

## Prosody signals focus location, not focus type

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It has traditionally been assumed in the linguistic literature that information structure is conveyed by acoustic cues in prosody (Steedman00; Jackendoff72). Moreover, some argue that different types of focus (new/contrastive) correspond to different prosodic categories (Pierrehumbert&Hirschberg90). However, to date, most of the evidence has come from intuitions or acoustic analyses of linguists' productions. We describe results from two production experiments investigating the acoustic realization of information structure by naive participants.

In Experiment 1, we elicited naturalistic productions of SVO sentences to determine whether speakers spontaneously prosodically mark the location and type of focused information. First, a Questioner asked a Speaker one of the questions in (1), which served to manipulate the information structure of the answer. Focus Location (subject/verb/object) was crossed with Focus Type (new/contrastive); the seventh condition elicited wide focus. The Speaker then saw a picture corresponding to the question's focused element (e.g. an omelet in 1d), and answered with a complete sentence.

We extracted 24 acoustic measures from the subject, verb, and object of each production to determine which measures best differentiated the three classes of Focus Location and the two classes of Focus Type. These measures included word duration and following silence, maximum/minimum/mean values of pitch and intensity, and changes in pitch and intensity over time. Discriminant function analyses demonstrated that duration+silence, maximum pitch, mean pitch, and maximum intensity best distinguished among conditions. Focus Location was successfully differentiated by these four cues (Wilks' Lambda  $\Lambda=.67, \chi^2(24)=165.44, p<.001$ ), such that focused words were longer than their unfocused counterparts, incurred larger pitch excursions, were more often followed by silence, and were produced with greater intensity. Interestingly, however, Focus Type was not systematically differentiated by these cues ( $\Lambda=.98, \chi^2(12)=10.61, p=.56$ ).

Experiment 2 was designed to more strongly encourage Speakers to prosodically mark information structure. Speakers were instructed to first silently read one of the questions in (1), then produce the answer aloud so that their Listener could determine the question type. After every production, the Listener chose which question in (1) the Speaker was answering. Acoustic analyses were performed only on trials for which the Listener chose the correct question, ensuring that the Speaker was successfully communicating the sentence meaning with his/her prosody.

Acoustic analyses of the same cues as Experiment 1 demonstrated excellent classification of Focus Location ( $\Lambda=.095, \chi^2(24)=1274.05, p<.001$ ), but only fair classification of Focus Type ( $\Lambda=.892, \chi^2(24)=62.08, p <.001$ ). Consistent with these production findings, perception results indicated that Listeners were highly accurate at determining intended Focus Location (85% correct for three levels), but only fair at determining Focus Type (60% correct for two levels).

In contrast to many theoretical proposals, these data demonstrate that while Speakers systematically prosodically mark focus location even in naturalistic productions, they do not systematically mark focus type even when the task explicitly demands it (and

Listeners are correspondingly poor at determining intended focus type from prosodic cues). These results therefore undermine the unstated assumption in linguistic literature that focus type is systematically marked, perhaps categorically so. Theoretical ramifications, including the role of context in comprehending focus type, will be discussed.

(1)

QUESTION:

- a. Wide focus: What happened yesterday?
- b. Subject focus, New: Who fried an omelet yesterday?
- c. Verb focus, New: What did Damon do to an omelet yesterday?
- d. Object Focus, New: What did Damon fry yesterday?
- e. Subject focus, Contrastive: Did Harry fry an omelet yesterday?
- f. Verb focus, Contrastive: Did Damon bake an omelet yesterday?
- g. Object focus, Contrastive: Did Damon fry a chicken yesterday?

ANSWER:

Damon fried an omelet yesterday.