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Suspensive and Disfluent Self Interruptions in French Language Interactions

Berthille Pallaud, Roxane Bertrand, Laurent Prevot, Philippe Blache,
Stéphane Rauzy

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FLUENCY AND DISFLUENCY ACROSS LANGUAGES AND LANGUAGE VARIETIES

Liesbeth Degand, Gaëtanelle Gilquin,
Laurence Meurant and Anne Catherine Simon (eds.)

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Suspensive and disfluent self interruptions in French language interactions

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Abstract

The numerous variations in verbal fluency are characteristic of oral utterances in conversation and can involve morpho-syntactic disruptions. This study focuses on self-breaks in verbal flow, whether or not they give rise to a disfluent sequence. Following Shriberg (1995) the structure description of oral interruptions (*Reparandum*, *Interregnum*, *Reparans*), we noted all the self-breaks along with their morpho-syntactic effects, in the eight dialogues of the CID (Corpus of Interactional Data). Our method, focusing on the self-breaks points, describes the identification and annotation procedures. It enabled us to introduce a classification of different oral phenomena relating to self-interruption and disfluency. In many cases they are followed by acoustic markers, verbal phenomena and morpho-syntactic consequences. This study made it possible to study the relationships between the interruptions themselves and their consequences. The syntagmatic process, when interrupted, was not always disrupted from a syntactic point of view: half of these ruptures are merely suspensive, the others are disfluent. The suspensive self-breaks happen with a certain regularity and their frequency has a low variation between the speakers. Considering the disfluent interruptions, it is quite different: they have a high variation. Our hypothesis is that the frequency of the suspensive breaks remaining homogeneous seems to be an essential component of speech flow. Disfluent breaks are much less frequent but the considerable variation between speakers suggests that they are representative of utterance characteristics specific to each speaker. This

hypothesis is supported by the high tendency we observed: the quicker the speech, the more the speaker produces disfluent breaks. This parameter does not influence the production of suspensive self-interruptions. All types of insertion (in the *Interregnum*) are present in one or other of the cases of interruption although in varying degrees. The phenomenon of resuming an utterance (rather than letting it unfinished) after a disfluent self-break seemed to be a dominant characteristic of oral utterances. Moreover, if we compare the *Interregnum* content, these disfluencies are two kinds of separate phenomena. On another side, the percentage of disfluencies (length of self-break ratings and disfluency phenomena) compared to the length of informative content in the oral utterances varies from one speaker to the next. This ratio is relevant since the length of time spent on non-informative utterance represents at least a third of the total speaking time.

1. Introduction

Numerous variations of verbal fluency are characteristic of utterances in conversation. For example, the fluctuation in the rhythm of the verbal fluency can be observed in the speed with which the words themselves are pronounced (Pasdeloup 1992; Duez 2001b; Shriberg 1999). Sometimes, these fluctuations can be real self-interruptions which are, systematically or not, followed by morpho-syntactic disruptions; that is, sometimes the utterance is simply resumed just as if it had not been interrupted and sometimes the utterance is disrupted (repaired or unfinished). If these interruption phenomena are not systematically linked with morpho-syntactic disruption, it seems important to examine the relationship between the interruption itself within an utterance and what is following it. This raises the question of the definition of what we refer to as disfluency. According to studies on oral utterances in spontaneous speech, several phenomena mainly qualified as disfluent can be observed.¹ These phenomena concern phonetic, acoustic and prosodic levels (Cole *et al.* 2005; Shriberg 1995 et 1999; Yoonsook *et al.* 2005; Shu Chuan Tseng 1999, 2005; Schuller *et al.* 2008) as well as morpho-syntactic levels (Pallaud 2006a, Dister 2008b). If the conversation is not prepared, no standard speaker would talk without producing these phenomena. They are specific to spontaneous speech and should not be considered as pathological (Starkweather & Givens-Ackerman 1997, Candea 2000). They may vary in quantity from one speaker to another, but they are always found in oral spontaneous speech (Blanche-Benveniste 1997; Cutler 1981; Den 2001; Fox Tree 1995; Henry & Pallaud 2003; Jeanjean 1984; Levelt 1989; Pallaud 2006b). They can occur almost anywhere in the utterance. The

¹ Some particles, such as *mais* (*but*) and *donc* (*so*), for example, are both connectors and particles and can have several uses or discursive functions (Chanet 2004): therefore, there are some specific issues to establish the list of discourse markers.

essential element in these disfluencies is the interruption point which is followed by a varying number of particular elements the speaker himself includes before achieving his utterance. These elements consist in *silent* or *filled* pauses and digressive insertions (speech markers, interjections and phatic utterances) which suspend the syntagmatic process. These ‘intrusive’ elements (Richard & Le Bot 2008) interrupt the flow of the utterance text and define a *between times* just after the point of interruption and before the utterance is resumed. The digressive insertions are discourse markers inserted into the utterance and which have in common between them, that they are not linked syntactically with the elements of the utterance which precede and succeed them. Most studies on disfluency do not distinguish between the interruption markers (filled or silent pauses, discourse markers, parenthetical incidents) and the effects of these interruptions (for example Constant & Dister 2010; Christodoulides 2015; Meteer & Taylor 1995; Zelner 1992).

Both Clark & Wasow (1998), as well as Shriberg (1999) described the subjacent structure of these interruption phenomena: as in Shriberg (1999: 7), the *Reparandum* refers to the entire stretch of speech to be deleted (that is, which will be reformulated). Thus, the stretch of the *Reparandum* is known by the stretch of the *Reparans*. The essential element in the disfluencies appear to be the *Interruption point* and that is why, in the case of an unachieved utterance (which is not followed by a *Reparans*; see below), we decided that the term preceding the point of rupture could be called *Reparandum*.

In this structure, the point of rupture is followed by the *Interregnum*, potentially used by the speaker to elaborate upon his utterance, and/or breathe: thus, a sort of verbal pause. Finally, there is the *Reparans* (that is at least a restart) which is the item that resume the syntagmatic process. The advantage of this description is that it makes it possible to discriminate first what precedes the break, then from what potentially follows it (that is the intrusive elements) without resuming the course of the speech, and last from what restarts, repairs or leaves the interrupted syntactic construction unfinished (Clark & Wasow 1998; Dister 2007; Pallaud 2006b; Henry & Pallaud 2003; Guénot 2005; Pallaud & Henry 2004 et 2007, Peshkov *et al.* 2013).

When the *Interregnum* is filled, it does not announce systematically a disruption: the utterance may be simply resumed without being repaired (suspensive interruption table 1). The disruption takes place after an adverb (*a little, un peu*) so that the syntactic linearity is affected in the disfluent break by the adverb’s repetition. The *Interregnum* contains discourse markers and a filled pause. In the Suspensive breaks we see the same elements in the *Interregnum* but they are

not followed by a repetition of elements from the *Reparandum*. The terms of *Reparandum* and *Reparans* are nevertheless used because there is a rupture provoked by elements in the *Interregnum*. Their stretch is the term preceding the interruption (*Reparandum*) or following the interruption *Reparans*.

Interruption		Reparandum	Interregnum	Reparans	
disfluent	tu perds	un peu	<i>comment dire euh</i>	un peu	des repères
suspensive	tu perds	un peu	<i>comment dire euh</i>	des repères	

Table 1. Structure of the disfluent and suspensive self-break

2. Objectives

Rather than trying to quantify and analyze a few predefined types of disfluency such as words that have been restarted, repaired or repeated, for example (Adda-Decker *et al.* 2003; Bear *et al.* 1992; Boula de Mareüil *et al.* 2005), we opted to identify all the points where the utterance flow is broken (self-break) and to describe the morpho-syntactic consequences of these ruptures on the verbal flow. Each time an *Interregnum* can be found (locatable by its specific elements mentioned above) it is possible to locate the self-break point. Moreover, as Shriberg (1999) and Beltz (2018) mentioned it, we discovered that the filling of the *Interregnum* is not mandatory in the repair structure. Some disfluent self-breaks are marked and followed only by the morpho-syntactic disruptions. In that case, the *Interregnum* contains no elements; it is empty. Nevertheless, the absence of interruptive spaces does not exclude the presence of acoustic-phonetic signs at the point of break (Shriberg 1999) or even at the *Reparans*. These are not analyzed in our study.

We propose to clearly distinguish between the *Interregnum* content and the morpho-syntactic consequences on the following utterance (the *Reparans*). Hence, it will be possible to analyze and compare the relationships between the self-breaks that are followed by a morphosyntactic disruption and those which are not. In that case, the description of the *Interregnum* content will be used to do this comparison.

3. Identification Methods: the annotation system of self-breaks and morpho-syntactic disfluencies

The identification methods and the annotation system for the breaks and morpho-syntactic disfluencies (Pallaud 2015) were developed and applied to the eight dialogues from the CID (the French Corpus of Interactional Data; Bertrand *et al.* 2008; Bertrand & Espesser 2017). The Corpus of Interactional Data is an audio-video recording of French spontaneous face-to-face conversations (8 pairs of speakers, 10 women and 6 men ; about 8 hours). The corpus was recorded in an anechoic room. Each speaker was equipped with a microphone headset enabling the recording of both speakers' voices on two different sound tracks to allow for a fine-grained analysis at the phonetic and prosodic levels as well as the study of overlapping speech and disfluencies. The CID involved familiar speakers, all French native speakers, who were asked to talk about either unusual situations (3 dyads) or conflictual professional situations (5 dyads) in which they were involved. Using Praat (Boersma & Weenink 2015) the speech signal was pre-segmented into Inter-Pausal Unit (henceforth IPU), defined as speech blocks surrounded by at least 200 ms silent pauses; this duration is well-suited to French speech. This indexation makes localization in the corpus easier and facilitates the manual orthographic transcription. It also limits the propagation of errors during the automatic phoneme alignment. More generally, the annotation process (elaborated within the framework of the OTIM project, Blache *et al.* 2009) used the set of IPUs as input. By using the same formal annotation scheme, multiple annotations were then performed at the different linguistic levels (Blache *et al.* 2010). Precise synchronization between these levels enabled to study the relationship between them.

Concerning the disfluencies, the eight corpus are totally annotated. The amount of words in the utterances in the whole corpus is : 58536 words. The 16 different speakers differ in the number of words spoken (mean: 3658; SD:2437).

Our study presents the method of identification for the breaks which is largely based on the detection of signs of interruption on the one hand, and on the other, a system of annotation which was developed to reflect the variety of morpho-syntactic break phenomena (Blache *et al.* 2014; Pallaud & Bertrand 2018).

3.1. Method of Identification for self-breaks and morpho-syntactic disfluencies

So as to describe the **totality** of the breaks (8327 breaks) in the utterances, we successively used two methods of detection, one semi-automatic and the other manual. Both methods rely on Praat software (Boersma & Weenink 2015) as an instrument of identification, annotation and description. The transcript's tier is segmented at the token level and include all the transcribed elements (including noises). The other tiers are used for coding the breaks which are also aligned with the tokens. The coding requires sometimes several tiers as often the breaks happen one after the other and their coding overlap. The contents of those annotations correspond to the description of the annotation method (*cf.* annotation). We did not distinguish the disfluencies which could be provoked by the partner talking at the same time of the speaker. We did not follow Candea (2000) on the structuring and the non structuring pauses (pauses succeeding to a filling pause or inserted in a repetition). These cases are not distinguished in our study.

3.1.1. *Semi-Automatic Method*

This method consists of locating the *Interregnum* in the verbal flow. Their contents are either isolated events (for example, a silent pause) or a sequence of several so-called 'associated' elements (for example, a filled pause, followed by a discourse marker or an interjection).² None of the break signs have a syntactic link with what precedes or follows them. The method therefore consists of systematically noting all the pauses (silent and filled) which by definition interrupt the fluency. Many of the discourse markers and interjections in the conversations are known (in French *tu sais, tu vois, bon, ben*; English equivalents, *you know, you see, well, okay* (1,2) and can also be systematically searched for. Searching for this category of marker can be complete after a full reading of the transcript (which is a necessary step, *cf.* results).

1. AB_571 and *err #* and I *err right* for my part I wasn't really in such a great state

Et *eah* et je *eah bon* pour ma part j'étais pas dans une si belle forme

² Some particles, such as *mais* (*but*) and *donc* (*so*), for example, are both connectors and particles and can have several uses or discursive functions (Chanet 2004): therefore, there are some specific issues to establish the list of discourse markers.

2. AB_620 It was *err you know* a completely crazy kind of si- *yeah err*
 kind of situation
 C'était *eah tu sais* une sorte complètement folle de si- *ouais euh* sorte de
 situation

Depending on the content of the *Interregnum*, these break signs can be categorized as follows:

- ◆ those which contain only silent pauses (sp) or filled pauses (fp): 39% of the interruptions
- ◆ interjections and discursive elements solely following the interruptions: only 15%. An established list would allow for automatic searching
- ◆ 'multiple' *Interregnum* contain at least two types of these elements: 26% of the interruptions

Therefore, this semi-automatic method allows us to identify some 80% of the total breaks in verbal flow (6627 breaks).

3.1.2. Manual method

There remain some 20% of breaks in verbal flow (1700 breaks) which are not picked up as none of the previously described elements contained in the *Interregnum* space are present: the potential space (*Interregnum* space) is empty. Nevertheless, this type of breaks is disfluent as self-breaks are marked and followed only by the morpho-syntactic disruptions. In that case, our manual method consisted of a semantic hearing/reading of the transcripts which, with the help of prosodic, semantic and/or syntactic parameters reveals these ruptures.

3. BX 360 there's also the case of the // of the two way wirings.
 Il y a aussi le cas du // du va-et-vient
4. BX 253 I get up prepare myself and all that and // and
 Je me lève me prépare et tout ça et // et

That one fifth of the interruptions is not marked by syntactic discord is a difficulty for our method. It means that 1700 had to be manually found. One solution would have been to search for syntactic discord which could constitute an automatic method of detection for disruptions in utterances (Blache *et al.* 2014). This would need to be evaluated by comparison with the results of the aforementioned manual method. The method used in automatic search for hetero-repetitions by Bigi *et al.* (2010) in the CID dialogues would have been

another solution. It was not chosen as self-repeats are numerous in conversational utterances; hence it would have consumed a lot of time anyway to distinguish the standard repeats from the disfluent one.

3.2. The Annotation system

The coding of the phenomenon caused by the rupture takes place around the point where the verbal fluency is interrupted. Moreover, the system of annotation takes into account previous studies (Pallaud & Henry 2004; Dister 2007, 2008a) which observed the disfluent utterance effects of self-breaks in spontaneous utterances; amongst these disfluencies the authors distinguish between those disfluencies which leave the utterance unfinished, those which include changes when they are repeated and those which had none at all. The morpho-syntactic aspect of the item affected by the break is also taken into account. It can be in the middle of a word (word-truncation) or in the middle of a phrase (phrase truncation) and demarcates three formal segments with the following chronology: the *Reparandum*, the *Interregnum* (Break point) and the *Reparans*.

Three consequences of these breaks have been observed and studied:

1*those when the utterance is simply continued:

We called this category of breaks *suspensive breaks* since they cause a suspension (which is temporary itself) and do not reorganize the utterance (contrary to a *disfluent break*).

5. BX 224 so err at first sight err everything was err fine.
Ainsi euh à première vue euh tout allait euh bien

2*those in which the speaker *restarts* a part of the interrupted utterance, and sometimes makes changes when the utterance is resumed.

6. CM 996 you may get some // some fireworks like that
Tu peux avoir des // des feux d'artifice comme ça
7. BX 278 finally # all that could be connected so- // somewhere
Finalement # tout ça pouvait être connecté quel- // quelque part

3*those in which the utterance is left *unfinished* and is followed by a new construction or a new phrase.

8. CM 1139 ah yes but I have // it was something that really made me
laugh

Ah oui mais j'ai // c'est quelque chose qui m'a bien fait rire
 9. CM 1198 and I// my ski bindings are not adjusted properly
 Et j'ai // mes fixations de ski ne sont pas ajustées correctement

Morpho-syntactic analysis of these lexicalized disfluencies (Pallaud 2002; Pallaud & Henry 2004) showed that the *Reparandum* can only be identified by the elements which will follow it and in particular which elements located before the break point are restarted in the *Reparans*. Then, the number of elements in the *Reparandum* is determined by what is in the *Reparans*. When the utterance is incomplete there is no *Reparans*; hence the *Reparandum* is the truncated item or the last item of the phrase left unfinished.

Except for the *Interregnum* (which has only one class and 6 categories), the *Reparans* and the *Reparandum* can be subdivided into classes, which in turn can themselves be subdivided into sub-classes: they are hierarchically coded. The annotation can either be focused on identifying the three elements of the structure (*Reparandum*, *Interregnum* and *Reparans*) or may describe each of the elements which they are made up of, as summarized in the following table (Blache *et al.* 2014). We annotated all the elements concerned in the structure:

- ◆ In the *Reparandum*: the type of element after which there is an interruption and its grammatical status
- ◆ The different types of the *Interregnum*
- ◆ In the *Reparans*: its position (the second place in the code) and its functioning (the last one)

Reparandum		
<i>Reparandum Type</i>	R	Temporary interruption
	I	Definitive Interruption
<i>Reparandum_category</i>	W	Word reparandum
	P	Phrase reparandum
<i>Lexical_type</i>	tw	Tool word
	lw	Lexical word
Interregnum B		
	no	no interval
	sp	silent pause (> 200ms)
	fp	filled pause
	dc	discursive marker
	ps	parenthetical utterance
	rt	truncation repetition

Reparans RA		
<i>Reparans_position_type</i>	<i>nr</i>	no restart
	<i>wr</i>	word restart
	<i>dr</i>	determinant restart
	<i>pr</i>	phrase restart
	<i>or</i>	other restart
<i>Reparans_type</i>	<i>co</i>	continuing the item
	<i>wc</i>	repairing word without change
	<i>rp</i>	repairing through repeating
	<i>rc</i>	repairing with change in the truncated word
	<i>rm</i>	repairing with multiple change

Table 2. System of Annotation for Breaks in Verbal Fluency

3.2.1. The Reparandum (R or I)

Within the *Reparandum* (R or I) two sorts of data are coded (the item is in italics and its code is underlined):

*the element affected by the break (second position: R,W, tw)

*the type of word (last position: R,W, tw,)

The element affected by the break (in italics):

Word fragment (W)

10. AP 246 a *collea-* (R,W,lw) well (B,dc) a *guy* (RA,dr,rc)
Un *collè-* bon un *type*

Phrase fragment (phrase truncation P)

11. CM 67 we were *completely* (R,P,lw) err + (B,fp,sp) *completely*
(RA,wr,wc)

Nous étions *complètement* euh + *complètement*

12. CM 24 this *is* (I,P,tw B,no) that evokes nothing
C'est ça n'évoque rien

The type of concerned lexicon (in italics):

– tool word tw

13. CM 32 *where* (R,P,tw) err yes (B,fp,sp,dc) *where* (RA,wr,rp) you lose a little
Où euh oui où tu perds un peu

– lexical word lw

14. CM 67 *wewere completely* (R,P,lw) err (B,fp,sp) *completely* (RA,wr,wc)
Nous étions complètement euh complètement

3.2.2. Potential Interregnum or Break (B) (table 1)

The *Interregnum*, which potentially can be filled, is located and coded to the right of the break point except when it is empty, in which case it is coded in the *Reparandum*. The breaks are in italics and their code is underline.

Examples of Breaks:

15. CM 24 this is (I,P,tw B,no) // that evokes nothing (I,P,lw) *err + err* (B,fp,sp,fp)
C'est // ça n'évoque rien euh + euh
16. CM 46 which was completely *ah that's it +* (B,dc,sp) *des-* (RA,nr,co) *err* (B,fp,sp) *desynchronized* (R,W,lw) *from the situation in fact*
Qui était complètement ah ça y est dés- euh désynchronisée de la situation en fait
17. CM 33 you lose a little (R,P,tw) *how could you say err +* (B,dc,fp,sp) *your references marks*
Tu perds un peu comment on dit euh tes points de repères

3.2.3. The Reparans or Repairs (RA)

When the *Reparandum* is coded (I), it means that the utterance is left unfinished. In that case, there is no *Reparans*:

18. AB 2864 I had gone to a show to the theatre to The Rochelle *with* (L,P,tw) *err* (B,fp) *I do not remember any more*
J'étais allée à une pièce de théâtre à La Rochelle avec euh je m'en rappelle plus

When the interruption is repaired, two types of data are coded in the *Reparans* RA: their *position* (the second place of the code) and their *functioning* (the last one).

3.2.3.1. The position of the *Reparans* which also shows the extent of the *Reparandum* (2nd position in the code)

– No restart (nr) : the sentence is simply suspended and continued after the *Interregnum*

19. CM 33 you lose *a little* (R,P,tw) how would you say err + (B,dc,fp,sp)
your references marks (RA,nr,co)

Tu perds *un peu* comment on dit ça euh + tes points de repères

-Minimal restart at the beginning of the word, Word restart (wr)

20. CM 67 we were (R,P,lw) *completely* err + (B,fp,sp) *completely*
 (RA,wr,wc)

Nous étions *complètement* euh + *complètement*

– Determiner restart (dr)

21. AP 246 *a collea-* (R,W,lw) well (B,dc) *a guy* (RA,dr,rc)

Un collè- bon *un type*

– The beginning of the phrase is restarted, Phrase restart (pr)

22. YM_1640 but anyway *you have to* (R,P,lw) err (B,fp) *you have to*
 (RA,pr,rp)

Mais de toutes façons *tu dois* euh *tu dois*

– Other types of restart (or)

23. MG_569 *he makes a sort of* (R,P,tw B,no) // *he is in a sort of village*
 (RA,or,rm)

Il fait une sorte de // *il est dans une sorte de* village

24. EDF_38 now *the water is twenty me-* (R,W,lw B,no) // *the water com-*
ing in is twenty cubic meters (RA,or,rm)

Maintenant *l'eau est de vingt mè-* // *l'eau qui arrive est de vingt mètres*
cubes

3.2.3.2. The *Reparans* functioning

The coding of the way the *Reparans* functions shows whether in the restart, one or more elements of the utterance have been changed or whether the utterance simply continues:

– simply continues without restart (co)

25. AP_242 *the* (R,P,tw) *err* (B,fp) *husband* (RA,nr,co)
Le euh mari

– repairs the truncated word without change (wc)

26. AP_249 *the f-* (R,W,lw B,no) // *family* (RA,wr,wc)
La f- // famille

– repairs through repetition (rp)

27. CM_33 *yes where you lose a little* (R,P,lw) *err +* (B,fp,sp) *you lose a little* (RA,pr,rp) *of*
Oui là où tu perds un peu euh + tu perds un peu de

– repairs with change in the truncated word (rc)

28. AP_246 *a colleg-* (R,W,lw) *well* (B,dc) *a guy* (RA,d,rc)
Un collè- bon un type

– with multiple changes (rm)

29. CM_56 *and we have go-* (R,W,lw B,no) // *we had rented* (RA,pr,rm)
a car
Et nous sommes par- // nous avons loué une voiture

30. YM_176 *and then I did* (R,P,tw B,no) // *sometimes I dreamed I did it* (RA,or,rm)
Et alors j'ai fait // parfois j'ai rêvé que je le faisais

4. Some results

In addition to providing a scheme of annotation and resources for spoken French, this study aimed to describe and compare the characteristics of the two types of self-break (suspensive and disfluent) which are evidenced. Several criteria were considered such as frequency, number of words between breaks,

the elements which follow the break, its position in the phrase/proposition and tool words/lexical words).

4.1. The percentage of Suspensive and Disfluent Breaks

Method of calculation:

The total number of breaks is obtained by finding all the cases of *Reparandum* (R,P and R,W) and all cases of abandon (I,P and I,W).

The suspensive breaks are the *Reparans* RA,nr,co.

The disfluent breaks are the remaining *Reparans* (RA,) and the I,P and the I,W

On average, more than half of the observed breaks (58%) were suspensive, the remainder being disfluent. The disfluent breaks can be subdivided into two categories: restarted utterances and abandoned utterances. Regardless of the speaker, the breaks followed by a disfluent restart (not all restarts and repetitions are disfluent, Bigi *et al.* 2010) are much more common than those left unfinished (an average of 29% and 13% respectively). These results showing a greater number of restarted disfluent breaks than abandoned ones, had been also observed in recordings of semi-directed conversation (Pallaud & Henry 2007; Dister 2007). Then, we can consider these results in 8 CID dialogs as solid and representative of dialogue situations in spontaneous conversation.

As we show previously (Pallaud & Bertrand 2018) interruptions which are merely suspensive occur on average every 12.3 words (SD:1,9). That means, for the CID corpus, an average of 8,2 suspensive breaks occur per every 100 words. They could be further categorized into breath and non-breath pauses (Trouvain *et al.* 2016), a distinction we did not try.

The disfluent breaks are on average considerably less numerous than the suspensive ones (one every 18.8 words; SD:7,7) and vary a lot more from speaker to speaker. Using Beltz *et al.* (2018) parameter, we found a similar result: 5,3 disfluent breaks every 100 words. Their study reviewed some recent studies on *disfluencies in general* and reported that, in spontaneous speech, these types of break occur in about 6 per every 100 words. In fact, the comparison is not easy as it is not mentioned what is considered as *disfluencies in general*.

Our hypothesis is that the frequency of the suspensive breaks is an essential component of speech flow. On the contrary, the considerable variation in the frequencies of disfluencies produced by the speakers suggest that disfluent

breaks are representative of utterance characteristics which are specific to each speaker. Could they be a mark of some individual dimension to speech while suspensive breaks mark the functioning of the speaker's oral and cognitive production (e.g. memory span).³ These disfluent breaks within the utterance form a new category of interruption, and a comparative approach, comparing with breaks which are only suspensive is justifiable.

4.2. Similarities and differences in Suspensive and Disfluent Breaks

A speaker who often interrupts his/her utterance has short interval (in number of words) and long interval when he/she interrupts less. A speaker who produces short sequences of words between two suspensive breaks has regularly and often some time to pause (the duration time of the *Interregnum*) and to pronounce his/her utterance. Does he/she therefore produce less disfluencies? If this was true, it would suggest a negative correlation in the *number of words* between two suspensive breaks and in the number of words between two disfluent breaks.

4.2.1. *Average interval between two breaks. A comparison between suspensive and disfluent interruptions*

The speakers have varying number of suspensive and disfluent breaks (Figure 1) in their utterances but do these two types of breaks differ and may be considered as independent. Considering the average number of breaks for each speaker, we observed a much higher variability in the average number of words between two disfluent breaks (18,7; SD: 7,7) than in the suspensive ones (12,3; SD: 1,9). We found a tendency for the suspensive breaks to be negatively linked with the disfluent ones (-0,36). Some speakers have higher interval between two disfluent interruptions even if their suspensive breaks are frequent (speakers 2, 11 and 12 for example) which is not in conformity with our assumption. These speakers do many suspensive and disfluent self-interruptions. The speakers (4, 7, 9 and 13 for example) have a high disfluent interval and a low suspensive interval which is in conformity with our assumption: to stop frequently in a suspensive way helps to avoid disfluent interruptions.

³ Specialists in simultaneous translation for example (Lederer 1981) have been able to measure the average number of words held in memory in these operations. They estimate that speakers hold between seven and ten words in reserve and have seven to ten words on hold (Blanche-Benveniste 1997: 22).

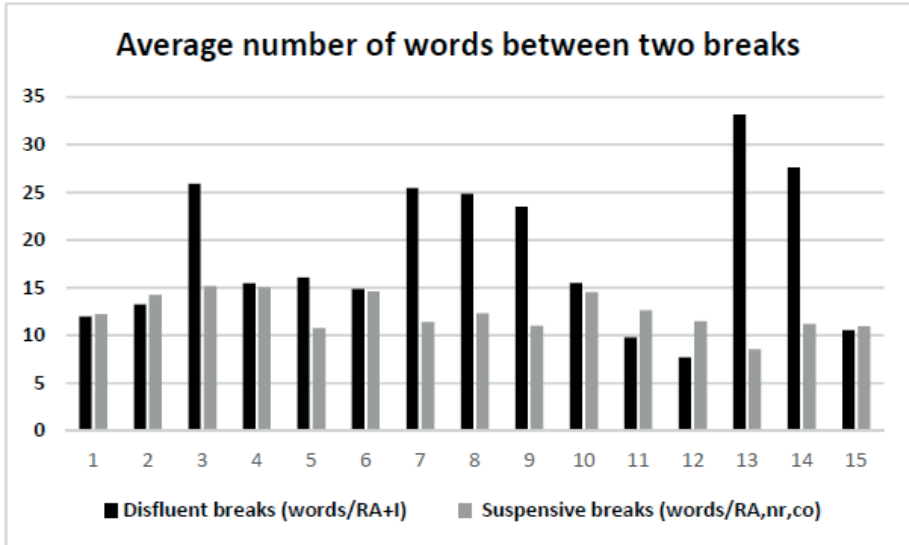


Figure 1. The average number of words between two breaks (suspensive and disfluent breaks) for each speaker

The same comparison (Figure 2) between the disfluent breaks followed by restart (on average: every 27.5 words; SD: 11,3) and disfluent breaks left unfinished (every 67.5 words; SD: 39,8) showed a positive correlation (+0.56; $p < .02$). Comparing the standard deviation SD in these two types of disfluencies, shows that the disfluencies with restart happen more regularly than the unfinished ones. Speakers who often interrupt, restart and change their utterances, are the ones who also often leave their utterances unfinished but more irregularly. Therefore, we could consider that there are speakers who falter whatever the means and those who falter less (Pallaud & Bertrand 2018).

4.2.2. Word speed influences

In this study, we can identify and distinguish, for each speaker, the total time taken to utter the words spoken and the duration of the *Interregnum* within the utterances. Then, we can measure two speeds in verbal fluency: the *speech speed* which takes into account the whole utterance (including *Interregnum*) and the *word speed* (the utterance without *Interregnum*).⁴

⁴ In our corpus, the values of the speech speed vary depending on the speaker from 173 to 259 words per minute: the average speech speed is 220 words per minute (SD: 21.53).

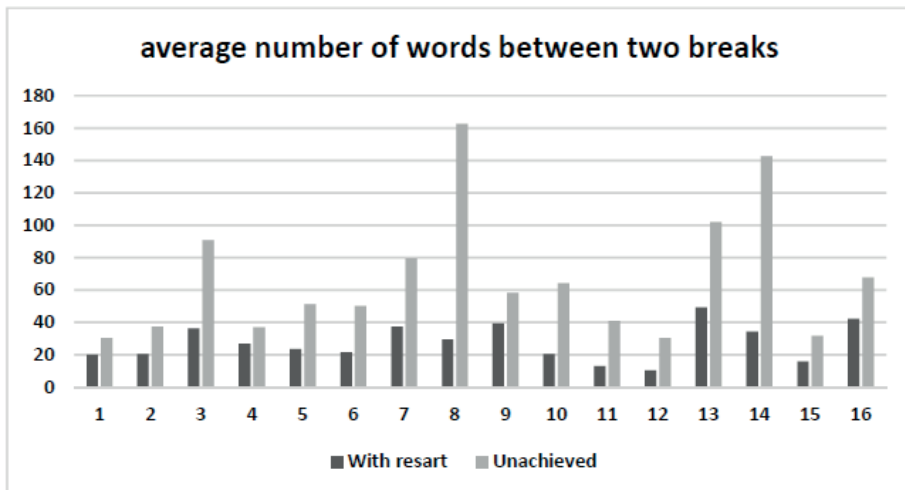


Figure 2. The average number of words between two disfluent breaks (with restart or unachieved) for each speaker

If the speaker disfluencies differ from one another when we consider the break frequencies could it be possible to establish a relation with the speed of the speakers talk. The *word speed* (that is the duration of words alone) seems to be a more precise parameter to investigate the way a speaker produces more or less disfluencies. The average rate is then 312 words per minute (SD: 23.7). This value varies depending in the speaker (from 245 to 345 words per minute). In particular, what is the relationship between the word speed for each speaker and other speech criteria, such as the number of words between disfluent or suspensive breaks and the Interregnum duration?

4.2.2.1. Relationship in suspensive breaks with the word speed

The average number of words between two suspensive breaks is 12,3 (SD1,9). When the speaker interrupts less his/her utterance, the number of the words between two suspensive breaks is greater. Could this parameter be influenced by the word rate? If the word rate increases, the number of words between two suspensive breaks could enhance. In fact, it does not significantly increase ($r=+0.27$). It was not possible to affirm that quicker speech makes it possible for the speaker to pronounce more words between two suspensive breaks. It is not a parameter which influences the production of suspensive self-interruptions.

4.2.2.2. Relationship in disfluent breaks with the word speed

Concerning disfluent breaks, the hypothesis is different: rapid speech flow would encourage linguistic errors which will be more numerous. As a consequence, this generates shorter sequences between two disfluent breaks (an average of 18,8 words; SD 7,7). Indeed, we observed a tendency (a negative correlation -0.36) between the rate of the words and the number of words in disfluent breaks: hence, the tendency is that the quicker the speech, the more the speaker produces disfluent breaks (which is shown by the number of words between two disfluent breaks that decreases).

4.3. Markers of Suspensive and Disfluent Self-Breaks

What are the existing relationships between suspensive and disfluent breaks and the presence of an interruptive marker (the *Interregnum*)? We have seen that the inventory of breaks in the utterances was established by two methods: automatic detection of the *Interregnum* spaces (*1), and, when there were none, the effects of the break itself (*2):

*1 The *Interregnum* are different in nature and consist in various elements in the verbal flow: silent or filled pauses (*err*) and discursive markers. These elements may or may not be associated. Four categories were distinguished: silent or filled pauses alone, discursive markers alone and *multiple spaces*.

*2 Syntactic and/or semantic discord reveals an interruption which has no observable break space (or at least cannot be observed using our criteria). This *Interregnum* is said to be *empty*.

4.3.1. *Distribution of Markers in Disfluent and Suspensive Self-Breaks*

Filled pauses are thought to co-occur with syntactic complexity (Watanabe *et al.* 2005). Do the elements in the filled *Interregnum* spaces have different links with disfluent utterances than those with simple suspensions of the utterance? In other words, would it be possible to predict the type of break by knowing the *Interregnum* content. The method used in order to answer this question was based on the number of words in the *Interregnum* (Figure 3). Suspensive breaks can only be detected by the elements contained in the *Interregnum* since, by definition, the content of the *Interregnum* having no effect (morpho-syntactic at least) on which follow them, the *Interregnum* is the only way to detect a suspended utterance. This is not the case with disfluent breaks: as was mentioned

above (part II, method), for some of these breaks, the *Interregnum* space may be empty.

In our annotated corpus (CID), we detected and analyzed all the 8327 breaks. The major difference between the suspensive breaks and the disfluent ones is that this last category has nearly half of its *Interregnum* empty (46%; Figure 3) which is not the case with the suspensive ones that have no empty *Interregnum* (by definition).

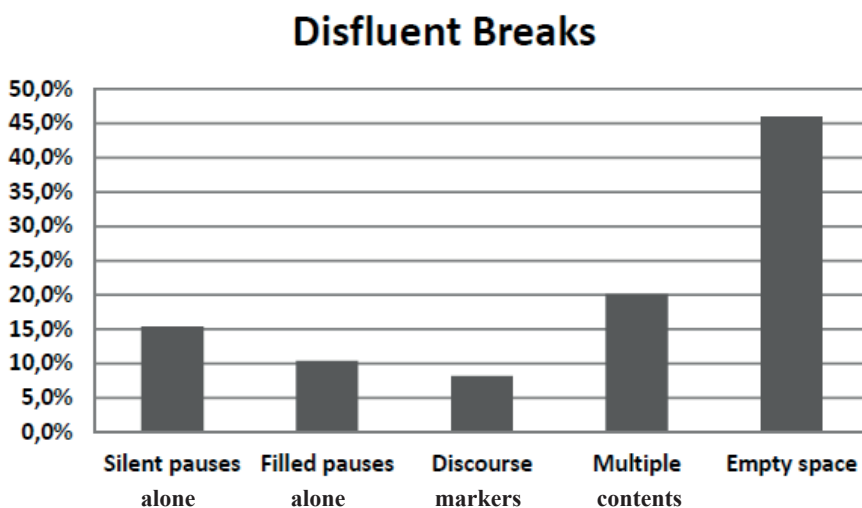


Figure 3. Contents of *Interregnum* spaces in Disfluent Breaks

These cases of morpho-syntactic disruption without a filled *Interregnum* were manually detected: they represent a fifth of total breaks (1700 breaks; 20%). Nevertheless (Figure 4), all types of *Interregnum* are present in the suspensive breaks and in the rest of the disfluent breaks: silent or filled pauses alone, discursive markers alone and multiple content.

We note that, if all the different types of *Interregnum* content are presented in both disfluent and suspensive breaks, they are not present to the same extent. Whether suspensive or disfluent, the breaks are more frequently followed by silent pauses and multiple contents in the *Interregnum* (around a third). But, if considering the silent pauses alone, the suspensive breaks are more frequent (38% against 29%), the inverse is found when we consider the *Interregnum* with multiple content (31% against 37%). Thus, as we observed the silent pause

is not only present in suspensive breaks. It is associated with a disfluent break in a significant number of cases (Duez 2001a and b). Filled pauses alone and discourse markers alone were less observed (around a fifth). In the suspensive breaks, the filled pauses were less frequent than in the disfluent breaks (12% against 19%). The contrary was observed with the discourse markers alone (20% against 15%).

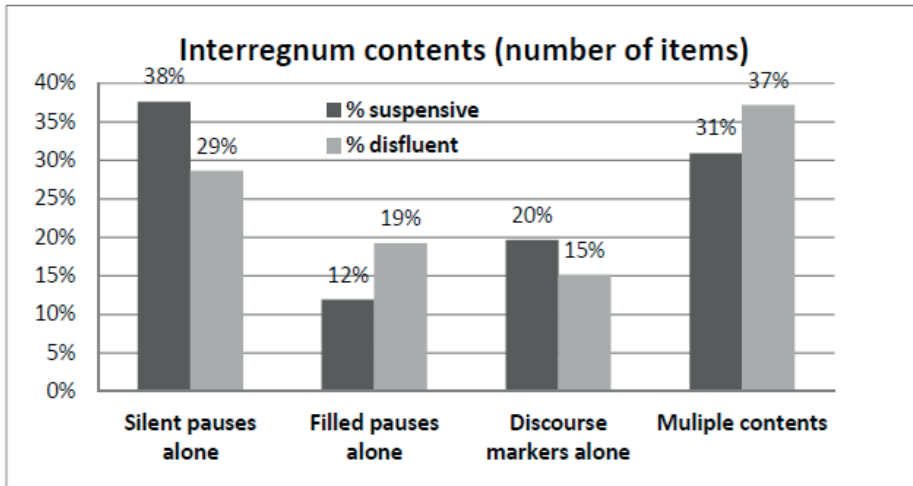


Figure 4. Filled Interregnum in suspensive and disfluent breaks. Percentage of silent or filled pauses alone, discursive markers alone and multiple content in the Interregnum (suspensive and disfluent breaks)

4.3.2. Distribution of Markers in the two types of Disfluent Break (with restart or unfinished)

Whoever the speaker may be and whatever the interrupted item (Figure 4) (Pallaud & Bertrand 2018), disfluent breaks with restarts are much more common and regular (see above Figure 2) than those when the utterance is left unfinished (29% versus 13% of total breaks).

Amongst them, there are also differences in position concerning the *Interregnum* (Figure 6). More than half of the disfluent breaks with restart (50% of the disfluent breaks) are followed by an empty *Interregnum* space. The remainder are followed by simple silent pauses and multiple element *Interregnum* (16%, 14%) and to a lesser degree, by discursive markers and filled pauses (7% and 8%).

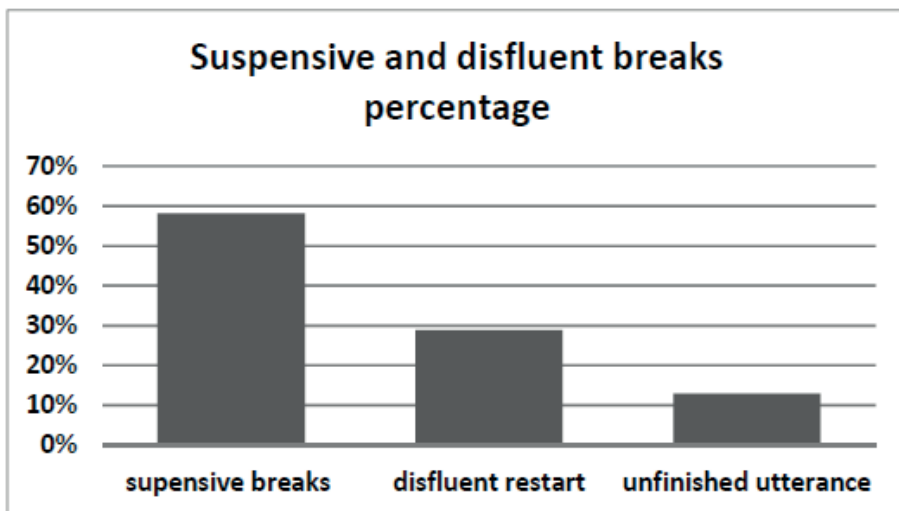


Figure 5. Percentage of the three types of self-interruptions: suspensive breaks, disfluent breaks with restart and unachieved breaks

Concerning those disfluent breaks which are unfinished, the figures are quite different. The proportion of empty *Interregnum* is only a quarter (28%). These interruptions are followed, in a third of the cases by multiple element *Interregnum* (33%), by simple silent pauses (18%), by filled pauses (14%) and by discursive connectors (10%). As is shown in the Figure 6, our semi-automatic detection (based on the presence of an *Interregnum*) enables us to detect three quarters of the left unfinished utterances, but only half of the breaks with restart. This result suggest that these two types of disfluent breaks ought to be considered separately and that it would be useful to develop separate methods to detect them. For example, it is interesting to note that the breaks with restart always contain repeats whereas the unfinished breaks have none. Using a detection of self-repeats, in the case of empty *Interregnum* (1704 disfluencies in the corpus CID), it would be possible to find the 1367 disfluencies with restart. The remain, 337 cases of unfinished utterances, requires a manual detection (4% of the total self-breaks but 27% of the unfinished self-breaks).⁵

⁵ The total of breaks : 8327. The total of unfinished utterances : 1222.

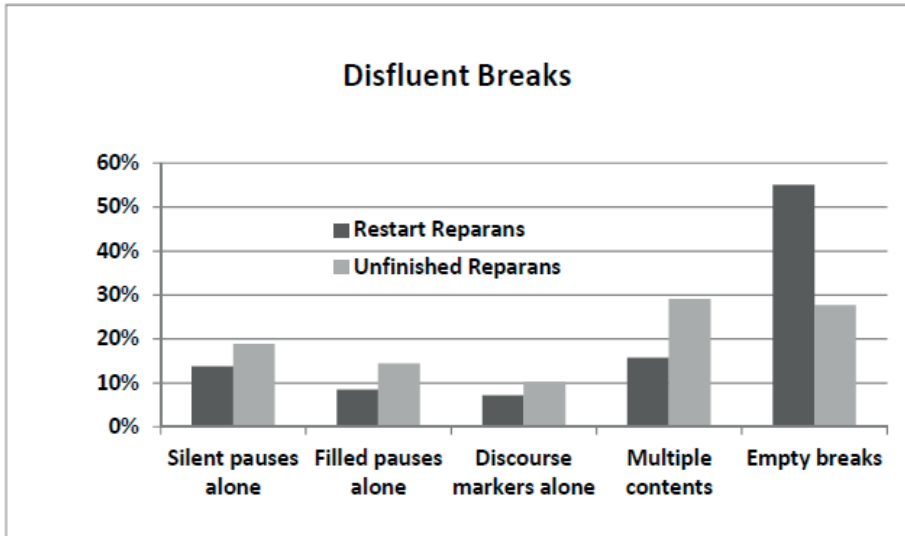


Figure 6. Proportions of types of insertions in disfluent breaks with restart (RA) and when the utterance is abandoned (I) (number of items)

4.4. The importance of the informative utterance in a spontaneous conversation

If we try to give priority to the informative communication it may be worthwhile taking out of the oral utterance those elements which are not directly concerned with the passing on of information. Disfluencies can be said as phenomena that do not add propositional content to an utterance (Fox Tree 1995: 709). The deletion of certain elements in the oral utterance would enable us to concentrate on a 'cleaned up' version of the utterance, a sort of a 'maximal phrase' (Blanche-Benveniste 1997). This is the case for some of the elements in the breaks which we have described here. The disfluent *Reparandum* is what the speaker himself decided to reject, by proceeding with a rephrasing. Hence, the size of the disfluent *Reparandum* is determined by the form of the *Reparans* (i.e. the readjustment). All the *Interregnum* intervals (editing phases) could also be eliminated since these instances do not contain any information (nevertheless, they are valid for a discourse analysis). Since it is impossible (with our current means) to distinguish between respiratory breaks and hesitation (cognitive activity) these *Interregnum* intervals are all considered in our calculations.

The average proportion of the *Interregnum* space with regard to the size of the utterance is 29.3% (SD: 4.8).⁶

The average proportion of the *Reparandum* with regard to the duration of the utterance is 4.6% (SD: 2.0).⁷ If we are considering the pure informative value of the utterance, we can say that a third of those produced by the CID speakers brings no information to their interlocutor.

5. Conclusion

We proposed to study of frequent phenomena in oral utterances prioritizing self-breaks as an essential part of these utterances. Our method, focusing on the self breaks points, describes the identification and annotation procedures. It enabled us to introduce a classification of different oral phenomena relating to self-interruption and disfluency. In the corpus CID, the speakers could interact freely and their speech was not prepared.

Our method allows us to identify two different types of self-breaks. Contrary to disfluent breaks which generate syntactic disruption, a little over half of these breaks are not followed by a reformulation of the phrase, or an unfinished phrase or word, but by a simple continuation of the utterance. We named them: suspensive self-breaks. Their frequency (around 12 words between two suspensive break) remains homogenous. Our hypothesis is that the frequency of the suspensive breaks remaining homogeneous seems to be an essential component of speech flow. Disfluent breaks are much less frequent but the considerable variation between speakers suggests that disfluent breaks are representative of utterance characteristics specific to each speaker, the functioning of the speaker's oral and the cognitive production. Thus, a comparative approach with suspensive breaks is justifiable.

Considering the average number of breaks for each speaker, we observed that suspensive breaks and disfluent breaks have a high tendency to be negatively linked. The speakers who interrupt more frequently their suspensive utterances seems to have the opportunity to have more time (more *Interregnum*) and hence to make less errors. This hypothesis is supported by the high tendency we observed: the quicker the speech, the more the speaker produces disfluent breaks (which is shown by the number of words between two disfluent breaks

6 Duration of the statement = duration of the *Interregnum* + duration of the words

7 The size of the *Reparandum* followed by disfluency is estimated by the size of the disfluent *Reparans*.

that decreases). This parameter does not influence the production of suspensive self-interruptions.

We note that, if all the different types of Interregnum content are presented in both disfluent and suspensive breaks, they are not present to the same extent. The major difference between the suspensive breaks and the disfluent ones is that this last category has nearly half of its Interregnum empty which is not the case with the suspensive ones that have no empty Interregnum. The silent pause is not only present in suspensive breaks, it is associated with a disfluent break in a significant number of cases (Duez 2001 a). In the suspensive breaks, the filled pauses were less frequent than in the disfluent breaks, the contrary was observed with the discourse markers alone.

If we compare the two types of disfluent breaks (with restart or unfinished) we found a positive correlation of breaks with restart with the unachieved ones, the last being more irregular. We could consider that there are speakers who falter whatever the means and those who falter less. Our semi-automatic detection (based on the presence of an Interregnum) enables us to detect three quarters of the left unfinished utterances, but only half of the breaks with restart. This result suggest that these two types of disfluent breaks ought to be considered separately and that it would be useful to develop separate methods to detect them.

The breaks and reorganizations do not seem on the whole to counter the running of the verbal sequence, but rather to impose a rhythm which is inherent to oral utterance (Pallaud 2008). It even seems that this rhythm which is particular to the creation of oral expression is, on the contrary, one of the conditions of optimal interaction in so far as by generating the reorganization of the utterance (a recurrence) and by alternating moments of silence and various interjections, makes the informational load of the utterance easier to bear (Boula de Mareüil *et al.* 2005; Fraundorf & Watson 2011; McAllister *et al.* 2001; Pallaud & Henry 2004; Shriberg 1995).

Hence, it would seem preferable to remove any pejorative connotations from the term disfluency, linked to the term *dysfluency*, which is itself reserved for phenomena which have been observed in certain pathologies such as stammering (Pallaud & Xuereb 2008) or Parkinson's disease, for example. Furthermore, the data obtained with 'standard' speakers enables a strategy of comparison with the utterances made by people affected by these different pathologies and to better describe their *dysfluent* characteristics. Other researches are focused on the comparison of the differences and similarities of disfluencies in spontaneous speech in a context of second language acquisition with native (L1) and non-native speakers (Beltz *et al.* 2018). In both cases (pathology as well lan-

guage acquisition), it seems worthwhile that the *fluent* disfluencies (*standard* speaker) can be described.

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CORPORA AND LANGUAGE IN USE

Fluency and disfluency are characteristic of online language production and may be signalled by markers such as filled and unfilled pauses, discourse markers, repeats or self-repairs, which can be said to reflect ongoing mechanisms of processing and monitoring. The *Fluency & Disfluency across Languages and Language Varieties* conference held at the University of Louvain in February 2017 marked the closing of a five-year research project dedicated to the multimodal and contrastive investigation of fluency and disfluency in (L1 and L2) English, French and French Belgian sign language, with a focus on variation according to language, speaker and genre. The closing conference was intended as an opportunity to further expand the range of languages, language varieties and genres studied from the (dis)fluency perspective. The selection of papers in this volume reflects the diversity of approaches aiming to uncover the ways in which fluency and disfluency are conceived in language production and comprehension and how they are signalled. Topics include methodological challenges in cross-linguistic (dis)fluency research, the role of contextual features in professional and non-professional settings, and the characteristics of fluency and disfluency in second language speech. Of particular importance in all contributions is the ambivalent role of pauses, discourse markers, repeats and other markers, which can be both a symptom of encoding difficulties and a sign that the speaker is trying to help the hearer decode the message. They should thus be interpreted in context to identify their contribution to fluency and/or disfluency, which can be viewed as two sides of the same coin.

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