THE DISSOCIATION OF DEACCENTING, GIVENNESS, AND SYNTACTIC ROLE IN SPONTANEOUS SPEECH

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ABSTRACT

This study examines co-referential repetitions in task-oriented dialogue for characteristics conducive to the lowered clarity of words naming Given entities. Pairs of word tokens repeatedly mentioning the same entity within a single task-oriented dialogue (n=294) and pairs introducing an entity in separate dialogues (n=48) were compared. In both samples intelligibility and length fell significantly with repeated mention. Deaccented second mentions, thought to be largely responsible for this effect, were rare (15% within, 6% between dialogues) and did not account for effects of repetition. Repetitions within sentences of the same structure are thought to encourage deaccenting, but were not common (6%, 35%), and structural similarity did not encourage deaccenting. Similarity in the conversational role of carrier utterances was associated with higher rates of similar structure among re-introductions, but not with increased frequency of deaccenting. Thus, factors which should promote marking of Givenness are either lacking or ineffective.

1. INTRODUCTION

This paper deals with the conditions under which Givenness affects the phonetic form of word tokens in spontaneous speech. Using broadcast monologues and interviews, Fowler and Housum [7] showed that the later token of a repeated word, which referred to Given information, tended to be shorter and less intelligible than the earlier, which introduced New information. On the basis of elicited descriptions, Hawkins and Warren [9] suggested that the greater part of this effect was due to a categorical phonological contrast between accented and de-accented tokens (but see [10]). Within very simple elicited descriptions, however, Terken and Hirschberg [13] have shown, that deaccenting of second mentions was by no means universal. Instead, it was most likely when the two mentions occurred in the same sentence position and filled the same grammatical role in successive sentences. The design of the study assured that sentences had very similar overall structures. Taken together, these results suggest that robust effects of repeated mention on intelligibility are more likely to appear where the utterances carrying repetitions offer structures that permit deaccenting.

We ask whether such conditions are likely to be found in conversational speech. Although extended narrative passages might encourage structural parallelism, task-oriented dialogue does not seem to call for the kind of structural consistency which Terken and Hirschberg elicited experimentally. Instead, utterance structure would seem likely to be influenced by utterance function. In experimental settings, functions are designated by the experimenters' instructions. In unscripted dialogues, the function of utterances can vary. Though a speaker might ask a series of genuine questions, it might be equally natural, for example, to ask a question, comment on the answer, offer additional information on the topic, and then ask another question. With this kind of variety in the function of utterances, the structures in which successive mentions occur could vary considerably. If so and if Terken and Hirschberg's observation generalizes to spontaneous speech, then such dialogues should rarely offer conditions conducive to deaccenting. Hence de-accenting would play a relatively small role in the loss of intelligibility which characterizes reference to Given information in dialogue.

For that reason, we re-examine a set of dialogue materials for which robust effects of Givenness on duration and intelligibility have been reported [4]. We ask the following questions:
1. Is the effect of Givenness on intelligibility in dialogue achieved by means of de-accenting?
2. Is deaccenting encouraged by repetition of sentence structures?
3. Is there a relationship between function and structure?
4. Does this relationship affect the rate of deaccenting?

We make use of two repetition paradigms which both showed loss of intelligibility but which should have different tendencies toward functional and structural repetition. The first uses repeated mentions of the same entity within a single task-oriented dialogue. The second uses repeated introductions of the same entity in different attempts at the same dialogue task. The former case is usually supposed to induce deaccenting. The latter case might not be expected to do so, because both tokens introduce information New to the listener. In fact, speakers do reduce intelligibility on second introductions, apparently in keeping with the Given status of the referent for the speaker. Since both introductory mentions serve a similar strategic function within their respective dialogues, they ought to have a good chance of occurring in utterances which are similar in function and structure. If these conditions affect deaccenting, and if de-accenting sustains the effect of Given status on intelligibility, then cross-dialogue cases should be more susceptible to de-accenting and intelligibility loss than within-dialogue cases.

2. METHOD

2.1. Materials and design
The materials are drawn from the HCRC Map Task Corpus, 128 task-oriented dialogues produced by pairs of Glasgow University students during a route communication task in which each participant had unique information to contribute (See [1] for a full description of design and methodology), and each was

recorded via a headmounted microphone on a separate DAT channel. There were no restrictions on what any speaker could say. Instead, each was encouraged to contribute fully to the completion of the task. Each of the 64 speakers participated in 4 dialogues, twice as Instruction Giver, relating the same map route to 2 successive Followers; and twice as Instruction Follower, using different maps. All maps represented imaginary places and the routes were defined by labeled landmarks. All *running speech* materials used in the intelligibility experiments were single word tokens of nouns or adjectives excerpted from the full renditions of landmark names. After completing their dialogues, speakers also read a list of *citation form* landmark names, which serve as controls.

Words for present analyses were of two types. The unique items from experiments on *repeated mentions within dialogues* included 294 first and second mentions with their respective citation forms. The items for *repeated introductions across dialogues* included 48 triples of first trial introduction, second trial introduction, and citation form control.

2.2. Measures of reduced clarity
2.2.1. Intelligibility loss. Word tokens were excerpted by digital editing from running speech or from citation lists, overlaid with noise of random amplitude, and presented in random orders to groups of 9 or 10 naïve listeners for identification (for details, see [4]). Intelligibility is the proportions of listeners correctly identifying the word token. *Intelligibility loss* is the difference between intelligibility of citation and running speech forms of the same word produced by the same speaker.

2.2.2. *k*-normalized duration. Millisecond durations of all word tokens were assigned normalized scores by a variant of the Campbell and Isard [5] system. All segments were assumed to have the same Gaussian distribution of log duration with identical means and s.d's. A standard value k was assigned to all the segments in each word under this distribution and allowing for the number of segments, syllables, and stressed syllables in the dictionary account of the word [3]. Roughly speaking, k indicates how long a word token is relative to the expected length of a word of the same numbers of segments and number and types of syllables.

2.3. GlaTOBI analysis of accenting
Developed for use with the HCRC Map Task Corpus, GlaToBI uses ToBI conventions to capture characteristics of Glaswegian Southern Scottish English. See [11] for a full description and coding reliability test. All utterances containing the stimulus words were GlaToBI coded by an expert coder (MA) in the course of a larger scale coding exercise on which 679 word-segmented intonational phrases. The coder performed frequent consistency tests with earlier phases of the coding task.

For present purposes, only 2 items of information were retained from this coding, the presence or absence of accent and boundary tone. *Deaccenting* was conservatively defined as loss between tokens of accent, or of boundary tone without addition of non-boundary accent, or loss of both. *Reaccenting* included
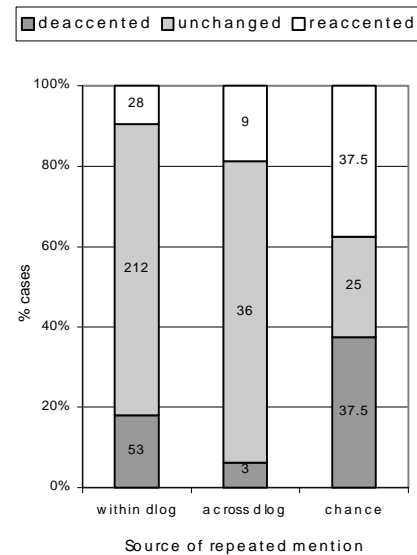

Figure 1. Accenting of repeated mentions in task-oriented dialogues as percentage of cases (with *n* for each cell).

addition of accent, or of boundary tone without loss of non-boundary accent, or addition of both. *Unchanged* items had the same code each time.

2.4. Structural Analysis
Utterances containing stimulus words were examined for phrasal structure in terms of noun phrases, verb phrases and prepositional phrases. *Same structure* pairs contained the critical word in the same constituent in the same sequence of phrasal constituents in both mentions, and preserved the grammatical function of the NP containing the word where this could be determined. *Different Structure* pairs did not match in this way.

Matching between utterances in same structure cases was not exact. A constituent might differ lexically between utterance, as in examples (1) and (2) below, or an additional phrase might follow the sequence that matched across utterances, as in (3).
(1) Above a site of a forest fire ==
     Above the site of the forest fire
(2) Over towards the seven beaches ==
     Over towards the seven beeches and down a little
(3) Do you have... == Have you got... == Got...
     In virtually all cases, successive mentions with the same structure were direct repetitions of the original utterance with or without minor changes.

2.5. Conversational move analysis
Conversational game and move analysis [6] was applied to the source utterances during overall coding of the Corpus. Conversational moves are categories of conversational act defined by function and by position in relation to other utterances. They may initiate or respond to gratuitous information, instructions, queries of various types, requests for
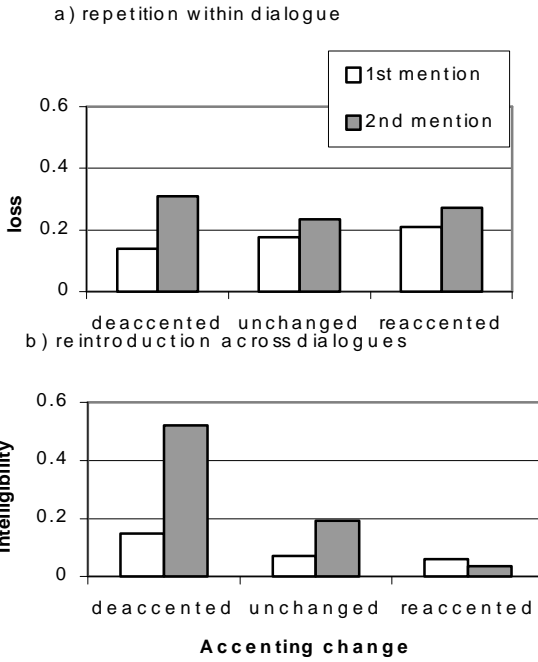
a) repetition within dialogue

b) reintroduction across dialogues

Figure 2. Effects of repetition on intelligibility loss for different changes in accenting (a. $N = 294$; b. $N = 48$)

a) repetition within dialogues

b) reintroduction across dialogues

Figure 3. Accenting changes across mentions in utterances with same and different structure.

confirmation, and the like. Over a similar dialogue corpus, move class helps to predict syntactic form [12]. Utterances containing repeated mentions were classed as same function pairs if they had the same conversational move coding, and as different function pairs otherwise.

3. RESULTS

3.1. Intelligibility and deaccenting

Figure 1 shows that, as we predicted, deaccenting is rare in repeated mentions within spontaneous task-oriented dialogue. Only 15% of within dialogue repeated mentions were deaccenting, with 12% reaccenting, and 72% unchanged. This distribution differs significantly from what would be expected with chance alternation among the 4 categories we used (37.5% deaccenting, 37.5%, reaccenting, and 25% unchanged: χ^2(df = 2, $n = 296$) = 327.59, $p < .001$). The figures for cross-dialogue repeated introduction, 6% deaccenting, 19% reaccenting, and 75% unchanged also provide lower than chance rates of deaccenting (χ^2(df = 2, $n = 48$) = 25.71, $p < .0001$).

Are the minority deaccenting repetitions responsible for the bulk of the intelligibility effects? Figure 2 shows the difference between running speech tokens and citation forms in intelligibility. (Normalized duration figures are omitted for economy. Higher values indicate greater loss of clarity. As reported, within dialogues, second mentions are more degraded than first (intelligibility loss: F_2 (1, 290) = 7.76, $p < .006$; k-normalized duration reduction: F_2 (1, 290) = 6.51, $p < .02$). As we might expect, deaccenting pairs showed more change more from first to second token than prosodically unchanged pairs,
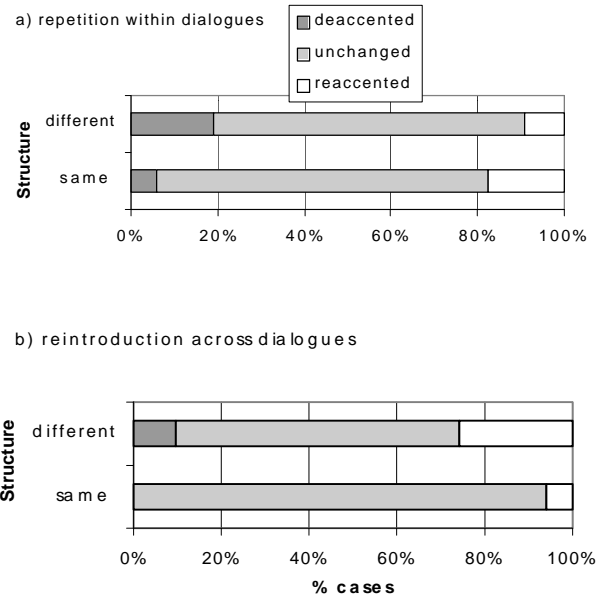
and unchanged show more than reaccenting pairs. In intelligibility to naïve listeners, this tendency towards an interaction did not approach significance and the unchanged pairs themselves showed a significant repetition effect. (F_2(1, 221) = 4.54, $p < .04$). In temporal reduction, the analogous interaction was significant (F_2 (2, 290) = 9.45, $p = .0001$), though again the prosodically unchanged pairs differed significantly with repeated mention (F_2 (1, 211) = 14.36, $p = .0002$).

Among repeated introductions, once more the repetition effect on intelligibility was independent of prosodic change (token, F_2 (1, 45) = 4.84, $p < .04$; token x prosodic change, $n.s.$), and unchanged pairs showed a significant repetition effect. (F_2 (1, 35) = 5.51, $p < .03$). Temporal reduction was also significant (F_2 (1, 45) = 6.20, $p < .02$), but now different prosodic changes were important (F_2 (2, 45) = 4.76, $p < .02$) and the 35 prosodically unchanged pairs did not differ significantly ($F_2 < 1$). Even though accenting has an effect on clarity and particularly on duration, accent changes seem to occur too rarely to be entirely responsible for the effects of repetition.

3.2. Structure maintenance and deaccenting

Is repeated use of a nominal in the same structure conducive to deaccenting in dialogue? Figure 3 shows rates of deaccenting, reaccenting and unchanged pairs for different-structure and same-structure repetitions. Both within and across dialogues, same structure repetitions are the rarer case (6% of repeated mentions, 35% of repeated introductions). Moreover, contrary to prediction, deaccenting was no more common in same

structure pairs than in different structure pairs (for repeated mentions, 6% v 19%; for repeated introductions, none v 10%, with no significant differences associated with the structural variable).

3.3. Function maintenance and structure maintenance

Table 1 shows the association between function maintenance and structure maintenance. As predicted, same move repetitions maintained structure more often than different move repetitions both within (10% v 5%) and across (48% v 12%) dialogues. As predicted, the association was stronger across dialogues (χ^2(df = 1, n = 48) = 4.94, p < .03; within dialogues, *n.s.*).

Source	Structure	Move	
		Same	Different
Within dialogues	Same	4	13
	Different	38	238
Across dialogues	Same	15	2
	Different	16	15

Table 1. Distribution of repetitions by structure and function.

3.4. Function maintenance and accenting

Though structure and function show some degree of association, function does not take the role which Terken and Hirshberg describe for structure. Same-move repetitions are not significantly associated with greater rates of deaccenting than different move repetitions in either set of experimental materials (within dialogues, 12% v 19%; between dialogues, 10% v none). In fact, although the cross dialogue reintroductions were more often function maintaining than within dialogue repetitions, they were less often deaccenting (6% across v 19% within: χ^2(df = 2, n = 346) = 7.56, p < .03).

CONCLUSION

Only two of our four questions have been answered as predicted. First, as expected, deaccenting is not responsible for intelligibility changes between initial introduction of New information and subsequent mention of Given information. In fact, deaccenting is relatively rare, with the about 70-75% of all cases showing no change of accent across repetitions. This result might have followed from the rarity of structure maintaining repetitions, if the two phenomena had been related in this corpus. Contrary to prediction, they are not. Second, as predicted, repeated mentions which both serve to introduce an item into a dialogue tend to maintain structure and function more consistently than repeated mentions within a single dialogue. Though function maintenance and structure maintenance are associated, neither has the predicted tendency to encourage deaccenting.

In effect, this investigation shows that the predictions made from well-controlled laboratory experimentation do not generalize to task-oriented dialogue. First, they have little opportunity to do so, since conditions under study - structure preserving repetition and deaccented repetition -- seem to be relatively rare in this kind of spontaneous speech. Second, there must be at least one other process sustaining the effect of Givenness by reducing token length and decreasing articulatory detail. This process may be an articulatory analogue of the gradual reductions in form of referring expression which reflect accessibility of antecedents in extended discourse [2, 8]. Whether this process is the principal marker of Givenness and what situations encourage it both remain to be seen.

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