The Role of L+H* Pitch Accent in Discourse Construction

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Abstract

L+H* is claimed to evoke contrast between discourse entities in English. To test whether this prominent accent projects a contrastive relation for the discourse foreground, spontaneous continuations of short stories were examined. For both subject and object positions, participants mentioned contrastive alternatives more often when the corresponding discourse entity was introduced with L+H* in the context. Also, the presence of L+H* on a discourse marker (e.g., *And NEXT*) that preceded the continuation facilitated the mention of the contrastive subject/object. These results do not merely confirm the function of L+H* on arguments in projecting contrastive relations, but also uncovers the facilitative mediation of the contrastive relation by L+H* on a discourse marker.

1. Introduction

One fundamental role of intonation in communication is to signal the informational structure of a discourse. In English, pitch accents mark discourse entities as important or salient in relation to other entities in the conversational context. Today's pragmatic typology of the pitch accents of American English is largely influenced by the previous proposal of Pierrehumbert and Hirschberg [1], and various types of pitch accent within the ToBI framework [2] allow for specification of the pragmatic denotation underlying distinctive tonal prominence. For example, both L* and H* are assumed to express informational salience, with H* adding the accented entity to the mutual belief space and L* marking the relative importance of an entity that is already part of the mutual belief space. However, relatively little has been done to examine whether the informational status of words in natural discourse is represented according to the words' accentual properties and whether speakers consistently distinguish the informational status of words with particular types of pitch accent during spontaneous production. The associations between pitch accent type and the informational status of accented words need to be further attested against natural speech data.

The present study investigates the function of L+H*, which is claimed to evoke contrast between the accented entity and its alternatives within a given discourse context [1] (e.g., *I said FIFTY, not FIFTEEN*). In particular, the experiment tests how L+H* in context affects the informational structure of a spontaneous continuation of a short story. Each story provided a prompt sentence such as "*DAVE chose popcorn,*" where a particular part of speech was highlighted with L+H*. We hypothesize that when a discourse entity is emphasized with a L+H*, the contrastive status of its alternative (e.g., *Julie*) is projected for the discourse foreground, and thus the continuation is more likely to mention the alternative. Such a view of the function of L+H* is motivated by past studies that

demonstrate the effect of accent on discourse comprehension. Bock and Mazzella [3] found faster comprehension times for two-sentence discourses in which the second sentence's accentual pattern was appropriate given the pattern of the first sentence (e.g., *ARNOLD didn't fix the radio.* → *DORIS fixed the radio*.) than for those with inappropriate accentual patterns (→ *Doris fixed the RADIO*). Dahan, Tanenhaus, and Chambers [4] tracked eye movements over drawings depicting a cohort pair (e.g., *candle & candy*) and distracters, and found that accentual prominence resulted in non-anaphoric interpretation, whereas lack of accent resulted in anaphoric interpretation. Their participants first heard instructions such as "*Put the candy above the square.*" Upon hearing the second instruction "Now, put the "*CAN/can…*" participants looked more to the cohort counterpart (*candle*) when the target had accentual prominence (*CAN...*). When the target did not have a prominent accent (*can…*), they fixated the previously mentioned entity (*candy*). Ito and Speer [5] tracked eye movements during a visual search of colored objects and found that when L+H* on a pre-nominal adjective was used felicitously (e.g., *Hang the blue ball.* → *Next, hang the RED ball.*), participants fixated the cell containing the target object faster than when L+H* was not used. Furthermore, when L+H* was used infelicitously (e.g., *Hang the blue ball.* → *Next, hang the RED star.*), participants incorrectly fixated on the previously mentioned object cell (ball) before fixating on the target cell (star). These studies do not merely demonstrate the robust effect of prominent accent on the interpretation of discourse entities, but they also indicate how rapidly accentual information is utilized during discourse comprehension.

In the present experiment, participants were asked to provide continuations for short stories that consisted of three contextual sentences (See Experiment below). The position of L+H* in the last sentence (Prompt) was manipulated (subject vs. object) in order to examine the link between grammatical/thematic role and informational status in the continuation. We assume that two discourse entities in contrastive relation share the same thematic role ($DAVE_{AGENT}$ → $Julie_{AGENT}$) and hypothesize that the contrastive linkage between the accented entity and the alternative entity projected for the discourse foreground primes syntactic parallelism in the continuation as a result of this shared thematic role. If so, the syntactic structure of the continuation should mirror that of Prompt more often when a part of the Prompt is highlighted by contrastive L+H* than when it is not. Then, if the subject NP of the Prompt has L+H* (*DAVE chose popcorn*), an alternative agent NP may be more likely to appear in the subject position in the continuation. Likewise, if the object NP of the Prompt has L+H* (*Dave chose POPCORN*), an alternative theme NP may appear more often in the object position. In addition, the present experiment contrasted the accentual patterns of *discourse markers* (DMs: words or phrases that set relations among utterances within the discourse [6]) such as '*And next.*' Results from Experiment 3 in [5] suggest that the accentual

pattern of a DM may affect the listener's expectation about the upcoming utterance. When participants heard L+H* on a DM in a contrastive sequence (e.g., *Hang a blue ball.* → *And NEXT, hang a RED ball*), their fixations to the target (red ball) declined much faster, i.e., participants rapidly identified the target and then shifted their attention from it more quickly, than when the DM had H* instead. If L+H* on a DM has a general effect of signaling upcoming contrast, the mention of the alternative of the preceding highlighted entity may be facilitated by the presence of L+H* on the DM.

2. Experiment

2.1. Design and Materials

Participants were asked to listen carefully to short stories and provide for each a brief continuation according to what they felt was a natural or appropriate extension of what they had heard. Each story consisted of three sentences followed by a DM, and L+H* placement was varied in the third sentence and DM only. (1) below provides a sample story:

(1) Context 1: *Dealing with so many customers daily, Laura and Jim secured some quiet time.*
Context 2: *They both kicked back to do some reading.*
Prompt : *Pausing occasionally, LAURA/Laura read the NEWSPAPER/newspaper.*
DM: *After THAT/that…*

The fist sentence of each story (Context 1) introduced two people, one male and one female, engaged in a naturalistic situation. Male and female names were paired to avoid ambiguities in the use of pronouns in participants' continuations. The second sentence (Context 2) specified an activity involving a set of potential objects (e.g., things that can be read). The third sentence (Prompt) exhibited strict SVO structure and introduced one of the two aforementioned people performing an action on a member of the object set elicited by Context 2. The Prompt exhibited one of three L+H* placement variations: no L+H*, subject placement, or object placement. The following DM always consisted of two words (*After that*; *Following that; And next; And then*) and had either L+H* or H* on the second word. Crossing the three Prompt variations with the two DM variations yielded 6 experimental conditions, represented in Table 1:

Table 1: *Experimental conditions*

Condition	Prompt	DM
C1	*Laura read the newspaper.*	*After THAT…*
C2	*Laura read the newspaper.*	*After that…*
C3	*LAURA read the newspaper.*	*After THAT…*
C4	*LAURA read the newspaper.*	*After that…*
C5	*Laura read the NEWSPAPER.*	*After THAT…*
C6	*Laura read the NEWSPAPER.*	*After that…*

Figure 1 provides sample F0 traces of the Prompt and DM variations. Table 2 indicates the average duration and F0 values for the subject and object positions of each of the three Prompt variations. (The average duration and F0 values for the two types of DM are shown within Figure 1).

Table 2: *Average duration and F0 values for subject and object in three Prompt variations*

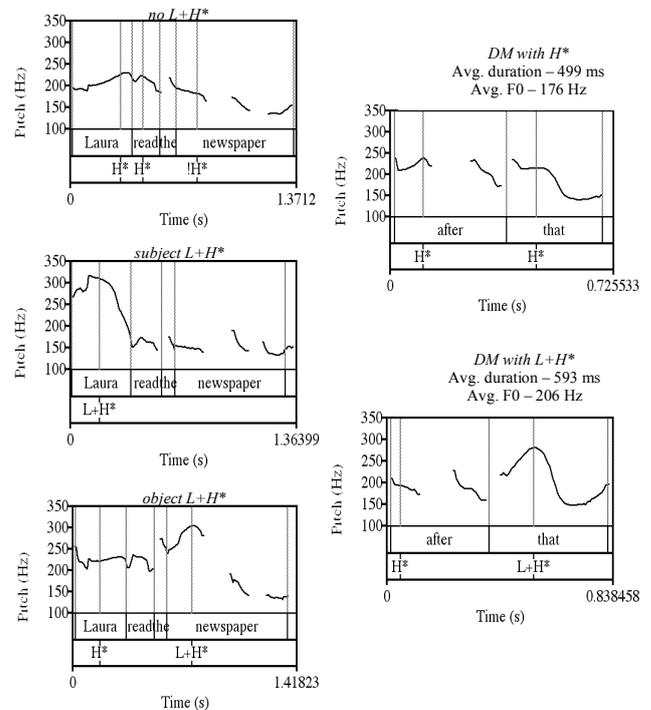| L+H* Placement	Subject		Object	
	duration (ms)	F0 (Hz)	duration (ms)	F0 (Hz)
None (C1&2)	295	212	510	162
Subject (C3&4)	309	286	503	153
Object (C5&6)	284	225	600	231

Figure 1: *F0 traces of Prompt and DM variations*

2.2. Participants

4 undergraduate students at Ohio State University who were native American English speakers participated in the experiment as part of their linguistics course requirement.

2.3. Procedure

The experiment consisted of 4 blocks of 24 trials each, yielding 96 total trials. Of these, 48 were target trials, with 8 trials per experimental condition, and 48 were fillers that exhibited syntactic and accentual structures varying from those of the targets. The blocks were balanced so that no more than two target trials appeared consecutively, and no experimental condition was repeated in consecutive trials. Participants were seated in a soundproof booth and presented the stimuli over computer speakers. They used a button box to advance through each of the three sentences at their own pace. Following each sentence, they were given an opportunity to repeat the sentence, and after the third sentence they had the opportunity to repeat all three sentences back-to-back. After this, they heard the DM and were given an onscreen prompt to speak, at which time they provided their continuations into a head-mounted microphone and then used the button box to advance to the next trial.

3. Results

3.1. Tagging of Continuation Type & Informational Status

Participants' continuations were first coded as 'parallel' or 'nonparallel' to the Prompt according to two criteria. First, a parallel continuation must have exhibited a strict SVO structure mirroring that of the Prompt. Second, a parallel continuation must have contributed to the discourse goal in a manner comparable to the Prompt. In each target trial, Context 2 introduced a specific goal within the discourse context (e.g., to describe acts of casual reading) to which the Prompt contributed (e.g., *Laura read the newspaper.*). Therefore, a parallel continuation must have described an action similar to that of the Prompt. (2) below shows a canonical example of parallel continuation:

(2)   *She read Time Magazine.*

In addition to this coding, the subjects and objects of each continuation were tagged according to their contrastive status with regard to the subject and object of the preceding Prompt. Contrastive subject status was assigned only to the member of the name pair introduced in Context 1 but not mentioned in the Prompt (e.g., Context 1: *…Laura and Jim secured some quiet time.* Prompt: *...Laura read the newspaper.* Continuation: *Jim read the newspaper.*) Contrastive object status was assigned only to a member of the object set elicited by Context 2 that was not identical to that mentioned in the Prompt (e.g., Context 2: *They both kicked back to do some reading.* Prompt: *...Laura read the newspaper.* Continuation: *She read Time Magazine.*)

3.2. Distribution of Parallel Continuations

Contrary to our prediction, the presence of L+H* in the Prompt did not lead to high occurrence of parallel continuation. As shown in Table 3, the ratios of parallel continuation for each Prompt type are comparable, indicating that the presence of L+H* in the Prompt did not increase the production of parallel continuation. Averaging the ratios of the two Prompt types containing L+H* yields a combined ratio of 60%, which does not indicate a robust increase in parallel continuation due to the presence of L+H*.

Table 3: *Ratios of parallel continuation by Prompt type*

Prompt Type	Example	Ratio of Parallel Continuation
H* only	*Laura/newspaper*	0.578
L+H* on subject	*LAURA/newspaper*	0.578
L+H* on object	*Laura/NEWSPAPER*	0.625

Table 4: *Ratios of parallel continuation by DM type*

DM Type	Example	Ratio of Parallel Continuation
L+H*	*After THAT*	0.646
H* only	*After that*	0.542

The presence of L+H* on the DM, on the other hand, seems to have induced more parallel continuations. Table 4 shows that there were about 10% more parallel continuations when the DM had prominent L+H* accent than when it had H*. This finding suggests that L+H* on a DM may indeed act as a cue to upcoming contrast, as suggested by the results of Experiment 3 in [5].

3.3. Distribution of Contrastive Information

While the presence of L+H* in the Prompt did not lead to greater occurrence of parallel continuation compared to when the Prompt exhibited only H*, the placement of L+H* in the Prompt seems to have guided the production of contrastive entities *within* parallel continuations. Table 5 provides the ratios of contrastive subjects and objects *within* the parallel continuations for each Prompt type:

Table 5: *Ratios of contrastive subjects and objects within parallel continuations by Prompt type*

Prompt Type	Example	Subject Ratio	Object Ratio
H* only	*Laura/newspaper*	0.622	0.865
L+H* on subject	*LAURA/newspaper*	0.730	0.865
L+H* on object	*Laura/NEWSPAPER*	0.725	0.925

When participants produced parallel continuations, contrastive information appeared more often when the Prompt contained L+H* than when it did not. Overall, both contrastive subjects and contrastive objects were mentioned more frequently after the Prompt with L+H* than without. In accordance with our prediction, contrastive objects were mentioned most frequently when the object of the Prompt was highlighted by L+H*. However, L+H* on the subject of the Prompt did not lead to the highest mention of contrastive subjects in parallel continuations. This may suggest that the participants were somehow more sensitive to intonational prominence in the object position than in the subject position. Further analysis of the data reveals that they were in fact equally sensitive to subject L+H* as to object L+H* (see 3.4).

Comparison of the distribution of contrastive subjects and objects within parallel continuations across the six conditions suggests an interaction between the accentual patterns of the Prompt and DM. In general, L+H* on the DM facilitated the mention of the alternative of the discourse entity highlighted by L+H* in the Prompt (Table 6).

Table 6: *Ratios of contrastive subjects and objects within parallel continuations by condition*

Condition	Subject Ratio	Object Ratio
C1: *Laura/newspaper; After THAT*	0.579	0.789
C2: *Laura/newspaper; After that*	0.667	0.944
C3: *LAURA/newspaper; After THAT*	0.800	0.850
C4: *LAURA/newspaper; After that*	0.647	0.882
C5: *Laura/NEWSPAPER; After THAT*	0.826	0.957
C6: *Laura/NEWSPAPER; After that*	0.588	0.882

After the Prompt with L+H* on the subject (C3&4), participants mentioned the contrastive subject more frequently when the DM had L+H* than when it had H*. Likewise, after the Prompt with L+H* on the object (C5&6), a contrastive

object was mentioned more often following the DM with L+H* than following that with H*.

While the data presented in Tables 5 & 6 indicate that L+H* placement in both the Prompt and DM guided the production of contrastive information within parallel continuations, the results are not unproblematic. Unexpectedly, the mention of contrastive subjects after the Prompt with a highlighted subject did not exceed that with the Prompt with a highlighted object. This result motivated a closer examination of individual participants' continuation patterns to determine if any individual's particular response tendencies could account for this finding. We noticed that one participant predominantly used a pronoun for the subject in her continuation, regardless of preceding accentual pattern. This tendency reduced the overall ratio of contrastive subjects for all conditions, but most affected the conditions exhibiting a Prompt with a highlighted subject. Thus, a subset analysis of the remaining three participants was conducted to examine the data in the absence of this response strategy.

3.4. Subset Analysis

An analysis excluding the aforementioned participant accounted for the discrepancy from Table 5 while still confirming the other findings detailed in the previous two sections. For the remaining three participants, the production of parallel continuation again was not dependent upon the presence of L+H* in the Prompt. The average ratio of parallel continuation for the two Prompts exhibiting L+H* was 52%, which was identical to that of the Prompt without L+H*. This subset analysis also supported the conclusion drawn from Table 4; namely, that the presence of L+H* on the DM induced more parallel continuations than did H* (58% for DM with L+H*; 46% for DM with H*).

The distribution of contrastive information within parallel continuations in this subset analysis closely mimics that of the distribution discussed in 3.3. Once again, mention of contrastive information was more frequent for Prompts exhibiting L+H* than for those exhibiting only H*. Contrastive objects were mentioned most frequently after the Prompt with a highlighted object, and in contrast with the problematic finding from Table 5, the ratio of contrastive subjects for the Prompt with a highlighted subject was 10% greater than the Prompt with a highlighted object. Table 7 below illustrates these findings:

Table 7: *Ratios of contrastive subjects and objects within parallel continuations by Prompt type for three participants*

Prompt Type	Example	Subject Ratio	Object Ratio
H* only	*Laura/newspaper*	0.800	0.800
L+H* on subject	*LAURA/newspaper*	0.955	0.865
L+H* on object	*Laura/NEWSPAPER*	0.857	0.925

The subset analysis of the distribution of contrastive information within parallel continuations across the six conditions indicates the same interaction between the Prompt and DM accentual patterns detailed above. In comparison with the findings presented in Table 6, when the Prompt highlighted the subject with L+H*, participants made more frequent mention of the contrastive subject when the DM exhibited L+H* than when it exhibited H* (C3: 100% vs. C4: 90%). Similarly, when the Prompt highlighted the object with L+H*, participants made more frequent mention of a contrastive object when the DM had L+H* than when it had H* (C5: 94% vs. C6: 91%). Thus, the results of the subset analysis confirmed the two important functions of L+H*: First, when it is used in the discourse background, L+H* prompts the use of the alternative entity in the discourse foreground. Second, when it is used with a DM that links utterances, this prominent accent facilitates the use of parallel structure exhibiting contrastive information.

4. Conclusion

The present study utilized a discourse continuation task to investigate the role of L+H* pitch accent in establishing contrastive relations in discourse. The mere presence of L+H* in the Prompt did not increase production of parallel continuations, indicating that L+H* alone may not prime structural parallelism. However, L+H* on the DM did induce a greater frequency of parallel continuation than did H*. When speakers produced parallel structures, L+H* in the Prompt guided the use of contrastive information. Most frequent mention of a contrastive subject or object appeared when that entity was highlighted in the Prompt. Importantly, L+H* on the DM facilitated this effect. This suggests that accentual prominence can mediate informational relations across utterances during discourse construction. Analysis of additional participants and the distribution of accent types in their continuations would further inform these findings. As participants may adopt particular response strategies, close attention to individual response tendencies is required to capture how these tendencies are affected by the accentual patterns of the stimuli. Analysis of the accentual patterns of the contrastive information in participants' productions would demonstrate whether L+H* on the DM primes prosodic parallelism as well as structural parallelism.

5. References

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