

Intransitive Sentences, Argument Structure, and the Syntax-Prosody Interface

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1. The prosody of broad focus intransitive sentences

1.1. Introduction

A long-standing observation about the prosody of intransitive sentences holds that in a broad focus context, when the verb in the sentence is unergative, sentence stress falls on the verb. We see an example of this in (1) with the unergative verb *jump*; people report the intuition that this sentence is pronounced a *boy JUMPED*.¹ I'll refer to this pattern, the one in which the verb receives stress, as the *verb-accent pattern*. The generalization also has it that when the verb in the sentence is unaccusative, sentence stress falls on the subject. A sentence like (2), with the unaccusative verb *fall*, is thus pronounced *A BOY fell*, not *A boy FELL*. I'll refer to this pattern as the *subject-accent pattern*.

This talk will discuss these alternations and present experimental results that not only support the intuitions in (1) and (2) but that also give us insight into the syntactic structure of unaccusative and unergative sentences if we adopt a recent theory of the syntax-prosody interface.

- (1) A boy JUMPED. *verb-accent pattern*
(2) A BOY fell. *subject-accent pattern*

1.2. Brief history

The intuition that broad focus intransitive sentences are not all pronounced alike is not a new one. But it was originally not put in terms of syntactic argument structure, as shown in (1) and (2). Schmerling (1976) is generally credited with first discussing the data in detail, and—at the time—this alternation between the verb-accent pattern and the subject-accent pattern was noteworthy, because the subject-accent pattern (today associated with unaccusatives) constituted an exception to Chomsky & Halle's (1968) Nuclear Stress Rule, which predicts the verb-accent pattern for all broad focus intransitive sentences.

1.3. Framing the generalization today: argument structure

Today, the unergative-unaccusative distinction is seen as being at the heart of these stress alternations. For example, Zubizarreta & Vergnaud (Z&V) in their Blackwell Companion chapter on phrasal stress and syntax, make the following generalization: “Within the class of intransitives, we find that unaccusatives behave differently from unergatives. In unaccusative structures, NS falls

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¹ Sentence stress is indicated with all-caps.

unambiguously on the subject....Similarly ... unergatives (in V-final contexts) allow NS on the subject”; Z&V add that with unergatives, “NS may also fall on the verb.”

- (3) Z&V example 46, with unaccusative verbs
- a. The MAIL arrived.
 - b. The SUN came out.
 - c. My BAG has disappeared.

Although many agree that broad focus unaccusative sentences have the subject-accent pattern, differing intuitions are reported for sentences with unergative verbs. While Z&V say that broad focus unergative sentences can be pronounced with *either* the subject-accent pattern or the verb-accent pattern, Kahnemuyipour (2009) reports that the verb-accent pattern is the default one for broad focus unergative sentences.

1.4. Phase-based approaches to the syntax-prosody interface

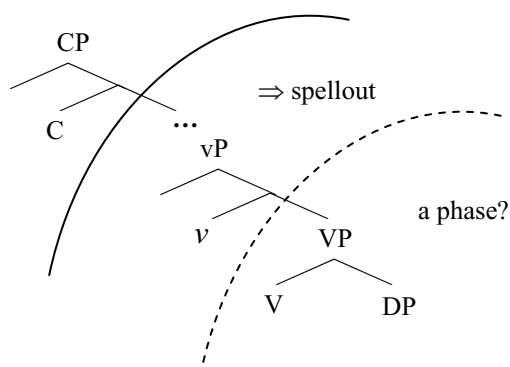
A recent approach to the syntax-prosody interface provides an explanation for these alternations and specifically makes a connection between the prosody of a sentence and whether the verb in the sentence is unaccusative or unergative. This approach is what I will call a phase-based approach because it is based on the notion of the syntactic phase as the domain for sentence accent assignment. The first and most complete articulation of such an approach is Kahnemuyipour’s (2004) dissertation, now a monograph (Kahnemuyipour 2009). Kratzer and Selkirk (2007) build upon Kahnemuyipour’s (2004) insights.

For our purposes here, a syntactic phase is simply a chunk of syntactic structure. In a phase-based approach to a syntactic derivation, structure is built up and sent to the phonological and interpretive interfaces in a cyclic way, throughout the derivation. In approaches like Kahnemuyipour (2009) and Kratzer and Selkirk (2007), the syntactic phase also constitutes a domain for stress assignment, with the highest constituent in each phase being assigned an accent. What determines these domains? Certain functional heads have been argued to be phase heads, and when these heads project, the material in the complement of the phase head is sent to spellout. In English, the phase heads are assumed to be (at least) little-*v* and Comp. Example (4) shows a representation of how this works and what is at issue for prosody and argument structure.

What is specifically at issue for the prosody of intransitive sentences is the fact that unaccusative and unergative verbs are said to be selected for by different types of little-*v* heads. Many claim that unaccusative little-*v* is “defective” and does not constitute a phase (or at least not a “strong” phase); in contrast, unergative little-*v* is said to be phasal (Chomsky 2001, 2005). Others argue that all types of little-*v* are phasal (Legate 2003, *inter alia*).

1.4.1. Predictions

If unaccusative little-*v* is defective and for all practical purposes not phasal, then the first phase in the sentence will be the one at the CP level, and—assuming a phase-based theory of the syntax-prosody interface—there will be only one domain for accent assignment. The highest constituent in that domain will be the subject, and the prosodic result is the subject-accent pattern. On the other hand, if the unaccusative little-*v* is phasal, then an unaccusative sentence will have two domains for accent assignment, with one domain containing the subject, and the other domain containing the verb. Given this theory of the syntax-prosody interface, then, we have different predictions for sentence accent based on whether the *v*P in the sentence is headed by a strong or weak little-*v*. The prosody that people use in unaccusative and unergative sentences can therefore help us determine just what kind of little-*v* is involved in unaccusative and unergative sentences.

(4) **How many domains for accent assignment?**

To summarize, these are the issues that motivate the experiment that I will present: Do people make a prosodic difference between broad focus unaccusative and unergative sentences? If people do make a distinction, then, assuming a phase-based theory of the syntax-prosody interface, the prosody that people use can tell us what kind of little-*v* is involved in unaccusative and unergative structures. Furthermore, within the unergative verbs, do people always use the verb-accent pattern, or do their pronunciations alternate between the subject-accent pattern and the verb-accent pattern?

2. Experiment

Participants read broad-focus-eliciting question and answer sentences, in which the answer sentences had matched unergative and unaccusative verbs, as well as matched subject words. The stimuli varied not just in whether the verb in the sentence was classed as unaccusative or unergative, but also in the following ways: narrow focus ($n = 8$; 4 narrow subject, 4 narrow verb); number of syllables in the verb (1-syllable or more); presence or absence of an adjunct (pre- or post-verbally); animacy of the subject (animate or inanimate); simple (past) or periphrastic (past progressive) tense.

Today I will report on a subset of the data collected: broad focus sentences with animate subjects and no adjunct. Measurements were taken of the relative prominence between the subject and the verb in each sentence for three different acoustic correlates of prominence, and statistical analyses were run for each type of measurement. The correlates of prominence measured were: pitch maximum, pitch mean, duration, intensity maximum, and intensity mean.

2.1. Materials

Twelve participants were recorded reading 50 question-answer pairs, 15 of which were fillers. These stimuli generally consisted of a scene-setting sentence, which participants were asked to read silently to themselves, and then a question sentence followed by an answer sentence. The question sentence was some variation on the standard, broad-focus eliciting question, *What happened?* An example from the stimuli is shown in (5).

(5)

Two NYU commuter students are talking about weird stuff that happens on the subway.

Q: Did anything happen on the N train this morning?

A: A thug yelled.

New York City can be crazy sometimes.

Verbs and subject words were phonologically matched, particularly in terms of the numbers of syllables and the segments making up the stressed syllable (from which measurements would be taken). This matching was done to reduce the effect of intrinsic pitch, duration, or intensity differences between different segments. Verbs ideally contained as many sonorants as possible and as few obstruents as possible, since only sonorants contain the speaker's fundamental frequency (F0), the input to the pitch tracker, and obstruents are incompatible with pitch tracking. The reality, however, was that not all the stimuli words followed these guidelines—tradeoffs were made in order to match words for unaccusative-unergative diagnostics.

2.1.1. Unaccusative and unergative diagnostics

Deciding on what unaccusative-unergative diagnostics to use was important because the classes of unergative and unaccusative verbs likely contain subclasses within them—and this is not news, because as many have discussed, not all verbs in each class behave the same with respect to a given diagnostic for unaccusativity or unergativity in English. For each verb, I started with the fact that verb was or could be used intransitively, and from there, in order to categorize a verb as unergative, three diagnostics were used. These are illustrated with the verb *yell*, one of the verbs in the stimuli. The first diagnostic for unergativity was that the verb was acceptable in the “X’s way” construction (Jackendoff 1990, Marantz 1992, Levin 1993, Levin & Rappaport Hovav 1995) (6).

- (6) The boy yelled his way through the game.

The second diagnostic for unergativity (a negative diagnostic) was that the verb had to be unacceptable with a resultative, as shown in (7)a. The third diagnostic was that the verb had to be acceptable in the reflexive plus resultative construction (Levin & Rappaport Hovav 1995), as shown in (7)b.

- (7) a. *The boy yelled hoarse.
b. The boy yelled himself hoarse.

Finally, to be considered an unergative, the verb had to be bad with existential *there*.

- (8) *There yelled boy at the game.

For the unaccusatives, two diagnostics were used, illustrated here with the verb *swell*, which was in the stimuli. The first diagnostic was that the verb had to participate in the causative/inchoative alternation (Levin 1993). The verb *break* is a classic causative/inchoative verb, as shown in (9).

- (9) a. Mary broke the plate.
b. The plate broke.

With *swell*, we see that (10)a is acceptable, and for me (10)b is ok, though perhaps not the best sentence in the world.

- (10) a. The sails swelled (in the wind).
b. The wind swelled the sails of the clipper.

The second unaccusative diagnostic was a negative one: the verb had to be bad in the cognate object construction (11).

- (11) *The sails swelled a great swell.

One unaccusative verb was included that does not participate in the causative alternation: *arrive*. I included this verb in part because it's considered a prototypical unaccusative verb in English (Levin &

Rappaport Hovav 1995: 56), because it has two syllables, and because I could find a phonologically matched two-syllable unergative verb for it (*connive*). Table (12) gives all the verbs in the stimuli.

(12) All verbs used in stimuli

unergative verb	unaccusative verb
<i>yell</i>	<i>swell</i>
<i>sang</i>	<i>rang</i>
<i>hobble</i>	<i>wobble</i>
<i>connive</i>	<i>arrive</i>

The same subject words were used in both unaccusative and the unergative sentences in many cases. When using the same subject word was pragmatically odd, phonologically matched subject words were used. These matched subjects are shown in Table (13).

(13) Matched subject words used in stimuli

subject word 1	subject word 2
<i>a thug</i>	<i>a slug</i>
<i>Erica's art</i>	<i>America's heart</i>
<i>the red</i>	<i>dread</i>

2.2. Participants and procedure

A total of 12 participants were recorded; I report here on the data from 4 participants. Participants were told that the reading task was about the connection between intonation and meaning, but otherwise, they did not know anything else about the purpose of the experiment. Participants were instructed to read the questions as if they were the ones asking the question, and the answers as if they were the ones giving the answer. I demonstrated this for participants with a few narrow focus questions, and participants practiced with some narrow focus questions like the one in (14).

(14)

Two little kids were talking about recess.

Q: Who played Pokemon?

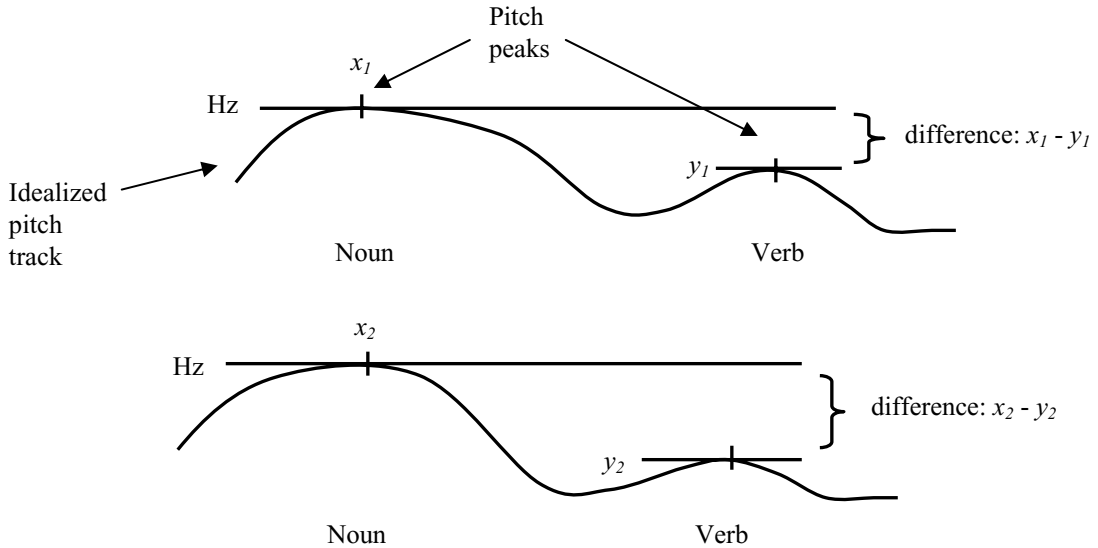
A: John played Pokemon.

2.3. Analysis

Measurements were taken of standard acoustic correlates of prominence of the stressed syllable of the noun and the verb in each sentence: pitch (F_0) maximum, pitch mean, duration, intensity (dB) maximum, intensity mean. Absolute measurements could not be used because of prosodic phenomena like declination (Ladd 2008: 16ff., 74ff.) and preboundary/phrase-final lengthening (Ladd 2008: 246; Turk & Shattuck-Hufnagel 2007).

After segmentation, a difference measurement was calculated between the subject (noun) and verb in each sentence, so that each utterance of each sentence was ultimately associated with one number for each type of measurement. An illustration of how this difference measurement was obtained is shown (15).

(15)



The curvy lines in (15) show idealized pitch tracks for intransitive sentences. The first big lump in each pitch track is the subject (noun) of the sentence, and the second big lump is the verb. Each has a pitch peak, x_1 and y_1 for the first sentence, and x_2 and y_2 for the second sentence. The calculation was simply $x_1 - y_1$, or, the prominence measurement on the noun minus the prominence measurement on the verb. That gave each token—each utterance that a speaker recorded—a number that could be used in the statistical analysis.

Interpreting this calculation is a little unintuitive. First, there's phenomenon of declination, which is the fact that a speaker's pitch generally goes down in a declarative sentence. This results in the pitch measurement on the verb almost always being lower than that on the noun—even when we as listeners hear the verb as stressed, the pitch on the verb is almost always lower than it is on the noun. This means that for pitch, the N-V measurement is always positive. What matters for prominence is therefore not an absolute measurement but a difference measurement between the noun and the verb; the bigger the difference between the pitch on the noun compared to the verb, the more likely we are to interpret the noun as prominent over the verb. The converse is true for duration—the stressed syllable of the verb is almost always longer than the stressed syllable of the noun, because we tend to lengthen just before a boundary like the end of a sentence. So the duration measurement for any declarative sentence is almost always negative, whether the verb is focused or not.

Measurements were taken from the interval that consisted in the nucleus of the stressed syllable of the word—with some exceptions. For pitch, the interval included onset approximants and coda sonorants, though word-final velar nasal codas were excluded from pitch measurements (e.g., *rang*, *sang*) since the pitch tracker was not reliable here. For the subject words, the duration measurement included onset rhotics and coda laterals.

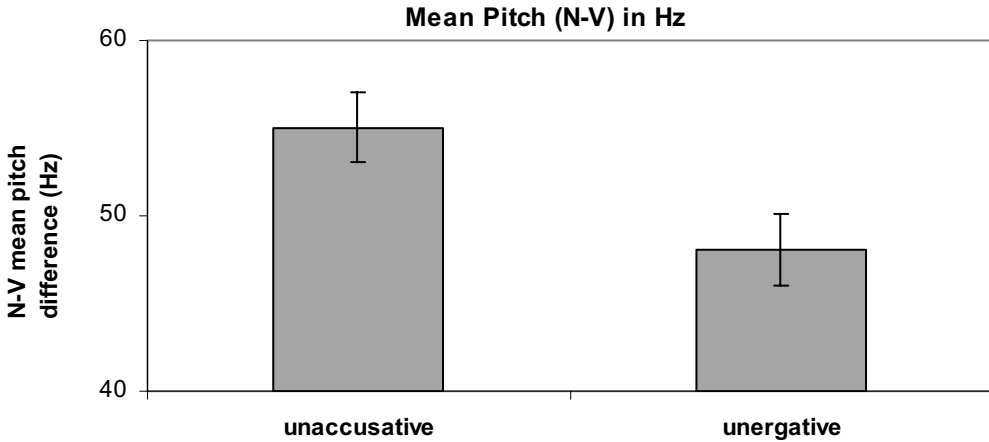
Multiple 1-way ANOVAs were run, one for each measurement of prominence, with verb type (unaccusative, unergative) as the independent factor, and participants as a random factor. Note that the results presented here are just for broad focus unergative and unaccusative sentences with animate subjects.

3. Results

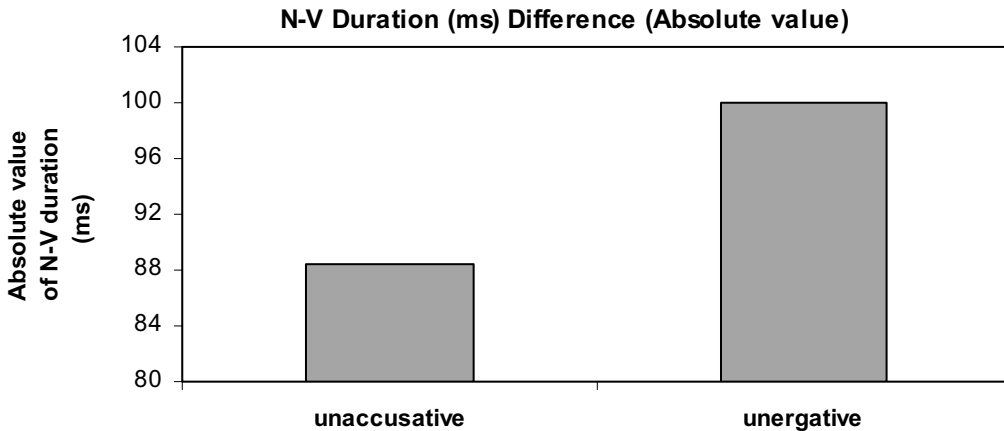
Significant results were found for two measurements of prominence: duration and pitch mean. These results showed that the average relative difference between the noun and the verb in unaccusative sentences significantly differed from the average relative difference between the noun and the verb in unergative sentences, and the difference is such that the noun in unaccusative sentences is given more prominence.

The graph in (16) shows the group means of the N-V pitch mean difference for unaccusative sentences compared to the group mean of the same measurement for unergative sentences. The number of tokens it was based on is 30. The results for duration are shown in section 3.3. In the interest of time, I will skip those and make a few more remarks on the results before concluding.

(16) Pitch mean difference in Hz between N and V in unacc and unerg sentences



(17) (Absolute value of) Duration difference in ms between N and V in unacc and unerg sentences^{2,3}



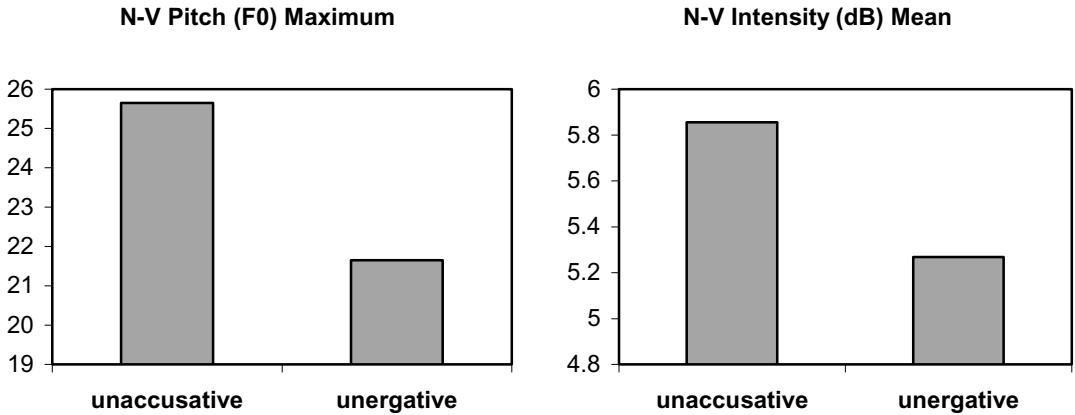
² Duration means were negative for both types of verbs. For clarity of presentation, the *absolute value* of the N-V difference measurement is shown in this graph.

³ N= 16; $F(1,3) = 12.995, p = .037$; unacc $M = -88$ ms, unerg $M = -100$ ms.

3.1. Not significant but in line with the subject-accent generalization for unaccusatives

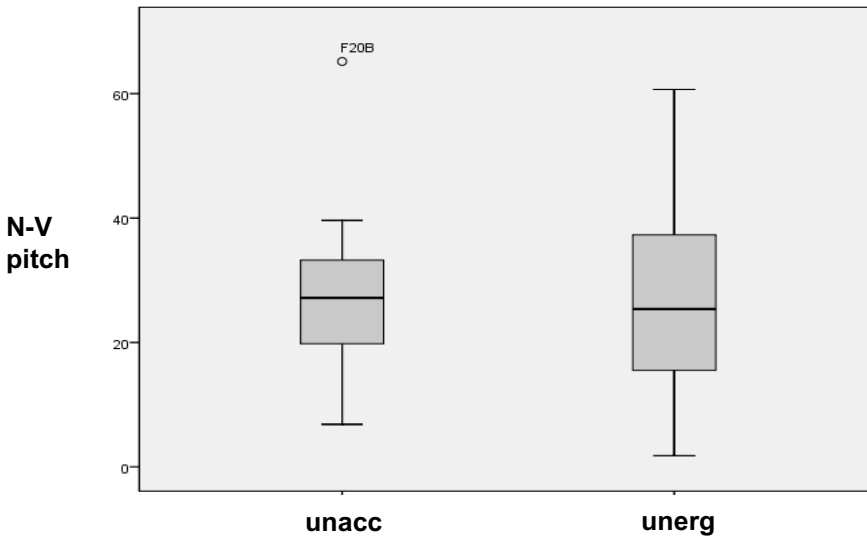
Although only two measurements of prominence were statistically significant, the group means for every measurement of prominence except one were all in line with the prediction that unaccusative sentences have the subject-accent pattern, as shown in the graphs in (18) for Pitch Maximum and Intensity Mean. These graphs show greater overall prominence on the noun for the unaccusatives. The group means for intensity (dB) maximum were not in line with the generalization that unaccusatives have the subject-accent pattern.

(18) Group Means (not sig. but support subject-accent generalization for unaccusatives)⁴



Recall that there is a disagreement on the pattern for the unergatives: Do people use the verb-accent pattern, or do they use both the subject-accent pattern and the verb-accent pattern? That question remains to be answered definitively. Looking at the boxplots for the unaccusatives and unergatives in (19), there appears to be more variability going on with the unergatives.

(19) N-V pitch max (Hz) boxplots of unaccusative and unergative verbs



⁴ Pitch results are for 1-syllable verbs; intensity results are for 1- and 2-syllable verbs combined.

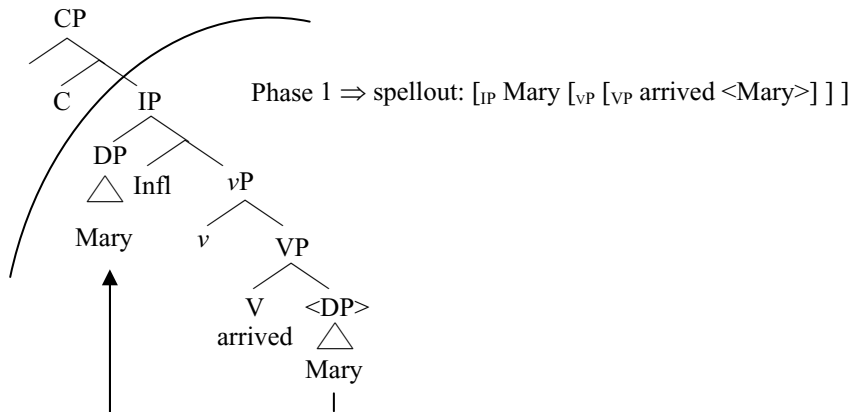
In order to explore the possibility of greater variability for the unergatives, a coefficient of variability test (Segalowitz & Segalowitz 1993) was calculated for each speaker, for each measurement type. For example, to get a coefficient of variability for pitch mean for a given speaker, the standard deviation of the speaker's pitch mean for sentences with 1-syllable verbs was divided by the mean of that speaker's pitch mean for those sentences. The result was not significant, however, though the group means were in the predicted direction, with greater variability for the unergatives than for the unaccusatives (unergative $M = .793$; unaccusative $M = .229$). Further work needs to be done to determine whether there is more variability, or perhaps a bimodal distribution, for the sentences with unergative verbs.

4. Conclusion

This study has found support for the claim that broad focus sentences with unaccusative verbs are pronounced differently from those with unergative verbs, and, in line with intuitions reported in the literature, broad focus unaccusative sentences are pronounced with the subject-accent pattern.

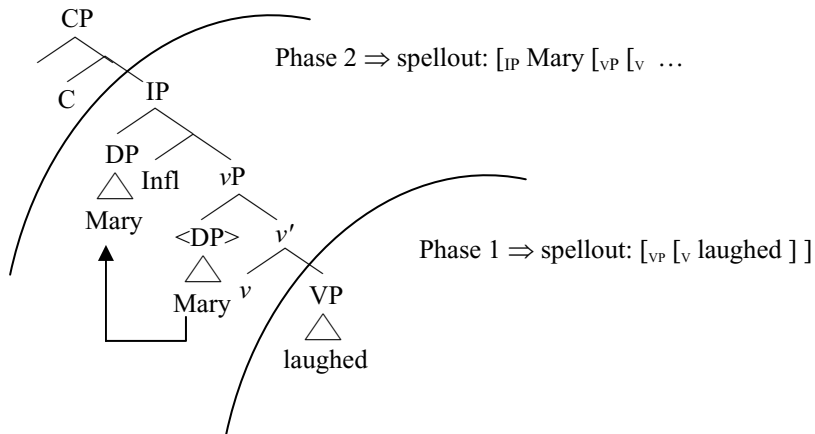
If we assume the phase-based theory of the syntax-prosody interface, then the results of this experiment suggest that sentences with an unaccusative verb have only one domain for sentence accent—resulting in the subject-accent pattern—and that unergative verbs seem to involve either two domains, or one or two domains (note that the right empirical generalization for the unergatives still needs to be determined). The tree in (20) shows that we can have only one domain for accent assignment for the unaccusatives if we assume that little-*v* is not a (strong) phase head, and so in a simple unaccusative sentence like *Mary arrived*, the first phase is the topmost one, at the CP layer. With only one domain for accent assignment, accent is assigned to the structurally highest constituent, and this results in the subject-accent pattern.

(20) Unaccusative verb: non-phasal vP, one domain for accent assignment



For an unergative sentence to have the verb-accent pattern, we must have two domains for accent assignment, as shown in (21).

(21) Unergative verb with phasal v*P, two domains for accent assignment



If we adopt a phase-based theory and want to have two domains for sentences with unergative verbs in English, this forces us to say that big V stays in situ and does not raise to adjoin to little-*v*, as is often assumed. But despite this technical detail, this experiment presents evidence from prosody that supports the theory that unaccusative little-*v* is not a strong phase head; this “defective” little-*v* in unaccusative sentences results in only one domain for accent assignment. Note that these results do not entail that all unaccusatives have the exact same *v*P-internal syntactic structure, but these results do suggest that the unaccusatives are unified in having a similar enough structural configuration that results in same number of domains relevant for sentence accent assignment.

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