EXPERIMENTAL PHONETIC STUDY OF THE PARENTHETICAL CLAUSES

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Introduction

The grammatical notion of "topic" has become a point of linguistic inquiry over the life of the field, but the particular bounds of the class of topics vary depending on what the author investigating them understood them to be, and their intentions when invoking them. Topics are broadly, and somewhat vaguely, defined as the part of the sentence that the sentence is supposed to be about (Mohler, 2018).

(1) a. As for **the battleship**, it was sunk in the South China Sea.

b. **A small fortune**, the entrepreneur made on a few wise investments.

c. **Arnold** was found sleeping in his basement.

The boldface phrases in the examples above represent typical topics. These are the central components of the sentence to which the other parts of the sentence apply.

Some diagnostic tests for identifying a topic make use of several phrases in a sentence-initial position that is thought to contain a topic, for example, as for, speaking of, and what about (Gorsz, 2016). In the sentence "Speaking of the Americans, a number of them are thought to be unhappy," speaking of identifies the topic of the sentence, the Americans. These different phrases each identify topics with different properties. Speaking of fails to produce a felicitous sentence when used with a topic that has not been mentioned contextually recently; out of the blue, saying speaking of is an awkward construction. As for cannot be combined with a topic that is not contrastive (Reed, 2018).

Another consideration in the realm of topics is their structural position. In linguistics, the strings of words that comprise a sentence are thought to be the product of an abstract hierarchical structure, often represented visually as a complex branching tree. It is assumed in most work on topics that they and, if applicable, their associated topic-marking phrases, are bound to particular positions in syntactic structure. For example, the "Cartographic Project" in syntax, which attempts to identify and "map out" universal syntactic structures, places the topic in a structural slot at the beginning of the sentence (Reed, 2018).

The topic-marking phrases as for and speaking of not only mark topic, but they are also parentheticals. As (2) illustrates, speaking of can appear in a variety of positions throughout the sentence, and is therefore not tied to a particular structural position, property characteristics of parenthetical phrases.

(2) a. Speaking of the forum, one of the administrators stepped down.

b. A friend of mine, speaking of computers, is currently working on building his own.

c. Did you hear that, speaking of Halloween, trick-or-treat will be cancelled in this town?

d. They recalled, speaking of board games, that a new version of Monopoly had come out.

The notion of topic is not critical to the analysis of parentheticals topics speaking of and as for which follows. The notion is relevant because speaking of and as for are frequently used as diagnostic tests for topic, and there may be valuable insights to be gained from investigating the interaction of topic with the interpretation of utterances containing parenthetical topics.

Selection of material

The term parenthetical, like a topic, refers to a wide range of phenomena. They are identified by perceived structural independence from the main utterance, and as having an interruptive effect within the sentence. There are several types of constructions identified as parentheticals, including nominal appositives (3a), reporting verbs like said (3b), and full clausal parentheticals (3c), among others (Daly, 2016). The boldface phrases in the following examples constitute typical parentheticals.

(3)   a. Don, **a friend of mine**, is the one you're looking for.

b. The demonstration was a waste of time, **said the chairperson**.

c. The number of participants is, **as you already know**, completely

arbitrary.

For decades linguists have been puzzled by the unusual properties of parentheticals, properties that are unexpected, especially from a syntactic perspective. For example, parentheticals, when examined carefully, have a virtually totally unrestricted distribution (Daly, 2016). That's unusual because most syntactic theory is based on the restrictions on certain words', phrases', or categories' distributions, where things can go vs. where they can't.

Figure 1 below illustrates the difference between the syntactically integrated and unintegrated approaches.

Parentheticals also do not participate in the phrase-structure relation of c-command. These unusual properties have led some linguists to conclude that parentheticals are syntactically independent in some way, though the interpretation of this notion varies wildly from proposal to proposal. Some argue that parentheticals are literally unconnected or "unintegrated" from the host sentence in which they appear (Hunt, 2019), while others claim that parentheticals are structurally integrated in a special way which gives rise to an illusion of independence.
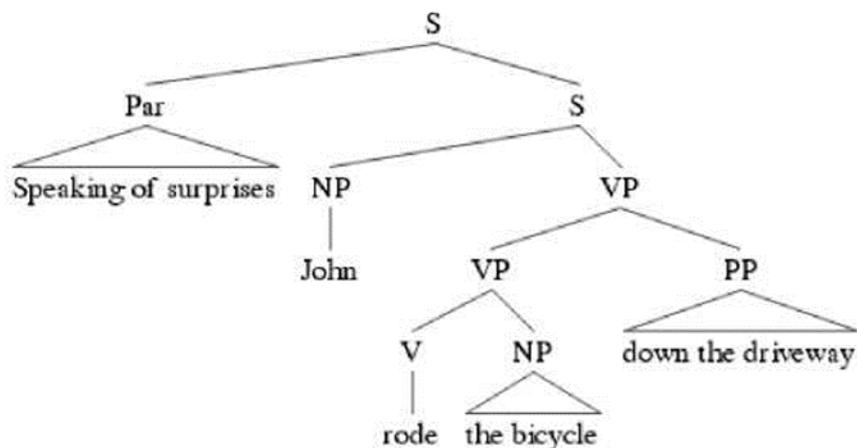
Figure 1 - Syntactically integrated representation of a parenthetical speaking of surprises

Figure 1 is an example of a syntactically integrated representation of a parenthetical speaking of surprises, in which the parenthetical is treated as a constituent of the main sentence John rode the bicycle down the driveway.

It illustrates an unintegrated representation, in which the parenthetical is part of the syntactic representation of the utterance, but is not attached syntactically to the main sentence. The motivations for taking one or the other position are addressed below.

Parentheticals are distinguished by a variety of linguistic features, including prosodic separation, a tendency to address not-at-issue content and various syntactic effects such as positional flexibility, invisibility to c-command, and exemption from interpretation in ellipsis and other constituency tests. These syntactic properties are most important in this project. These properties have led some linguists to hypothesize that the syntactic representation of parentheticals is unique in some way. For instance, De Vries takes the invisibility to c-command as evidence for an alternative instantiation of the operation merge. Others like Kutik, E, Cooper, W. E., & Boyce, S. (2019) suggest that these facts indicate that parentheticals are syntactically unattached to the host sentence which contains them. Both approaches have supporters and detractors.

Parentheticals, especially parenthetical full clauses, are "invisible" to various effects associated with the syntactic relation of c-command. Daly (2016) identifies a numberof syntactic effects related to c-command which parentheticals do not participate in. For example, syntactic constituents inside a parenthetical cannot be extracted by way of movement, like WH-movement in question formation.

(4)   What did the police, the commissioner suspected Hank stole _, search his house? (Daly, 2016)

While a number of these effects can be explained without referring to the hypothesis that parentheticals are invisible in some way to the syntactic relation of c-command (for example, WH-movement is also barred from adjuncts, a constraint which could be invoked as an explanation for the impossibility of extracting from parentheticals as well), some can only be accounted for as a consequence of parentheticals' being invisible to c-command.

Tape and decoding of the material

The SPRUCE (SPeech Response from UnConstrained English) text-to-speech system (Tatham & Lewis, 2018) uses a parser that performs a syntactic parse as well as a semantic parse. The semantic parse identifies logical relationships between words and between sentences. Based on the syntactic and semantic parses, a system of rules determines the most plausible intonation contour for each sentence. A syllable dictionary provides the phonetic specifications for each syllable as well as some of the words. For the synthesis output, these phonetic specifications are overlaid with the intonation contour. However, as the authors admit, embedded phrases like parentheticals require information that is not available from the input text through the parser (Tatham & Lewis, 2018). The semantic parse of this system is not sophisticated enough to identify higher-level discourse structure to detect parentheticals.

Tatham and Lewis's SPRUCE text-to-speech system (2018) uses the phonetic encoding system of Pierrehumbert (2018) to integrate prosodic structure into the structure of the written text. This means that down to the smallest unit of the letter, each text constituent is tagged with detailed prosodic specifications. The sentence that is prosodically encoded is, In

November the region's weather was unusually dry. In this encoding method, these symbols have the following meaning:

* = word boundary;

% = minor phrase boundary;

( ) = pitch target level, e.g. (0.5) results in a pitch target of 50 percent of the possible maximum pitch at this point in the sentence;

numbers = duration in 100th of a second;

{ } = maximum pitch at start and end, followed by minimum pitch at start and end;

ax = schwa.

Prosodic annotation example (Pierrehumbert, 2018, p. 989)

Sentence: In November the region's weather was unusually dry.

Phonetic transcription: ihn nowvehmber dhax riyjhenz wehdher waxz axnyuzhaxliy drai

Encoded as: {325 260 195 165}(0.4) SIL 8 ih 4 n 3* n 4 ow 7 v 9 eh 10(1.0) m 8 b 4 er 13% (0.3) SIL 34 *dh 2 ax 2* r 5 iy 7(0.6) jh 10 en 8 z 10* w 3 eh 7 (0.8) dh 4 er 8* w 6 ax 5 z 7* ax 4 n 9 yu 16 (0.8) zh 6 ax 5 l 4 iy 9* d 8 r 5 ai 24 (1.0)%

Prosodic annotation either requires a recording of the sentence - the method used in Pierrehumbert (2018) - or a segment, syllabe or word dictionary that the parser can access and a system of rules for adding prosody. The latter is used in SPRUCE. However, Pierrehumbert's encoding system, and with that SPRUCE as well, does not allow pitch range control for individual phrases, which is needed for the model to be applicable to parentheticals. The lack of pitch range control can be seen above. The topline and baseline values can only be specified in the curly brackets preceding the sentence, which sets the topline and baseline pitch values for the start of the sentence as well as the end. Thus, there is no mechanism for sentence-internal pitch range control, which is required for synthesizing parentheticals.

Let's investigate sentences with two sequential or nested parentheticals. Of these, sequential two-parentheticals have two parenthetical parts. Nested two- parentheticals have three parenthetical parts since the outer parenthetical phrase is broken up into two parts, par1(a) and par1 (b), as in:
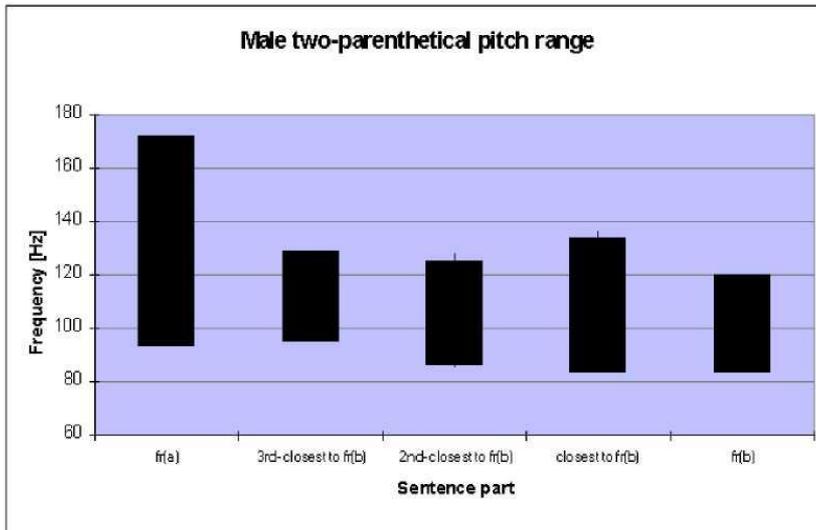
(4) Nested two-parenthetical example

"We saw the movie - Jane (who knows the director) insisted on going - but were unimpressed." | fr(a) | par1(a) | par2 | par1(b) | fr(b) |

As has been shown in chapter four, the parenthetical phrase directly preceding fr(b) in multi-parenthetical sentences behaves like the parenthetical phrase of single- parenthetical sentences. Furthermore, the trend for each additional parenthetical part in multi-parenthetical sentences is that the further away it is from fr(b), the lower is the topline, higher the baseline and smaller the range. This relationship is displayed in Figure2 for females and Figure 3 for males. Each figure includes both sequential and nested values to show the general trend of two-parentheticals. In each figure, the bar represents the pitch range of each sentence part. The pitch range is delimited by the baseline at the bottom and the topline at the top. Since parenthetical phrases in nested and sequential two-parentheticals are not exactly the same, some bars feature short vertical lines at the top or bottom ends to indicate the difference.
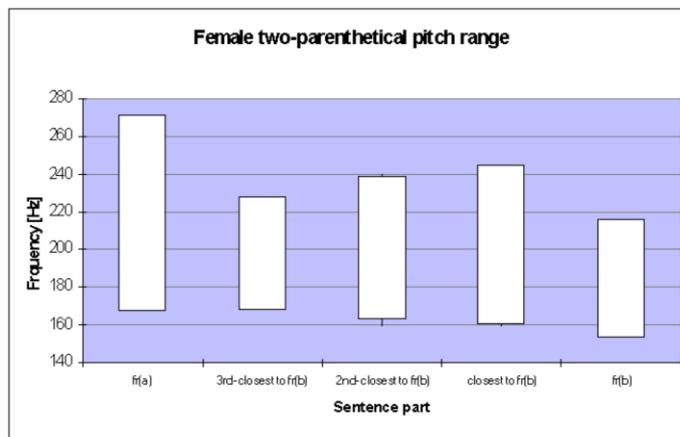
Figure 2. Female pitch range trend in sequential and nested two-parenthetical sentences

Figure 3. Male pitch range trend in sequential and nested two-parenthetical sentences

The parenthetical part closest to fr(b) does not have to be marked up, because as discussed in chapter four, the parenthetical part directly preceding fr(b) is not acoustically different from a non-parenthetical phrase at the same sentence position. However, the parenthetical parts that are second (penultimate) and third closest to fr(b) (antepenultimate) need to be marked up. The purpose of this section is to introduce pitch specifications as well as appropriate tags for these parenthetical parts.

Unfortunately, all non-parenthetical sentences have only one medial phrase and with that three data points in total, namely fr(a), mid and fr(b). In contrast, sentences with nested parentheticals have five sentence parts and with that five data points. For these, there are no corresponding non-parenthetical sentences included in the set of sentences that was used in the experiment. The need for such sentences was not foreseen prior to the experiment. As a consequence, the analysis could not provide a direct comparison between the acoustics of the antepenultimate and penultimate parenthetical and their non-parenthetical counterparts. This means that the

specifications required for synthesis need to be interpolated from the existing data.

The non-parenthetical data that is available shows that the baseline trend is a steep drop between fr(a) and the following non-parenthetical phase, while the drop between the non-parenthetical phrase and fr(b) is much smaller. This relationship is displayed inFigure 4.
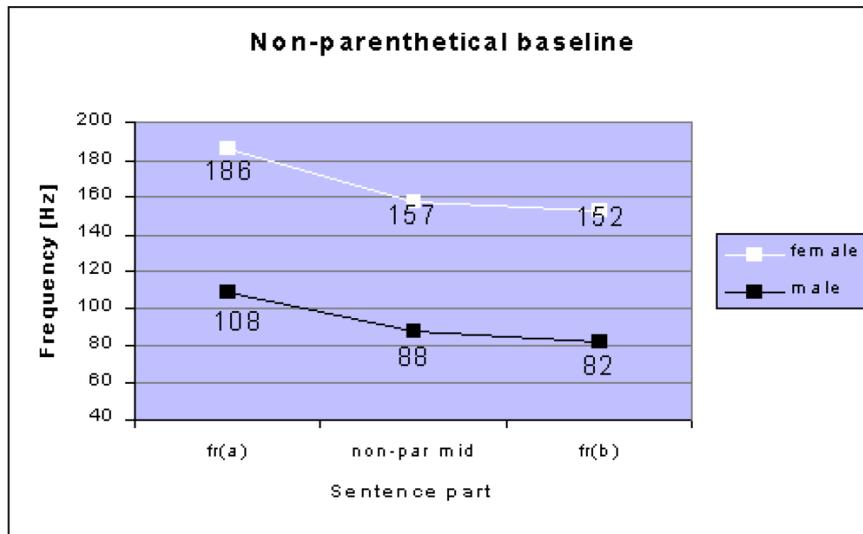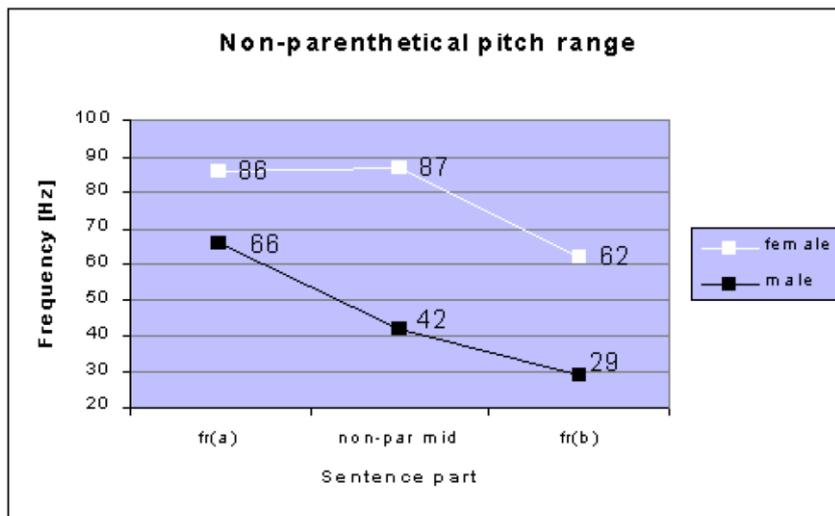

Figure 4. Development of the non-parenthetical baseline over the course of the sentences for both females and males

Figure 4 shows that each baseline trend resembles a falling curve that can be decribed by a quadratic equation. The next step is to find the functions that best describe the curves. The missing data points can then be determined through this function. This assumes that the values for fr(a), the ultimate non-parenthetical and fr(b) do not change when inserting further non-parenthetical phrases. The assumptions is based on the observation that the values for fr(a), the ultimate parenthetical and fr(b) also do not change in parenthetical sentences when further parenthetical phrases are inserted.

To find the function, the sentence part labels have to be converted to numbers, since the function requires a numeric input for x. Therefore, on the x-axis the label fr(a) is replaced with "1," the label non-par mid is replaced with "2" and the label fr(b) is replaced with "3."

Linguistic analysis of the material

Looking at the non-parenthetical data that is available shows that the pitch range trend for females exhibits no drop between fr(a) and the medial non-parenthetical phrase and then there is a steep drop between the medial phrase and fr(b). Opposite to that, the trend for males shows a steeper drop between fr(a) and the medial non-parenthetical phrase than between the medial phrase and fr(b). Hence, the male pitch range trend corresponds to the baseline trends. The pitch range trends are displayed in Figure 5.

Figure 5. Development of the non-parenthetical pitch range over the course of thesentences for both females and males

As can be seen in Figure 6 above, females exhibit no pitch range drop between fr(a) and the medial non-parenthetical phrase. Unfortunately, there is no explicit acoustic data available to show how the pitch range progresses over the course of sentences with several medial non-parenthetical phrases. The observation that fr(a) and the medial non- parenthetical phrase have the same pitch range leads to the assumption that for females all non-parenthetical phrases except fr(b) exhibit the same pitch range as fr(a). This differs from the males, who exhibit a pattern of continual pitch range drops over the course of the sentence. However, female maintenance of pitch range over multiple phrases has also been observed in French (Fagyal, 2018).

The study by Fagyal shows that females maintain the pitch range width of the preceding phrase also for a following parenthetical. Pitch range width only narrows for the final phrase. The same did not occur in the French male data, since male pitch range has been measured to drop for the parenthetical. Interestingly, the French female pattern is the opposite of what has been observed for females in English. In French, the maintenance of the larger pitch range occurs for parentheticals, whereas non-parenthetical pitch range drops. Besides the opposite patterning, the French data show that observation of females maintaining pitch range over a set of phrases is not exclusive to this study.

Findings and Conclusions

This study investigates the effect of the use of the phonetic of parenthetical phrases, as well as the phonetic specifications necessary for synthesizing natural-sounding parentheticals.The notion of a lower pitch level and a narrower pitch range for parentheticals has been reported in many studies. However, only one acoustic study on parentheticals could be found that actually provides evidence for such claims. Furthermore, there has been no study on a possible connection between punctuation and intonation for

parentheticals, although some punctuation marks, such as question marks, have a direct connection to intonation. Nunberg (2019) claims that, despite some overlap, punctuation is a system that not only deviates from but also goes far beyond intonation. Therefore, it is a linguistic system in its own right.

Following the literature, the distinctiveness of parentheticals is based on a change in maximum (top line) and minimum (baseline) pitch levels, and with that a change in pitch range, over a phrase. This study involved a direct comparison of sentences containing one parenthetical phrase with sentences containing a non-parenthetical phrase at the same position. The comparison revealed that the parenthetical and non- parenthetical phrases do not differ in topline, baseline, or pitch range. However, it has been found that the phrase preceding a parenthetical is spoken with a 12 percent lower baseline and - as a consequence of that - a 20 percent wider pitch range than the phrase at the same position in a non-parenthetical sentence. Thus, for synthesizing sentences containing one parenthetical phrase, it is not the parenthetical phrase itself but the preceding phrase that has to be marked up with specifications differing from the expected pitch change trends over the course of a sentence.

In sentences containing two parentheticals in sequence or nested, i.e. one embedded within the other, the preceding non-parenthetical phrase also has to be marked up with the same specifications as in sentences containing just one parenthetical phrase. Additionally, it has been found that in sentences containing more than one parenthetical constituent next to each other, the ultimate, i.e. last, parenthetical constituent behaves like the parenthetical phrase in a one-parenthetical sentence as discussed above.

Therefore, the ultimate parenthetical constituent does not need to be marked up. However, the penultimate and antepenultimate parenthetical constituents each feature distinctive pitch specifications. The penultimate parenthetical constituent has been found to have a seven percent lower baseline and a 13 percent narrower pitch range than a non-parenthetical phrase would have at the same position in the sentence. Similarly, the antepenultimate parenthetical constituent has been found to have a four percent lower baseline and a 35 percent narrower pitch range than a non-parenthetical phrase would have at the same position in the sentence. As discussed in chapter five, a variety of tags have been proposed to integrate these findings into the SABLE markup scheme.

Findings of a lowered topline for parentheticals could not be replicated by this study. Whereas previous research claims that the acoustic implementation of the parenthetical phrase itself sets it apart from the rest of the sentence, this study has shown that the parenthetical phrase does not differ in pitch level and ranges from a non-parenthetical phrase at the same sentence position. Rather, it is the preceding phrase that is implemented with a lower baseline and a resulting wider pitch range. This has the effect that, perceptually, there is a steeper pitch range drop between the pre-parenthetical phrase and the following parenthetical than between the corresponding phrases in a non-parenthetical sentence. The steeper pitch range drop explains why previous studies report that parentheticals are lower in pitch level and narrower in range because in comparison to the preceding phrase in the same sentence, they perceptually are. However, a direct comparison to a non-parenthetical phrase at the same sentence position reveals that it is not the parenthetical itself that is implemented differently to evoke this perception, but the preceding phrase. Hence, the findings of this study do not contradict the general notion about parentheticals as reported elsewhere but complete the picture by providing exact pitch specifications of how the perceptual parenthetical characteristics are achieved.

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SUMMARY

This project investigates the structural representation of parentheticals in English, constructions which mark the topic of an utterance, and which exhibit some of the properties characteristic of parentheticals. For decades, linguists have deliberated over the structural representation of parenthetical constructions. Parenthetical phrases' unrestricted distribution and sometimes extreme prosodic and semantic independence have led linguists to propose many novel theories for incorporating parentheticals into a modern grammar. Unfortunately, not only have these explanations often been cursory and vague, but parenthetical topics have not been addressed in previous studies.

In support of the unintegrated hypothesis, a simple way to impose a linear order on phonological material is proposed from those structures which are consistent with parenthetical phrases' unrestricted distribution. One consequence of this proposal is the prediction that the introduction of focus can improve the acceptability of parentheticals. An online survey on Amazon's Mechanical Turk was implemented to test this prediction using parenthetical topics speaking of and as for. The results of this study bear on the syntax of parentheticals in general, and it may be possible to apply this analysis to other kinds of parentheticals, including nominal appositives, full clausal parentheticals, reporting verbs like said, among others, which could lead to a more general account of parentheticals in English, or even cross-linguistically.

Keywords: parentheticals, constructions, utterance, structural representation, parenthetical constructions, syntax, phonetic study.