Beat Gestures as Prosodic Domain markers in French: A case study

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It is widely held that co-speech gestures are produced in a coordinated fashion with prosodic prominence [1, 2, among many others]. Studies have shown that gesture apexes tend to be temporally executed in conjunction with pitch accentuation [3, 4, and 5, among many others]. Fewer studies have looked at the temporal execution of these gestures in languages such as French, where pitch accentuation operates on the domain of prosodic phrases. A main pitch accent (T*) obligatorily marks the right edge of the smallest prosodic phrase (also known as the accentual phrase, or AP, see [6]), and a pitch rise may or may not occur on the initial syllables of the AP, marking the left edge. In this sense, these accents are said to have a demarcative function (among other pragmatic functions such as rhythmic marking or emphasis). Prosodic and gestural analyses were carried out on an 18-minute, academic-style discourse, with the goal of exploring the temporal relationship between gesture production and prosodic structure in French. Specifically we ask if the apex of beat gestures tends to coincide with pitch accented syllables. In cases where beat apexes do not coincide with a pitch accented syllables, do beat gestures continue to mark phrase-initial or –final positions independent of pitch accentuation?

The discourse for study comes from a Ted Talk presentation by [7]. This speaker was chosen for his extensive use of gestures, as well as the video editing of his presentation, which kept the amount of time where the speaker was not visible to a minimum. The speaker's gestures were annotated by the first author in ELAN and included annotations for gesture phrasing (preparation/stroke/retraction) and apex. The coding was carried out without accompanying audio in order to avoid influence from audio in determining apex placement. The apex was determined following [8: 190], where the endpoints of unidirectional strokes, or moments of change in velocity or direction of multi-directional strokes were considered as apexes. Gestures were then reassessed with audio in order to determine their referentiality and each gesture was classified into one of McNeill's four gesture dimensions [2]. Regarding prosodic annotations, the F_ToBI system [6] was used to determine prosodic phrasing and pitch accentuation. Further, as gesture apexes that occur up to 200ms before a stressed syllable may perceptively align [9], any syllable that was within 150ms of a pitch-accented syllable was perceptively double checked and marked as perceptively aligning or not.

Gesture coding resulted in a total of 779 apexes. Of these, 670 apexes were classified as coming from non-referential beat gestures. Twenty-five apexes were excluded from further analyses due to their occurrence outside of speech, or they occurred with another beat apex on the same syllable. Beat apexes occurred perceptively during pitch accented syllables 72.09% of the time. Beat gesture apexes occurred during non-accented syllables 27.91% percent of the time. Of these, 72.23% still occurred on AP-initial syllables.

These results suggest that beat gestures are often temporally correlated with pitch accentuation (see Figure 1), but when pitch accentuation is not present, beat gestures may continue to mark prosodic phrasing independent of pitch accentuation (see Figure 2). These findings suggest that the relationship between gesture production and pitch accentuation may not be as straight-forward as previously reported, and a language's prosodic structure may influence gesture production. Further research is needed to disambiguate other factors that may influence gesture placement independent of pitch accentuation, such as the role of prosodic lengthening or rhythmic marking.

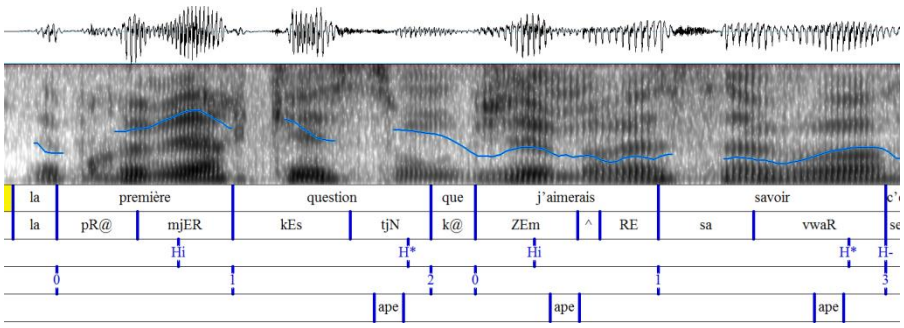

Figure 1. *F_ToBI and gesture annotations of a 2-AP phrase "la première question que j'aimerais savoir" [The first question I would like to know] where the right edge of the first AP and both the right and left edge of the second AP are marked both prosodically and gesturally*

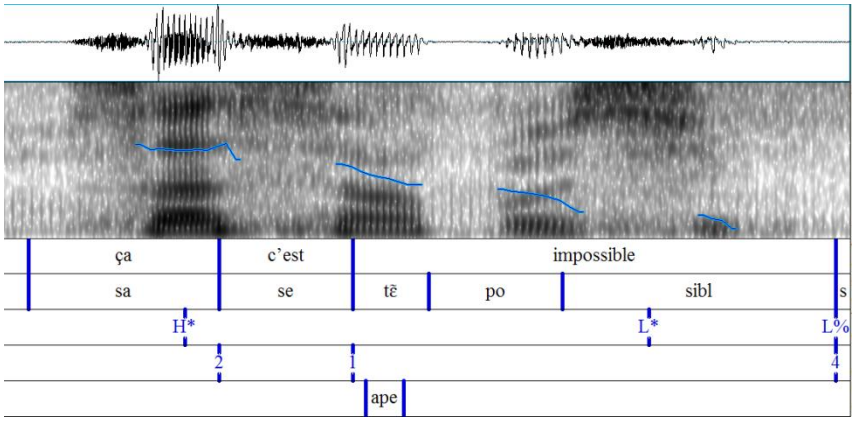

Figure 2. *F_ToBI and gesture annotations of a 2-AP phrase "Ça, c'est impossible" [in English "This is impossible"] where the second AP's left edge is marked by a beat gesture but not by prosody.*

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