



**HAL**  
open science

# What do gestures in subordination tell us about clause (in)dependence?

Manon Lelandais, Gaëlle Ferré

► **To cite this version:**

Manon Lelandais, Gaëlle Ferré. What do gestures in subordination tell us about clause (in)dependence?. GESPIN2017- Gesture and Speech in Interaction, Aug 2017, Poznań, Poland. hal-02117490

**HAL Id: hal-02117490**

**<https://hal.science/hal-02117490>**

Submitted on 2 May 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# What do gestures in subordination tell us about clause (in)dependence?

*Manon Lelandais & Gaëlle Ferré*

University of Nantes, LLING UMR 6310  
Chemin de la Censive du Tertre, BP 81227 Nantes cedex 3 FRANCE

manon.lelandais@univ-nantes.fr; gaelle.ferre@univ-nantes.fr

## Abstract

Subordinate constructions have been described in syntax as dependent constructions elaborating on primary elements of discourse. Although their verbal and vocal characteristics have been deeply analysed, few studies have provided a qualified picture of the gestures that accompany them and how these gestures can shed light on their dependence or autonomy. We propose to partly fill this gap with the analysis of co-speech gestures produced with two types of subordinate structures in conversational British English.

## 1 Introduction

In syntactic and discourse studies, subordinate constructions are often described as additions associated to another propositional content in the host structure (Halliday, 1985). This study focuses on restrictive relative clauses and appositive clauses, which both specify or elaborate upon another propositional content (Halliday, 1985).

A restrictive relative clause modifies a nominal expression, refining the identification of its referent (Langacker, 2008). The nominal referent is connected to some participant in the process designated by the relative (Langacker 2008: 424). In *the reasons they gave*, the restrictive relative clause *they gave* increases the relevance of *the reasons*, creating a subcategory for *the reasons* as a referent. Although also introduced with a relative pronoun, an appositive relative clause does not single out a nominal referent, but makes an additional comment about a referent or a whole clause (Longacre 1985). In *I'll happily eat black pudding which I know is disgusting*, the appositive relative clause *which I know is disgusting* evaluates *black pudding*, which can however be identified independently as a referent.

Both of these subordinate clauses are defined as dependent on another predication (Lehmann, 1988). However, the literature shows little consensus in defining clear scopes and boundaries for these structures (Smessaert et al., 2005). This study therefore questions whether they all express the same degree of dependence upon their co-text. If some substantial work has focused on the relation of subordinate clauses to their "hosts" from the perspectives of syntax (e.g. Smessaert et al., 2005) or prosody (e.g. Couper-Kuhlen, 1996), no study has to our knowledge enquired into the gestural expression of these constructions. We investigate the production process of subordinate constructions in English, focusing on several gestural factors of autonomy. The main hypothesis is based on the capacity of these constructions to show distinct factors in function of their syntactic type. Different degrees of autonomy are consequently identified from this new perspective, providing a qualified picture of their insertion in discourse.

## **2 Theoretical background**

### **2.1 Syntactic subordination**

In the traditional categorial division of clause complexes into two uneven and complementary syntactic subgroups, i.e. a main clause and a subordinate, restrictive relative clauses and appositive clauses are both viewed as optional and dependent constituents (Lehmann, 1988), which are deemed semantically useful without standing as constitutive elements. However, the categorisation of these subordinate constructions as dependent has been disputed and reproved by a number of linguists (e.g. Smessaert et al., 2005), described as imprecise for analysing spontaneous speech, especially regarding the nature of introductory elements. From the observation of semantic necessity as imprecise, other criteria are suggested to evaluate clausal combination, in a hierarchy of syntactic and semantic relations (Smessaert et al., 2005). These criteria encourage to investigate clause linkage relying on a wider set of syntactic and semantic parameters, or to go beyond the syntactic frame in observing not only governing relations, but also modal and illocutionary relations (Smessaert et al., 2005).

### **2.2 Gestural subordination**

If little work analysed subordination from a multimodal point of view, some gestural correlates<sup>1</sup> have been shown to participate in the creation and maintenance of cohesion in speech (Hoetjes et al., 2015; Perniss & Özyürek, 2015) with a focus on reference-tracking and information structure.

Two speech segments can be related through their production in co-occurrence with a single gesture unit (Enfield, 2009). On the contrary, hands returning to rest position signal a boundary in discourse (Calbris, 2011).

Beat gestures also single out particular entities (Cavé et al., 1996). They are connected to discourse structure in their function (Kendon, 1972; De Kok & Heylen, 2009), marking out the rhythmic organisation of the utterance

Other articulators play an equally important role in discourse structure. Gaze often moves away from the co-speaker for discourse elaboration as soon as the speaking turn is taken and secured (Barkhuysen et al. 2008). A change in gaze direction towards the co-speaker announces a discourse boundary (De Kok & Heylen, 2009) or an appeal to the co-speaker (Holler et al., 2014).

Eyebrow movement, especially rises, also demarcate various kinds of speech units (Granström & House, 2005).

## **3 Corpus and methodology**

### **3.1 Working hypotheses**

Based on the theoretical background, a specific list of gestural factors of independence is taken into account. If the two syntactic types of subordinate constructions are not equally dependent on their co-text, their number of factors of independence is expected to be different. Namely, the proportion of beat gestures should differ between the two syntactic types (Kendon, 1972; De Kok & Heylen, 2009), as well as the proportion of returns to rest position for hand gestures (Calbris, 2011). The two syntactic types should also be realised with a different proportion of changes in gaze direction (Barkhuysen et al. 2008), and with a different proportion of isolated eyebrow rises (Granström & House, 2005).

### **3.2 Corpus transcription and annotation**

In order to check these hypotheses on conversational English, we used the ENVID<sup>2</sup> corpus described in Lelandais & Ferré (2016). It was first transcribed in Praat (Boersma &

---

<sup>1</sup> As part of a larger piece of work, this article focuses on a limited number of gesture features. However, many other correlates have been established by the literature.

Weenink, 2013) using standard orthography, and segmented into tone-units. Based on morphological criteria, subordinate constructions were localised and coded on a separate track as SC. The selected occurrences were classified according to their syntactic type. A second track delimitates the environment of these clauses: the preceding tone-unit or part of tone-unit was labelled L (left co-text), the subsequent one labelled R (right co-text).

A total of 386 subordinate constructions were annotated in the corpus, representing 9.76% of the total speaking time (i.e. 3.27 forms/min). 55 occurrences of each syntactic type (restrictive relative clauses, appositive relative clauses) were selected for a balanced comparison, making up a total of 110 forms. The selection targeted occurrences without an interruption, surrounded with other tone-units from the same speaker on their left and right boundaries (i.e. other than a single silent pause yielding the speaking turn). We also made sure that our selection of syntactic constructions was balanced across speakers, so as to avoid any bias due to intra-speaker gestural variability.

After having imported the Praat annotations in Elan (Sloetjes & Wittenburg, 2013), hand gestures, gaze direction, as well as eyebrow movement were manually coded by the two authors, following the parameters proposed by Bressemer and Ladewig (2011). Gesture annotation was based on gesture phrases (Kendon, 2004). Each phrase was considered to start at the onset of the gesture and to end at the return to rest position if there was one. In the case of two consecutive gestures, the first phrase ends at a significant change in shape and/or trajectory. Other gestural features such as direction and gestural space were also noted by the two coders.

In separate tracks, gaze direction was annotated as either towards the co-participant or away, eyebrow movement distinguished between rise and frown, and hand gestures were categorised into iconics, metaphoric, pointings, beats, emblems, and adaptators, drawing mainly from McNeill's typology (2005). As hand gestures may have several dimensions, two values could be noted and counted if need be.

The coding scheme used for hand gestures determines the relation of information contained in a gesture to the information in the corresponding speech (Kipp et al., 2007). For instance, if the speaker traces a circle while talking about a round object, the gesture was tagged as an iconic. Ambiguous types were resolved with discussion between the two coders and agreement was reached on the main dimension of gesture types. In order to establish reliability of the gesture type classification, a second coder judged 20% of the data that had been classified by the original coder. The agreement between coders was 100% for gaze direction, 96.4% for eyebrow movement, and 72.1% for hand gesture types.

## 4 Results

This paper evaluates the gestural autonomy of two types of subordinate constructions. We test whether these constructions are different in their number of gestural factors of independence. To answer our research questions, we used a series of Generalized Linear Mixed Models (GLMMs) fit by maximum likelihood estimation using the R 3.4.0 statistical programming language (R Core Team, 2012) and the lme4 package (Bates et al., 2014). We tested the effect of four factors of independence. Because there was quite a large variation between speakers and dialogues in the production of subordinate constructions, we systematically included Speaker and Dialogue as random factors in the models. Particularities are detailed for each tested effect.

### 4.1 Hand beats

We first explored possible interactions among the two syntactic types (fixed factor = Type; values = appositive, restrictive) and beat gestures during the production of a subordinate construction (fixed factor = Beat; values = yes; no). We only took into account isolated hand beats, i.e. beats

---

<sup>2</sup> This corpus features 5 dyads of British English speakers. They already knew each other and were simply asked to talk as freely as possible.

which were not part of a thread of repeated gestures in a discourse sequence. Likewise, hand beats occurring in the middle of very long tone-units (i.e. not close to any prosodic boundary) were excluded. The main effect of beat gesture was significant for restrictive relative clauses ( $\beta = 1.29$ ,  $SE = .32$ ,  $p = .0001$ ). There are also less beat gestures in appositive clauses ( $\beta = -2.19$ ,  $SE = .4$ ,  $p < .001$ ). There are significantly less beat gestures in the tone-unit immediately before the restrictive relative clause, i.e. L ( $\beta = -1.12$ ,  $SE = .4$ ,  $p < .01$ ), and afterwards, i.e. R ( $\beta = -1.22$ ,  $SE = .5$ ,  $p = .01$ ). Example (1) below illustrates this tendency, in association with Figure 1, where (a), (b), (c), and (d) correspond to different moments in its production.

- (1)<sup>3</sup> Michelle L [(a) but i put it on the bit  
 SC **where hum (cough) (h) they (h) they were uh #] [(b) in the] [(c) garden]**  
 R [(d) and they were talking]

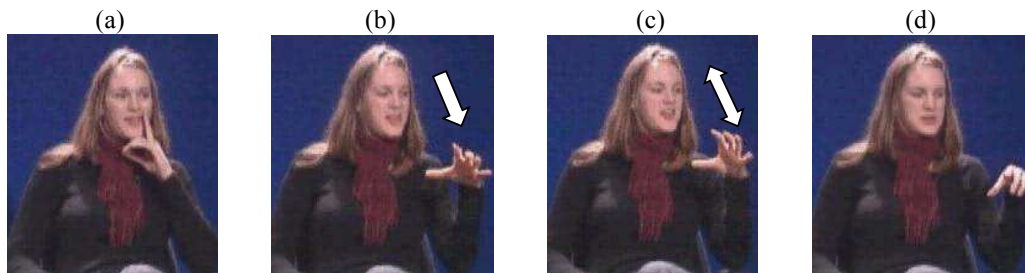


Figure 1. Two successive beats in (1), in co-occurrence with a restrictive relative clause.

SC stands out from the rest of the sequence through its two successive hand beats (b) and (c). The co-occurrence of these hand beats with "in the garden" pragmatically indexes the most relevant informational content in the sequence, which is marked as the retrieval of a substantial search. No other beat gesture is produced in the whole discourse sequence. The palm-down open hand configuration of the hand beat takes an abstract deictic value as Michelle strives to locate an exact scene in time. Michelle partially retracts her palm-down open hand in R (d), dropping her wrist to find a new rest position for the next speaking turns.

#### 4.2 Overlapping hand gestures between two tone-units or more

We then explored possible interactions among the two syntactic types (fixed factor = Type; values = appositive, restrictive) and overlapping hand gestures of the main speaker (fixed factor = overlap; values = yes; no). The main effect of overlap was significant for the sequences containing restrictive relative clauses ( $\beta = 1.34$ ,  $SE = .36$ ,  $p < .0005$ ). Those containing appositive clauses feature significantly less overlap ( $\beta = -2.37$ ,  $SE = .37$ ,  $p < .001$ )<sup>4</sup>. Example (2) and Figure 2 feature an appositive relative clause realised with very distinct hand gestures between tone-units.

- (2) Rhianna L [(a) my mum's pushing ] me to get my license  
 SC **(h) uh which [ (b) i guess i should ] #**  
 R (h) but well [ (c) first of all  
 for the moment]

<sup>3</sup> L, SC, and R respectively stand for left co-text, subordinate construction, and right co-text. Transcription conventions include the following:

(h): audible inbreath; #: silent pause  
 square brackets: gesture span

(a), (b), (c), ...: reference to still pictures in subsequent figure

<sup>4</sup> This result is interesting given the fact that appositive relative clauses are shorter than restrictive relative clauses (mean duration of 1.27s vs. 1.51s respectively).

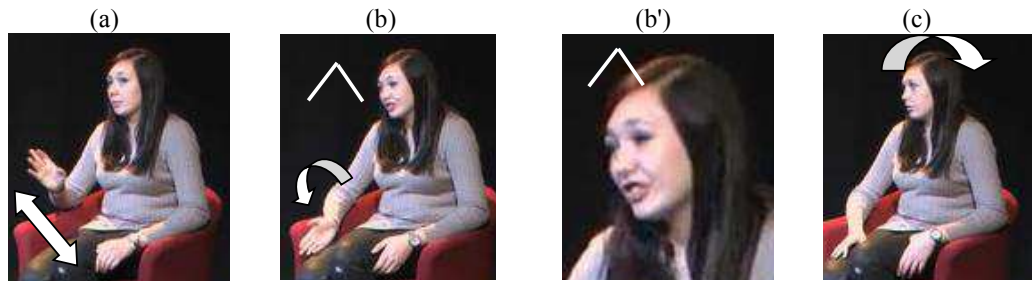


Figure 2. Series of hand gestures during the gestural realisation of example (2), with a very distinct hand gesture in SC (b) from that in L (a), correlated with an eyebrow rise.

Rhianna lays out the reasons why she does not want to learn to drive. She first mentions an adverse opinion in L: her mother would like her to get her license. Rhianna marks this information with a sweep of her right hand corresponding to the verbal item "pushing" (a). This iconic hand gesture gives a hyperbolic dimension to the discourse segment, as Rhianna gives a literal and concrete expression to her mother's advice, and materialises it as strong pressure. However, SC does not elaborate upon her mother's side. SC is a comment going back on L's new information ("get my license"). SC introduces a change in point of view, in that the argumentation switches back to Rhianna's voice in the debate. With a head nod and a lower flip of her right hand (b), Rhianna acts both as the character in the situation she has described in L (Rhianna assents to her mother's exhortation) and as a speaker-utterer: she acknowledges the legitimacy of her mother's advice and marks this concession with a hand flip. She also raises her eyebrows in this design (Figure 2b' is a close-up), taking a strong stance on L's arguments, and marking SC as a contrastive move. Rhianna resumes her main argumentation line in R with a much more categorical expression: while bent in assent during SC, she holds herself upright in R and accompanies the next tone-units with a continuous negative head shake. This sequence is then characterised with two successive assertions that are not equal in intensity: the one taken in R is stronger than that in SC. This asymmetry mirrors the discourse structure, as R continues her sequential discursive agenda while SC does not.

#### 4.3 Gaze movement

We also tested whether there was a possible interaction between the two syntactic types (fixed factor = Type; values = appositive, restrictive) and changes in gaze direction (fixed factor = Change; values = yes; no). The main effect of gaze direction was significant for appositive relative clauses ( $\beta = 0.52$ ,  $SE = .24$ ,  $p < .05$ ) as changes occur frequently. Changes in gaze direction are illustrated in example (2) above. No main effect was found for restrictive relative clauses ( $\beta = -0.1$ ,  $SE = .32$ ,  $p = .75$ ).

#### 4.4 Eyebrow movement

Finally, we tested whether there was a possible interaction between the two syntactic types (fixed factor = Type; values = appositive, restrictive) and eyebrow rises (fixed factor = Rise; values = yes; no). The main effect of eyebrow rises was significant for appositive relative clauses ( $\beta = 1.23$ ,  $SE = .39$ ,  $p < .002$ ). This characteristic is also illustrated in example (2) above. However, the difference for restrictive relative clauses is not significant ( $\beta = -0.32$ ,  $SE = .48$ ,  $p = .51$ ). Likewise, the differences with L ( $\beta = 0.47$ ,  $SE = .58$ ,  $p = .43$ ) and R ( $\beta = 0.15$ ,  $SE = .57$ ,  $p = .79$ ) are not significant either.

### 5 Discussion and conclusion

Our analysis confirms that the two syntactic types can be distinguished in their degree of autonomy. Restrictive relative clauses feature only one significant interaction with a factor of independence, while appositive relative clauses show interactions with three factors. Restrictive relative clauses restrict the referential domain of a given entity. Their co-occurring hand gestures

are able to mark out the most relevant lexical feature for a better identification. However, apart from this specificity, no other factor considered in this study signals independence for this type of construction. Appositive relative clauses stand in sharp contrast as they are much more independent, showing multiple cues balanced on several articulators. This interplay between articulators makes disruption more perceptible.

The differences regarding the distribution of the factors in the two syntactic constructions suggest that no common boundary cue is systematically used during subordination. However, the significant presence of hand beats and eyebrow rises hint at the prevalent use of prosodic gestures in both types of subordinate constructions. Interestingly, in the vocal modality, rhythmic cues play a seminal role in the demarcation of both constructions (Lelandais & Ferré, 2016).

Most of the gestures occurring in subordinate constructions also give pragmatic instructions on the informational value of the propositional content (e.g. hand beats, changes in gaze direction, open palm-up gestures, eyebrow rises). Subordinate constructions introduce a break when they establish a different assertive position from the preceding utterance. To avoid a gap between the co-speaker's representations and the speaker's input, gestures mark out this break, but are also able to indicate the informational value of this break in the discourse sequence.

We have alluded to prosodic gestures accompanying subordinate clauses. The effects of prosodic structure have been found to extend beyond the vocal tract to include body movement, in that both manual and oral gestures lengthen at prosodic boundaries (Krivokapić et al., 2017). In the vocal modality, pre-boundary lengthening occurs on different locations for restrictive relative clauses and appositive clauses (Lelandais & Ferré, 2016). An interesting development would be to measure and compare the duration of hand gestures around these boundaries, as well as their temporal alignment.

## References

- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2014). Linear mixed-effects models using eigen and s4 [online: <http://cran.r-project.org>].
- Barkhuysen, P., Krahmer, E., & Swerts, M. (2008). The interplay between the auditory and visual modality for end-of-utterance detection. *The Journal of the Acoustical Society of America*, 123(1), 354–365.
- Boersma, P., & Weenink, D. (2013). *Praat: doing Phonetics by Computer*. Retrieved from <http://www.fon.hum.uva.nl/praat/>
- Bressem, J., & Ladewig, S. (2011). Rethinking gesture phases: Articulatory features of gestural movement? *Semiotica*, 184, 53–91.
- Calbris, G. (2011). *Elements of meaning in gesture*. Amsterdam: John Benjamins.
- Cavé, C., Guaitella, I., Bertrand, R., Santi, S., Harlay, F., & Espesser, R. (1996). About the relationship between eyebrow movements and Fo variations. In *Fourth International Conference on Spoken Language* (pp. 2175–2178). Philadelphia: PA.
- Couper-Kuhlen, E. (1996). Intonation and clause combining in discourse: the case of because. *Pragmatics*, 6(3), 389–426.
- De Kok, I., & Heylen, D. (2009). Multimodal end-of-turn prediction in multi-party meetings. In *Proceedings of the 2009 international conference on Multimodal interfaces* (pp. 91–98). New York: ACM.
- Enfield, N. J. (2009). *The Anatomy of Meaning: Speech, Gesture and Composite Utterances*. Cambridge: Cambridge University Press.
- Granström, B., & House, D. (2005). Audiovisual representation of prosody in expressive speech communication. *Speech Communication*, 46(3), 473–484.
- Halliday, M. A. K. (1985). *An Introduction to Functional Grammar*. London: Edward Arnold.
- Hoetjes, M., Koolen, R., Goudbeek, M., Krahmer, E., & Swerts, M. (2015). Reduction in gesture during the production of repeated references. *Journal of Memory and Language*, 79, 1–17.
- Holler, J., Schubotz, L., Kelly, S., Hagoort, P., Schuetze, M., & Özyürek, A. (2014). Social eye gaze modulates processing of speech and co-speech gesture. *Cognition*, 133(3), 692–697.
- Kendon, A. (1972). Some relationships between body motion and speech. In A. W. Siegman and B. Pope (Eds.), *Studies in Dyadic Communication* (pp. 177–210). New York: Pergamon.
- Kendon, A. (2004). *Gesture: Visible action as utterance*. Cambridge: Cambridge University Press.
- Kipp, M., Neff, M., & Albrecht, I. (2007). An annotation scheme for conversational gestures: how to economically capture timing and form. *Language Resources & Evaluation*, 41, 325–339.

*Lelandais – Ferré: Gestures and clause (in)dependence*

- Krivokapić, J., Tiede, M., & Tyrone, M. E. (2017). A Kinematic Study of Prosodic Structure in Articulatory and Manual Gestures: Results from a Novel Method of Data Collection. *Laboratory Phonology*, 8(1), 1-26.
- Langacker, R. W. (2008). *Cognitive grammar*. Oxford: Oxford University Press.
- Lelandais, M., & Ferré, G. (2016). Prosodic boundaries in subordinate syntactic constructions. In *Speech Prosody* (pp. 183-187). Boston: ISCA.
- Lehmann, C. (1988). Towards a typology of clause linkage. In John Haiman & Sandra A. Thompson (Eds.), *Clause combining in grammar and discourse* (pp. 181-225). Amsterdam and Philadelphia: John Benjamins.
- Longacre, R. E. (1985). Sentences as Combinations of Clauses. In Timothy Shopen (Ed.), *Language Typology and Syntactic Description: Complex constructions* (pp. 372-420). Cambridge: Cambridge University Press.
- McNeill, D. (2005). *Gesture and thought*. Chicago: University of Chicago Press.
- Perniss, P., & Özyürek, A. (2015). Visible Cohesion: A Comparison of Reference Tracking in Sign, Speech, and Co-Speech Gesture. *Topics in cognitive science*, 7(1), 36-60.
- R Core Team. 2012. A language and environment for statistical computing. r foundation for statistical computing. [online: <http://www.r-project.org>].
- Sloetjes, H., & Wittenburg, P. (2008). Annotation by Category: ELAN and ISO DCR. In *Proceedings of the 6th International Conference on Language Resources and Evaluation*. Retrieved from <http://www.lat-mpi.eu/tools/elan/>
- Smessaert, H., Cornillie, B., Divjak, D., & Eynde, K. (2005). Degrees of clause integration: from endotactic to exotactic subordination in Dutch. *Linguistics*, 43(3), 471-529.