventions for the ECHO Project (Nonhebel et al. 2004). After having coded the mouth components in detail (open/closed, corner of the lips, tongue, teeth, etc.) for 92 Ss or PUs, we substantially cut down the number of features because the data would have been too heterogeneous to analyse in combination with non-manual tags. The seven remaining tags are the following: "closed", "closed with lip movement", "closed with air (breathe out)", "open", "open with lip movement", "open with air (breathe in)", and "mouthing". We have limited the coding to the strict interval of the S or PU. A mouth movement that is similar to the 'erm' in spoken language has been coded as "open with air" and not as "mouthing" because the mouthing is not always clear enough.

Table 4 shows an overview of the final and complete tag set used for this pilot study to describe nonmanuals.

Gaze (G:)	Eyes (E:)	Eyebrows (B:)	Head (H:)	Mouth (M:)
addressed	closed	Raised	nod	closed
spatial	blink	frown	shake	closed-lip mov.
other	eyelid down		turn	closed with air
	wide open		tilt	open
	squint		chin up	open-lip mov.
	other		chin down	open with air
			other	mouthing

Table 4: Tag set for nonmanuals

5. Results

After having annotated the small-scale corpus presented in section 2 according to the guidelines presented in section 3 for the manual elements and in section 4 for nonmanuals, we were able to start a multi-layer search in ELAN in order to extract for each occurrence of a pause or a palm-up sign its overlapping non-manual components.

Our first question aims to investigate the type of information nonmanuals give about pauses and palm-up signs. We tried to see whether some nonmanuals or some combinations of nonmanuals behave regularly when a pause or a palm-up appears, and whether these regularities can help distinguish consistent categories of pauses and palm-ups.

In practice, we started the analyses with a spreadsheet containing all the S (113) and PU (80) occurrences (total: 193), each one being associated with its respective tags on non-manual components. Within these data, we investigated each pause (sub-)group and each palm-up group by filtering the data by non-manual tags. These filtering operations resulted in successive occurrence sets that we systematically examined in terms of consistency. Each time, the question was "is there any apparent coherence between the groups resulting from this filter (or combination of filters)?". The consistency was approached in terms of position (within the turn or within the semantic unit, if the turn was made up of several ideas) and in terms of functions (in a broad sense and ignoring any theoretical typology of functions).

The results of this investigation are presented below, showing the more consistent categories of manual markers arising from the regularities observed in their co-occurring nonmanuals.

5.1 Palm-up signs and nonmanuals

All categories of palm-up signs (PU, PU-R, PU-L, PU-L(I)) are clearly divided into two main categories by the criterion of gaze (see Table 5). A PU with a gaze tagged as "spatial" (more precisely a spatial gaze within a context of role taking[2]) fulfills the function of a modality marker (PU-Mod): It conveys a subjective comment or evaluation from the point of view of the role-played character or the signer himself/herself on what is being said (disagreement, feeling of inability, pleasure, etc.)[3]. All the other gazes ("addressed", "spatial out of a role" and "other") indiscriminately cover the uses of PU as lexical units (THAT-IS or NOW) and fillers (PU-Lex/Fill), whatever the position of the PU is: at the start, during or at the end of the semantic unit. See Examples 1-3 with Figures 1-4 to illustrate each category. The PU-Lex/Fill are often accompanied by other potential (dis)fluency markers, such as pauses (S1 or S2), false starts, connecting particles, etc. Within the two categories, no other consistent sub-category seems to be related to any other nonmanual.

PU	Defining nonmanual	Tag	Number of occurrences
Modality marker	**G:spatial (within a role)**	PU-Mod	21
Lexical units and fillers	G:all the other tags	PU-Lex/Fill	59

Table 5: Palm up categories

Ex. 1 BEFORE FG:E Grid $_{\text{PU-Mod}}$ FG:E GIVEN UP GRID GRID CALCULATION GRID $_{\text{PU-Lex/Fill S2:body-BoE}}$
Before, the sign for Excel was with the letter E. ***It is not good****. We gave up the letter E and we kept only the sign for grid.* ***Here it is****.*

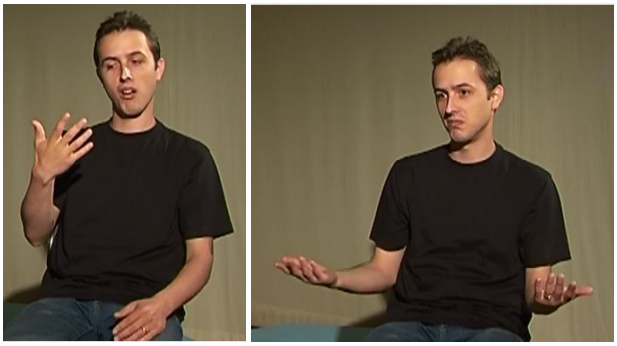

Figure 1: PU-R-Mod on the left, PU-Lex/Fill on the right

Ex. 2 $_{\text{PU-R-Lex/Fill}}$ I SIGN $_{\text{PU-Lex/Fill}}$ YES $_{\text{S2:crossed-BoM}}$ ERM I $_{\text{PU-L(I)-Lex:Fill}}$ DEAF WORLD DAY TRUE DEAF WORLD DAY WHY?
Here it is*. I sign* ***now****. [/] Yes, erm, according to me,* ***well****, what is the point of the Deaf World Day?*

[2] As previously mentioned (section 4.1), the distinction between "spatial out of a role" and "spatial within a role" made in a pre-final step of the annotation guidelines should be re-introduced in the tag set.

[3] This is in line with van der Kooij et al. (2006).

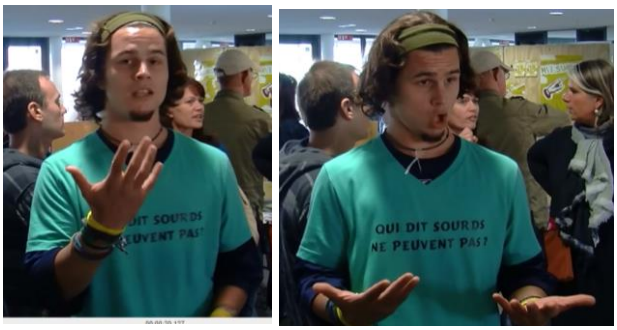

Figure 2: PU-R Lex/Fill (HERE-IT-IS) on the left, PU Lex/Fill (NOW) on the right

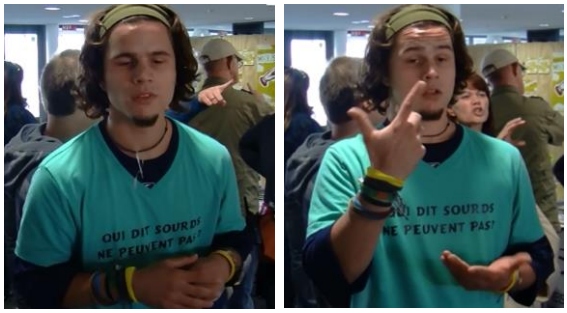

Figure 3: S2:crossed-BoM on the left, PU-L-(I)-Lex/Fill on the right

Ex. 3 DEAF $_{\text{PU-L (I)-Mod}}$ NOT ENOUGH IN MORE WORLD DEAF
*Deaf people, **Oh!** they **really** are not involved enough in the deaf world.*

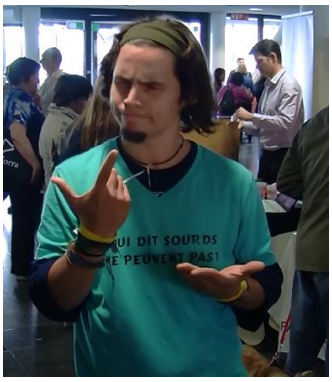

Figure 4: PU-Mod

5.2 S1:end and nonmanuals

In a similar way to the PUs, the S1:end markers are firstly sub-categorized by the opposition between the gaze-tag "spatial within a role" and the other gaze-tags ("addressed, "spatial out of a role" and "other"). This first distinction identifies a group of S1:end functioning as a modality marker (S1:end-Mod) in the same way as the PU-Mod (see below Ex. 4).

Ex. 4 I WALK BEAUTIFUL DUCK MANY I LOOK S1:end-Mod I BECAUSE I DEAF HEARING MANY I ALONE S1:end-Mod DEAF
*I'm walking. There are many beautiful ducks. I **look** at them **for a long time**. There are many hearing people around me, but I am the **only** deaf person.*

As for the other cases, namely with a gaze which is not "spatial within a role", the presence of a head movement is relevant. When there is a head movement other than "nod", S1:end functions as a marker of stress (S1:end-Str) (see Ex. 5). When there is a head nod, it fulfills a phatic function, namely it shows that the signer makes sure he is well understood (S1:end-Pha) (see Ex. 6).

Ex. 5 BEFORE WIRE$^{\text{S1:end-Pha}}$ WIRE COMPUTER HOME WIRE $^{\text{S1:end-Pha}}$ $_{\text{PU-Lex/Fill}}$ WIRE NOTHING$^{\text{S1:end-Str (shake head)}}$
*Before, there was a wire, **ok**. At home, there was a wire line computer, **ok**, **well** there is **no** more wire.*

Ex. 6 YES FUTURE BETTER CHANGE FOR EXAMPLE $_{\text{S2:crossed-BoM}}$ TOO MUCH SPELLING$^{\text{S1:end-Pha}}$ FOR EXAMPLE USB$^{\text{S1:end-Pha}}$ BETTER KEY$^{\text{S1:end-Pha}}$
*Yes, it is better to change. For example **[/]**, there are too many signs with **acronyms, ok**. For example, for the sign **«USB», ok**, it is better to use the sign for **key, ok**.*

When S1:end is not accompanied by a head movement and the gaze is not the same as for the modality marker, it rather produces an effect of suspension within the discourse, a sort of blank in the communication (see below Ex. 7). Table 6 sums up these four categories.

Ex.7 DEAF WORLD DAY YES THERE PARIS PARIS$^{\text{S1:end-Sus}}$ ERM THREE FOUR YEAR PAST
*Yes, the Deaf World Day took place in Paris, **Paris**, erm, three or four years ago.*

S1:end	Defining nonmanual(s)	Tag	Number of occurrences
Modality marker	**G:spatial (within a role)**	S1:end-Mod	9
Others Stress	G:addressed or G:spatial out of a role **H:movement but not "nod"**	S1:end-Str	7
Phatic	G:addressed **H:nod**	S1:end-Pha	19
Suspension	G:addressed or G:other **H:/**	S1:end-Sus	12

Table 6: S1:end categories

5.3 S2:body/crossed and nonmanuals

S2:body and S2:crossed are both categorized in the same way by the nonmanual components. They all function as boundary markers (Bo). Once again, the gaze draws relevant boundaries between them. Combined with the

regularities in terms of position of the markers, the gaze distinguishes between three main S2:body/crossed categories. At the beginning or the end of a speech turn, a S2:body/crossed is perceived as a framing pause (S2:body/crossed-BoS and S2:body/crossed-BoE). In most cases (BoS and BoE) the gaze is addressed and may be highlighted by a head nod. But in some cases (only at the starting of a turn – BoS), the gaze is tagged as "other" and is layered by a turn. The S2:body/crossed markers that appear within a turn (S2:body/crossed-BoM) mark the end of a semantic unit. They may be accompanied by a turn. Table 7 provides an overview of these categories and Figures 3/5 illustrate the difference of gaze within these categories.

At the end of a turn, a S2:body/crossed with a nod fulfills a phatic function, in a similar way as S1:end-Pha.

The various S2:body/crossed often appear just after or before a PU.

S2:body S2:crossed	**Defining nonmanuals**	**Tag**	**Number of occurrences**
Boundary marker			
Framing pause - End of turn (phatic)	G:addressed H:nod	S2:body/crossed-BoE	10
	G:addressed H:/		7
Framing pause - Start of turn	G:addressed H:nod	S2:body/crossed-BoS	2
	G:addressed H:/		6
	G:other H: turn		4
Middel of turn, end of semantic unit	G:other H:turn or /	S2:body/crossed-BoM	9

Table 7: S2:crossed and body categories

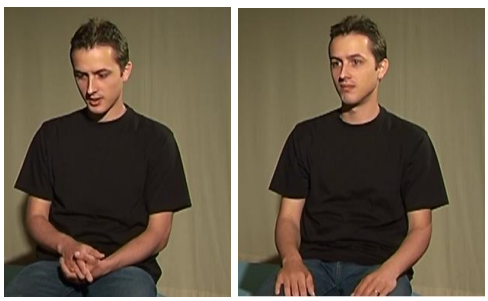

Figure 5: S2:crossed-BoM on the left, S2:body-BoE on the right

5.4 S2:neutral and nonmanuals

Three categories of S2:neutral have been found. These three categories are summed up in Table 8. All three are similar to the already established categories for the other kinds of manual markers. The clue nonmanuals are the head (movement or not) and the gaze (spatial or not). The presence of a head movement characterizes the modality marker (S2:neutral-Mod, also recognizable by its usual "spatial – within a role" gaze) (see an illustration in Figure 6) and a boundary marker (with "addressed" or "other" gaze). As a boundary marker, S2:neutral specifically marks the transition between a concept and its explanation (S2:neutral-BoEx) as illustrated in the Example 8.

Ex. 8 SOCIETY STRONG DIFFERENT $_{\text{S2:nEUTRAL-BoEx}}$ POOR RICH WORLD ONE WORLD TWO
*The society is very different **[/]** there are two worlds: one for the poor and another one for the rich.*

The lack of head movement (whatever the gaze and the position of the marker is) produces an effect of suspension of the discourse (S2:neutral-Sus), in the same way as in S1:end-Sus (see Ex. 9). This third category often appears in the close context of another (dis)fluency marker, as for example S1 pauses, auto-contacts, "flying indexes", etc.

Ex. 9 INFORMATION DIFFERENT ASSOCIATION THERE-IS FOR FOCUS$^{\text{S1:end-Sus}}$ $_{\text{S2:neutral-Sus}}$ CULTURE DEAF
*There are different associations giving information in order to focus **[/]** on the deaf culture.*

S2:neutral	**Defining nonmanual(s)**	**Tag**	**Number of occurrences**
Modality marker	**H:movement** G:spatial (within a role)	S2:neutral-Mod	3
Boundary marker Explanation	H:movement G:addressed or other	S2:neutral-BoEx	4
Suspension	**H:no movement** G:addressed or other	S2:neutral-Sus	12

Table 8: S2:neutral categories

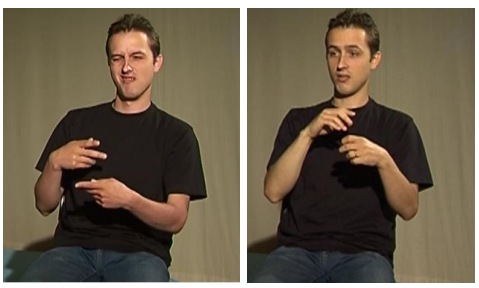

Figure 6: S2:neutral-Mod on the left, S2:neutral-Sus on the right

5.5 S1:start and nonmanuals

Our data only contained 9 occurrences of S1:start, so it is necessary to treat the remarks below with caution. We hypothesize that when a pause comes at the beginning of a sign, it can either produce an effect of hesitation similar to a false start, or mark a stress (see Table 9). Depending on our examples, the latter function is cued by a combination of five non-manual features: G:addressed or spatial (out of a role), E:wide, B:raised, H:chin up, M:closed. Figure 7 shows an illustration of the contrast between these two categories.

S1:start	Defining nonmanual	Tag	Number of occurrences
Hesitation	**G:spatial (within a role) or other or addressed**	S1:start -Hes	7
Stress	G:addressed or spatial (out of a role) E:wide B:raised H:chin up M:closed	S1:start -Str	2

Table 9: S1:start categories

Figure 7: $_{\text{S1:start-Str}}$WHOLE on the left, $_{\text{S1:start-Hes}}$WINDOW on the right

No cases of S1:middle were found in our data.

6. Discussion

The results presented in section 5 suggest that the non-manual components of LSFB make distinctions within pauses and palm-up signs consistently and contribute to the value of the manual marker. Each marker category was shown to cover various functions, such as modality or boundary or phatic markers. The distinction between the different functions can be linked to the non-manual information and even to a reduced set of non-manual features which may have a significant impact on the annotation work. In the same vein, the improvement of the guidelines we established (mainly the delimitation of the intervals to consider and of the features to examine) for the coding of the nonmanuals co-occurring with potential (dis)fluency markers such as pauses and palm-up signs, is in itself a considerable gain (66% of time saving) for the annotation efficiency.

This study and its results are limited by the shortcomings that are inherent to every pilot study: the reduced amount of data, of signers, of speech context variety, etc. The 193 occurrences of pauses and palm-ups we examined represent only a sample of 10 minutes of the productions of four signers. Despite the small data set, a qualitative study could be carried out that paves the way for the next – more extensive – steps of this research on (dis)fluency markers in LSFB. By using a broader corpus and quantitative analysis techniques (Chi2 and multivariate analysis for instance), we should be able to test the relevance of the nonmanuals combinations resulting from this first investigation on the sub-categorization of pauses and palm-ups.

With regard to the issue of nonmanuals and their relation to the two manual markers we have focused on, the preliminary findings can be summed up as follows.

[1] The fact that pauses and palm-up signs frequently appear with other probable (dis)fluency markers confirms that they deserve being taken into account in the combinatory study we pursue.

[2] The annotation guidelines presented in sections 4 and 5 seem to be appropriate and efficient for our subject. A small change will be made, within the gaze-tag set. Coming back to a previous choice, a four-tag set will be used for coding the gaze: addressed/spatial – out of a role/spatial – within a role/other.

[3] Two types of nonmanuals must be coded in order to describe pauses and palm-ups accurately, namely the gaze and the head. Together they form the defining cues for the sub-categories of all groups of markers: PU, S1:end, S2:body and S2:crossed, S2:neutral, S1:start. Moreover, depending on the marker, the annotator can know which nonmanual refines the information provided by the gaze and the head and which ones are not expected to provide regular information.

[4] One specific type of gaze (namely the "spatial – within a role" gaze) gives the same function to the PU, the S1:end and the S2:neutral markers. This function has been identified as the marking of modality.

[5] A particular behaviour of the head, namely the absence of movement of the head, layered with a pause or a palm-up and with a sort of fixity in all manual and nonmanual components, produces an effect of suspension that is common to S1:end and S2:neutral.

The presence of a nod, be it with S1:end or with S2:body or S2:crossed, gives to the marker a phatic function.

[6] These regularities among groups of markers can be seen as a signal of accuracy among the categories and features we found.

[7] Within the PUs, S1:end and S2:neutral, the opposition between "addressed" and "other" gaze surprisingly does not impact the function of the sign. The same can be seen with other markers in LSFB, like THAT-MEANS (see Figure 8), ALSO or the use of list buoys. This prompts us to investigate whether the gaze

might be independent, and whether it could be considered, in itself, as a (dis)fluency marker.

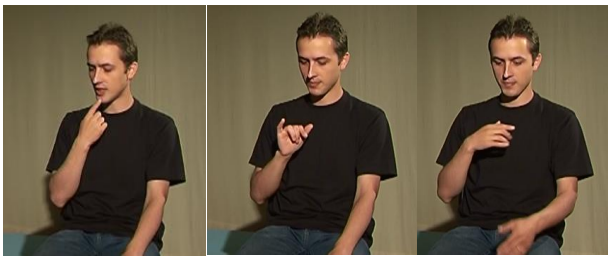

Figure 8: SAY WHAT THIS-IS
(*What does it mean? It is…*)

7. Conclusions

This study shows that the non-manual components of LSFB make distinctions within pauses and palm-up signs in a consistent way and contribute to the value of the manual marker. The relevant combinations of nonmanuals, in the context of pauses and palm-up signs, help speed up the annotation process by reducing the number of nonmanuals that must be taken into account and by limiting the number of features to examine for each nonmanual. The gaze and the head appeared to be necessary and sufficient to describe pauses and palm-up signs accurately.

These findings are limited to the extent of this pilot study, but it will pave the way for the next steps of the broader research project on (dis)fluency markers in LSFB (Degand et al. 2012) this work is part of. The next two steps will be to test the validity of these results on a broader corpus and to extend the study to other potential (dis)fluency markers. We will have to make a selection between, among others, false starts, self-repairs, repetitions, "flying indexes", gestures/motions fillers, spatial discourse organization, constructed actions, connecting signs such as rhetorical questions, AND, ALSO, SAME, and finally maybe the eye gaze.

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