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► **To cite this version:**

Gaëlle Ferré. Pragmatic gestures and prosody. Gesture and Speech in Interaction (GESPIN), Max Planck Institute for Psycholinguistics, 2023, Nimègue, Netherlands. Paper 6893. hal-04214534

HAL Id: hal-04214534

<https://hal.science/hal-04214534>

Submitted on 22 Sep 2023

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Pragmatic gestures and prosody

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Abstract

The study presented here focuses on two pragmatic gestures: the *hand flip* (Ferré, 2011), a gesture of the Palm Up Open Hand/PUOH family (Müller, 2004) and the closed hand which can be considered as the opposite kind of movement to the opening of the hands present in the PUOH gesture. Whereas one of the functions of the hand flip has been described as presenting a new point in speech (Cienki, 2021), the closed hand gesture has not yet been described in the literature to the best of our knowledge. It can however be conceived of as having the opposite function of announcing the end of a point in discourse. The object of the present study is therefore to determine, with the study of prosodic features, if the two gestures are found in the same type of speech units and what their respective scope is.

Drawing from a corpus of three TED Talks in French the prosodic characteristics of the speech that accompanies the two gestures will be examined. The hypothesis developed in the present paper is that their scope should be reflected in the prosody of accompanying speech, especially pitch key, tone, and relative pitch range. The prediction is that *hand flips* and closing hand gestures are expected to be located at the periphery of Intonation Phrases (IPs), Inter-Pausal Units (IPUs) or more conversational Turn Constructional Units (TCUs), and are likely to be co-occurrent with pauses in speech. But because of the natural slope of intonation in speech, the speech that accompany early gestures in Intonation Phrases should reveal different features from the speech at the end of intonational units. Tones should be different as well, considering the prosodic structure of spoken French.

Index Terms: Pragmatic gestures, Palm Up Open Hand, closing hand gesture, prosody

1. Introduction

It is nowadays well-established that gesture participates in the linguistic meaning of the messages conveyed by participants in interaction. Yet, there is still a gap between the number of studies focused on the functions and integration of representational gestures in oral communication, and studies that describe non-representational gestures. Among the latter, points (Kita, 2003) and beats (Biau et al., 2018; Biau and Soto-Faraco, 2013; Prieto Vives et al., 2018; Rohrer et al., 2019; Swerts and Kraemer, 2007; Wang and Chu, 2013) have received some attention, although more work is indeed needed to complete the understanding of their different roles. These two gesture types are however not the only pragmatic gestures found in speech (Kendon, 2004). Cienki (2021) has described one function of the metaphoric gesture sometimes called *hand flip* (Ferré, 2011) as serving to introduce a new point in discourse. This gesture is a member of the PUOH (Palm Up Open Hand) family described by Müller (2004) and can take many different forms, according to Cienki, ranging from a simple raising of a finger in its most reduced performance, to a fully-fledged bimanual hand flip. This gesture is quite pervasive in argumentative

discourse and is typically performed when a speaker wants to emphasize on the fact that some addition or justification has been provided to the argument (Ferré, forthcoming a). The gesture could be considered as a representational gesture because of its metaphoric dimension, but is generally viewed as non-representational. *Hand flips* are considered as variants of beats by some scholars (McNeill, 1992, 2005, among others), although beats have been shown to play a more local emphasis function on lexical items whereas *hand flips* serve to emphasize larger discourse units (Ferré, forthcoming b).

The opposite gesture used to frame the end of a discourse unit is performed as a closing of the hands in a deliberate movement, not just a retraction of the *hand flip*. It shows more tension in the fingers than would be the case in a simple retraction phase and may be followed by a retraction of the hands. It has not yet been described in the literature, to the best of our knowledge. Yet, it has been revealed as a particularly conspicuous gesture in the corpus used for our study. Its function could be seen as close to the argumentative role of the *hand flip* insofar as it serves to frame the end of a discourse unit and it emphasizes the fact that the speaker has closed a particular argument in speech. This gesture could then be considered as the exact opposite of the *hand flip* and the aim of the present paper is to ascertain that this is indeed the case. One way to do this is to look at the prosodic form of the speech these two gestures accompany and reveal what prosodic unit they are more likely to frame. This is what will be done on a corpus of three TED talks in French. This type of corpus is quite suitable for the observation of the two pragmatic gestures since conference talks typically present argumentative speech in which the two gestures are performed more frequently than in ordinary conversations. After giving some context for the production of the gestures and explaining some elements of French prosody essential to understand the study conducted here, the corpus and methodology will be described. This will be followed by the results of the statistical analysis conducted on the corpus as well as a discussion.

2. Background

2.1. Two pragmatic gestures

The two gestures analyzed in the present paper play a role in showing the information structure of linguistic messages. Cienki (2021) describes several forms of PUOH gestures and the way these gestures underline or highlight a new point in discourse. The PUOH gesture is described in Müller (op. cit.) as particularly multifunctional since it not only expresses uncertainty (in its epistemic function), but may also be used to quote somebody's speech or to release the floor to another participant in interaction (interactive function) or introduce a new discourse item, the function it assumes in the corpus in our study and which has been retained here. As explained by Müller, the various roles of the gesture all derive from a single core meaning: the presentation of a discourse object to

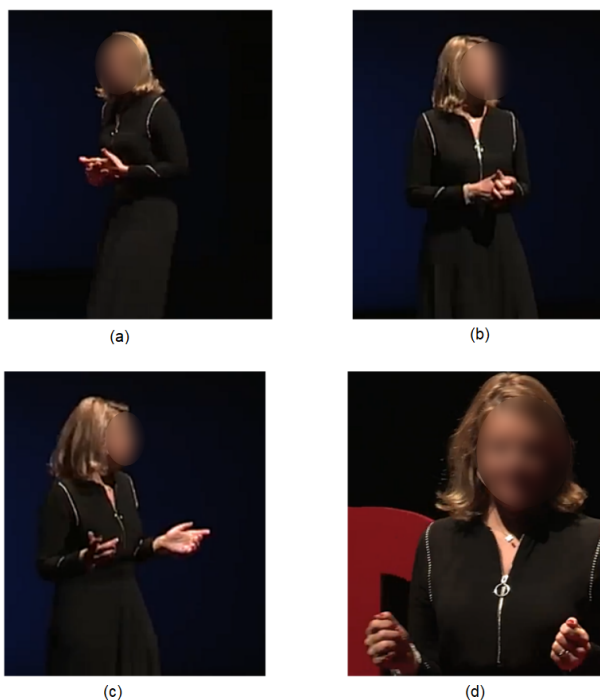


Figure 1: Two hand flips (images a and c) and closing hand gestures (images b and d) by one of the speakers of the TED talk videos.

interlocutors on the empty palm of the hand presented as some offering. Cienki (op. cit.) goes further in his description of the gesture when its function reflects discourse organization. He observes that the gesture can be single handed or two-handed, and can even be performed with very different hand shapes and movement type and direction ranging from the complete flip of the hand (i.e., *hand flip* is therefore the term that will be used in the present paper) to a smaller raising of a finger as a reduced form of the same gesture that would play the same function as opening a discourse unit. A reduced form of the gesture is discussed in the example provided below to illustrate the two gesture forms discussed in the present paper. Since the PUOH gesture serves to highlight or frame a discourse unit, its scope of action is larger than the word, contrary to the scope of beats, which are used to highlight a particular lexical element in speech. However, it has yet not been established the type of discourse unit under its scope, and whether *hand flips* and closing gestures frame discourse at the same level. The two gestures are illustrated in the example below.

Ex:	Je viens d' <u>une enfance</u> (0,2s)	<u>très</u>	<u>libre</u> (0,5s)
	<i>My childhood was</i> (0,2s)	<i>very</i>	<i>free</i> (0,5s)
	hand flip 1	beat	closing gest. 1
	et <u>joyeusement</u>	<u>bordélique</u> (0,8s)	
	<i>and happily</i>	<i>messy</i>	
	hand flip 2	closing gest. 2	

Just before this extract, the speaker was standing with her hands clasped in front of her body and after a silent pause, she adds a new point in her talk illustrated in the example above. This new point is first accompanied by a small *hand flip*, illustrated in Figure 1(a) performed in co-occurrence with the underlined text at the beginning of the utterance. The *hand flip* here is par-

tial as the speaker's fingers are still interlaced. With her hands still in this position, she produces a short beat gesture on '*très*' (*very*) which is synchronized with an emphatic stress on this degree adverb. She then closes her hands in a tight clasping gesture (Figure 1b) as she utters the end of '*libre*' (*free*). The two gestures can be considered as framing this point of the talk where the speaker describes her childhood and which forms a complete information unit.

She then adds a coordinate clause after another silent pause. This second clause is accompanied by a second *hand flip* (Figure 1c) that coincides with the utterance of '*joyeusement*' (*happily*). This gesture is larger than the first; her hands are slightly more open and not clasped anymore. At the end of the clause, she finally performs another closing hand gesture illustrated in Figure 1(d) just before the silent pause. This coordinate clause can be considered as forming a new information unit in the argument that is added to the description of her childhood by the speaker. Here, she opposes '*free*' and '*messy*' to describe the fact that her parents didn't attend to their children the way they should have done. It should be noted, by the way, that this second closing hand gesture is also much more intense in its intentionality than the first one performed by the speaker and although the speaker's face is blurred in Figure 1, the video reveals that she also closes her eyes while performing this second closing hand gesture as if she wanted to focus her whole attention onto herself and what she is going to say next.

After this short extract, she continues her description with the following comment that comes as an illustration of her point: "*Chez moi, par exemple, au moment de manger on ouvrait le frigidaire, on prenait ce qu'il y avait dedans*" (*At home, for example, when it was time for dinner, we just opened the fridge and took whatever was there*). This illustration in her argumentation is also accompanied by two *hand flips* and two closing hand gestures. We can therefore say that the two gesture types are indeed used to frame new information units in her talk. But since not all information units are systematically framed by the two gestures, we can say that those which are accompanied by them are highlighted and considered as more important argumentative moves than other speech parts.

2.2. Prosodic information structure in French

Without wanting to give too detailed a description of prosodic constituency, it may be useful to briefly describe what constituents have been taken into account in this study, what their prosodic features are and how they define information structure. This will be useful in understanding the two gestures which frame information units, as we have seen in the previous section.

Some prosodic units are more formal than others. This is the case of Inter-Pausal Units (IPUs). IPUs define chunks of speech separated from the rest of the speech material with silent pauses. The threshold generally adopted to determine the presence of a silent pause in French is 200 ms, or 0.2 sec (Bertrand et al., 2008; Bigi & Priego-Valverde, 2019), a duration which ensures that (a) silent pauses can be perceived by listeners, and (b) they can't be confused with the closure of stop consonants. These silent pauses indicate how speakers group the different pieces of information present in spoken messages but they may also indicate some hesitation on the part of speakers or on the contrary some highlighting of a speech segment with what can be called "*focalisation pauses*" (Strangert, 2003; Ferré, 2004). There is one pause of this type before '*très*' in the example given in the previous section. The pause after '*libre*' is linked to the

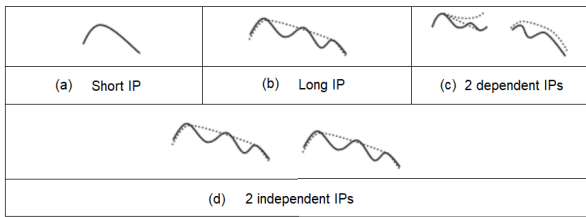


Figure 2: *Prototypical intonation curves for neutral statements in French (adapted from Vaissière, 2005:250).*

structure of the message, rather than to the highlighting of a word. As to hesitation pauses, they are generally not present in the type of videos we have collected here, since they have been edited before broadcasting and hesitations probably removed. Besides, even the original presentations probably contained few hesitations as the talk was rehearsed and not as spontaneous as everyday interactions.

A bit more complex to determine are Intonation Phrases (IPs, Nespor & Vogel, 2007). These prosodic units partly overlap IPUs, since some IPs may as well form IPUs by themselves, but they are however smaller information units since each IP is not necessarily followed by a silent pause, so that an IPU may contain several IPs.

These two types of prosodic units are quite adapted to describe the structure of oral discourse and they are directly dependent on how speakers organize and prioritize pieces of information in their linguistic messages. Pitch key is one of the parameters that indicate new information units in messages. As shown in Figure 2a and b, pitch follows what is called a natural declination slope in neutral statements and the fundamental frequency decreases progressively throughout a simple intonation unit. As shown in 2c however, it can be rising at the end of the first IP in a series of two dependent IPs (although this is not necessary as shown by Martin, 2006). The direction of pitch movement is falling on two independent IPs as shown in 2d. Yet, the first stressed syllable of the second IP is reset to a higher frequency than the one on the last stressed syllable of the first IP. Pitch declines progressively throughout an oral paragraph and is reset again at the beginning of a new paragraph. Figure 2 also reveals that there is an initial pitch rise at the beginning of speech units, whereas the end of speech units is uttered with a falling pitch contour.

2.3. Research questions and hypotheses

The research questions which have guided this study postulate that the two gestures under observation frame discourse units in a parallel way. Beside this parallel distribution, it is unclear whether they frame larger intonation units like IPUs or smaller ones like IPs. They may as well be synchronized with conversational units like TCUs.

If they frame larger speech units like IPUs or even TCUs, the gestures should be accompanied with speech uttered with:

- rising pitch contours for *hand flips* which open discourse units and falling contours for closing hand gestures;
- pitch upstep for *hand flips* and pitch downstep for closing hand gestures;
- possibly higher pitch key for *hand flips* than for closing hand gestures.

If, however, they frame smaller speech units like IPs, since these units may be dependent or independent and have therefore varied prosodic forms, the tone of the speech will still be rising when accompanying *hand flips* but it may be rising as well when synchronized with closing gestures instead of falling. Pitch may not necessarily be upstepped for *hand flips* and pitch key may not be higher either.

3. Corpus and annotations

The corpus selected for the present study consists of three video documents available online.¹ These videos are 3 TED talk presentations in French, lasting 13 min 19, 9 min 43 and 13 min 41 respectively, therefore totaling 36 min 43. The three TED talks have been selected for several reasons. They are in French and have been filmed so that gestures are fully visible, even if the framing may change from time to time. There are indeed parts in which there is a zoom-in on the presenter's face but these parts are not too frequent and do not hinder gesture analysis. We'll keep in mind however that gesture frequency or gesture mean duration cannot be compared across videos or gesture type for the same speaker. Another reason for selecting the videos was the presence of the two gestures under observation and the fact that the three speakers are female which facilitates prosodic comparisons across speakers. Besides, TED Talk videos are professional recordings with good image and sound quality and are easily accessible online. Such videos have been used in other studies (Prieto et al., 2018; Rohrer et al., 2019; Harrison, 2021) which facilitates comparisons within a same argumentative discourse genre.

In a first annotation step, gestures were coded in ELAN (Sloetjes & Wittenburg, 2008) with the sound turned off and taking only gesture strokes into account. **205 hand flips** were found in the corpus, as well as **187 closing gestures**. Beats and points were also coded for another study and taken into account for a comparison in the statistical analyses, although they will not be described here. Inter-coder reliability has not yet been tested in this preliminary study, but this should clearly be done in the future.

In a second step, the entire corpus was transcribed with PRAAT (Boersma & Weenink, 2009). The first unit adopted for the transcription was Inter-Pausal Units (IPUs), i.e., speech chunks comprised between pauses longer than 200 ms, as described in the previous section. Intonation Phrases (IPs, Nespor & Vogel, 2007:16) were then determined as well. This prosodic unit is smaller than utterances but comprises one or several accentual phrases. Finally, Turn Constructional Units (TCUs), a conversational unit were determined for the whole corpus following Sacks, Schegloff & Jefferson (1974). Turn Constructional Units are speech segments which are complete in terms of intonation, syntax and pragmatics.

After this transcription, gesture annotations were imported in PRAAT so that prosodic phenomena could be coded on the relevant parts of the corpus. The first annotations made concerned the position of gesture strokes in IPUs and IPs which were divided in equal temporal parts: beginning, middle and end. The possible co-occurrence of gesture strokes with a silent pause or speech emphasis were coded as well.

3 tiers were then added to study the prosodic form of the

¹<https://www.youtube.com/watch?v=qHqElv07h9M&t=402s>
<https://www.youtube.com/watch?v=YVULuSfkrHs&t=10s>
https://www.youtube.com/watch?v=rvWx_MMrzgM

speech accompanied by the two types of gesture. The first tier was used to note pitch key as High, Mid and Bottom, and determined with the help of the automatic algorithm Intsint (Hirst, 2007). The second tier was used to code pitch as possibly Upstepped, Downstepped or Same. The last tier coded pitch contours in the speech accompanied by gestures as Flat (F), falling (HL) or rising (LH).

4. Results

In order to determine the scope of the two gestures, a series of Chi2 tests was conducted on the data with the software R v. 4.6.2 (R Core Team, 2012). Starting with the distribution of the two gestures within IPUs, TCUs and IPs, the Chi2 score was highly significant for IPUs ($X\text{-squared} = 52.755$, $df = 9$, $p < .001$), for TCUs ($X\text{-squared} = 117.49$, $df = 9$, $p < .001$) and IPs ($X\text{-squared} = 85.092$, $df = 9$, $p < .001$) and the observation of residuals revealed that:

- *Hand flips* are used preferentially at the beginning of IPUs as hypothesized but the residuals are not as high as expected. There is however a stronger association of these gestures with the beginning of TCUs. Finally, *hand flips* do not occur at the end of IPs but they may occur at the beginning or in the middle of these units, without any preference here. Therefore, one can say that *hand flips* are typically performed to open larger discourse units than smaller phrases.
- Closing gestures are typically met at the end of IPUs and TCUs, with a stronger association with end of TCUs than IPUs. They are rare at the beginning of these units. Residuals are higher for these gesture types than for *hand flips*. Closing gestures are also co-occurrent with the end of IPs and therefore show a scope of action that is not the strict parallel of the one for *hand flips* at the beginning of discourse units.

As far as their co-occurrence with pauses and emphatic stresses is concerned, although they do show some differences with beats and points for which the test is significant, we found that the two gestures observed in the present study are neither performed during silent pauses nor in co-occurrence with emphatic stresses. Closing gestures even repel speech emphasis ($X\text{-squared} = 27.795$, $df = 3$, $p < .001$) whereas no prediction can be made concerning *hand flips*.

Let us have a look now at pitch key, pitch declination and contours in the speech accompanied by the two gestures. As far as pitch key is concerned, the test was significant but showed only differences for beats and points. No particular pitch height could be determined for *hand flips* and closing gestures. There was however a significant difference regarding pitch declination in speech ($X\text{-squared} = 25.126$, $df = 6$, $p < .001$), although residuals' values are not very high and negative most of the time.²

- *Hand flips* are frequently performed in synchronization with speech upstepped pitch but residuals are not very high. This observation is congruent with the fact that they typically occur at the beginning of IPUs, but may also be found in the middle of such units which reduces their possible synchronization with upstepped pitch.

²Positive residuals show that observed occurrences are more frequent than expected theoretical ones (attraction) whereas negative residuals show that real occurrences are less frequent than expected theoretical ones (repulsion).

- Closing hand gestures are synchronized with pitch downsteps which is congruent with their position at the end of TCUs, IPUs and IPs, where pitch height is typically lower than on previous syllables in statements. Closing hand gestures are performed in positions which exclude pitch upstep.

As regards the pitch contours of the speech accompanied by the two gestures, the statistical analysis also shows significant differences in the data, although to a lesser extent ($X\text{-squared} = 13.692$, $df = 6$, $p = .03$). Once again, residuals are not very high and are often negative.

- *Hand flips* are typically performed in co-occurrence with rising pitch contours in speech and do not co-occur with falling contours. This is congruent with their occurrence in initial position in IPUs and this result confirms our predictions.
- Closing hand gestures however do not confirm our predictions in this regard since they do not occur in synchrony with falling pitch contours. This pitch contour is met in French at the end of TCUs and IPUs but this is not necessarily the pitch contour expected at the end of IPs. When two IPs are dependent one upon the other, the contour of the first IP is in fact rising to express that dependency. Since closing hand gestures may appear at the end of the three unit types, it is therefore not surprising that they would not show any regularity in their co-occurrence with particular pitch contours in speech.

5. Discussion and conclusion

The present paper has proposed a prosodic analysis of the speech accompanied by two hand gestures in TED talk presentations: *hand flips*, a gesture of the PUOH family described by Müller (2004) and Cienki (2021), and closing hand gestures, which do not seem to have been an object of attention in the literature. These two gestures play a role in the structuring of discourse arguments by speakers, one introducing discourse units whereas the other closes them. Yet, the scope of the units introduced and closed by the two gestures are still little known and a prosodic analysis of the speech the gestures accompanies gives information on the type of unit highlighted by these two pragmatic non-representational gestures. Whereas beats and points highlight very local lexical items (Ferré, forthcoming b), *hand flips* and closing hand gestures frame larger speech units like Intonation Phrases (IPs), especially for closing gestures, Inter-Pausal Units (IPUs), but are even more frequently met at the beginning and end of Turn Constructional Units (TCUs) as defined in Conversation Analysis. These prosodic units have been shown by Chafe (1988) to be linked with the information structure of speech. As a comparison, beats were shown by Ferré (forthcoming b) to be found in the middle of TCUs and IPUs, and in the middle and at the end of IPs. Points occurred at the beginning of IPs and IPUs but showed no preference for their placement in larger discourse units like TCUs.

The observations made here for *hand flips* have confirmed and probably also deepened our understanding of the descriptions made in the literature, with some reservations though. *Hand flips* have been described as particularly multifunctional as they may express epistemicity and concession, but may also be used as interactive gestures performed to refer to previous speech or release the speech floor to somebody else. In the corpus used in the present study, which is monologic in nature, it is essentially used to introduce a new point in discourse. It

has been shown here to introduce larger discourse units like IPU's (which most often coincide with utterances in non hesitant speech like TED talk presentations) and TCUs which form "information packages". However, it does not introduce smaller speech units like IP's. We must however admit that since gestures were coded with the sound of the video being turned off, this may have introduced some noise in the data and weakened our observations.

To the best of our knowledge, the closing hand gesture has not been described in the literature, but can be considered as offering a counterpart to the *hand flip*. Its distribution has been shown in the present paper as closing both larger prosodic units like IPU's and TCUs, and smaller ones like IP's, thus revealing a broader scope in the organisation of information structure. Once again, the fact that gestures were coded with the sound of the video turned off probably weakens the analysis which should be refined with more qualitative observations in a further study and include intercoder reliability tests. It has nevertheless been interesting to note that these two gestures showed a different distribution from beats and points as already stated at the beginning of the discussion.

The present study has also shown that *hand flips* and closing hand gestures do not co-occur with pauses and emphatic stresses in speech. Closing hand gestures even repel speech emphasis which makes sense since they were found to close discourse units.

The differences in the distribution of the two gestures in accompaniment of speech units have led to observations in the prosodic form of the accompanying speech in terms of pitch key or register, as well as pitch declination and contours. The speech accompanied by the two gestures does not show any difference in terms of key. It may be uttered equally in High, Mid or Bottom register. This may be an effect of the type of corpus used for the study, in which the Bottom and High keys are not used in the same proportion as in conversational speech where they can be used to mark the state of the conversational floor. Here, talks are monologues and speakers do not have to compete for the floor or release it to another participant. Therefore the Mid key is over-represented and the Bottom key is probably used to mark discourse paragraphs of a higher rank.

As far as pitch declination is concerned, *hand flips* are often accompanied with upstepped speech, which means that the intonation of the first syllable pronounced in synchrony with the gesture stroke is higher in pitch than the intonation on the previous syllable. On the contrary, closing hand gestures accompany speech whose intonation is downstepped compared with the pitch height on the previous syllable. These observations are directly linked with the placement of the two gestures in synchrony with speech. Upstep is regular at the beginning of a prosodic unit like IPU's, although not always present at the beginning of IP's, whereas downstep is present at the end of IPU's, TCUs and IP's in statements. One could have thought that since beats are regularly described as associated with prosodic emphasis, they would also co-occur with pitch upstep (in which case we would not have found any significant difference with *hand flips*), but beats are not systematically associated with prosodic emphasis as shown in Ferré (2014) and may even signal emphasis on their own (Ferré, 2018).

As far as intonation contours are concerned, results are less impressive: *hand flips* typically accompany speech with a rising pitch contour, although not as frequently as we would have expected due to the fact that they preferentially open larger discourse units than smaller ones and that they may also occur a bit later in the speech unit (middle position). Closing hand ges-

tures do not however co-occur with falling pitch contours due to the fact that they serve to close larger (IPUs and TCUs) as well as smaller speech units (IPs), and that among these smaller speech units, some are dependent on another unit, a dependency marked prosodically speaking with a rising pitch. This introduces a greater variation in pitch contours than for *hand flips* which therefore prevents any regularity in prosodic form for the speech uttered in synchrony with these gestures.

To finish, the present study has confirmed previous analyses of the *hand flip* and added a more nuanced description of its scope when its role consists in highlighting some discourse unit, but it has also added the description of closing hand gestures, which can be conceived together with *hand flips* as framing gesture devices for discourse units. Compared with other works in Gesture Studies, few studies take into account prosody and gesture, and descriptions of the prosody of speech that co-occurs with gestures are still scarce. We therefore hope to have contributed to the field in this respect. One should keep in mind however that this analysis is limited to a particular corpus genre (TED talk public lectures) and to a restricted number of gestures, even if the two gestures are of course also present in other discourse genres. Despite these limitations, one should note that a fair amount of work has been dedicated to the analysis of representational gestures leaving behind other co-speech pragmatic gestures and we hope that the present study has contributed, even modestly, to our understanding of gesture functions.

6. Acknowledgements

This research received no specific grant from any funding agency in the public, commercial or nonprofit sectors, and we are grateful to two anonymous reviewers for their constructive comments on a previous version of the paper.

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