The Referent of Accented Pronouns is Determined by Coherence Relations

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Abstract

This study investigates the effect of coherence relations and accent on pronoun reference. Participants heard sentences like *John saw Jeff, and Jane called him*, and indicated which noun the pronoun referred to. Here, the pronoun is said to be ambiguous because it can refer either to *John* or to *Jeff*. The sentences had one of two different types of coherence relations (Kehler, 2002), and were varied for pronoun accent. Coherence relations describe the relation between two different propositions. Accenting the pronoun changed the referent in one coherence relation condition, but not the other. Contra Kehler, Kertz, Rohde, and Elman (2008), different coherence relations responded to accenting in dissimilar ways. Furthermore, coherence relations were more important in determining pronoun referent than syntax, against Smyth (1994).

Keywords: Discourse Processing; Pronoun Interpretation; Prosody; Accent; Parallel Structure; Coreference.

Introduction

Pronouns are used to indicate entities already accessible within the discourse model, and accenting is used to make items more salient. Therefore, accenting a pronoun seems paradoxical at first: Why draw attention to something which is already active? Pronouns themselves are not straightforward. There are sometimes several candidates for reference and therefore there is a risk of ambiguity. Nevertheless, pronouns are used with great frequency. What is more, they are used more often by those with limited processing capacities (Hendriks, Englert, Wubs, & Hoeks, 2008). It follows that the interpretation of ambiguous pronouns has long been of interest to both psycholinguists and computational linguists, with influential models from one field being used in the other (Ledoux, Gordon, Camblin, & Swaab, 2007; Gordon, Grosz, & Gilliom, 1993). Accenting is itself controversial. In spite of being recognized as important, the workings of prosody are still a matter of debate (Fodor, 2002; Shneiderman, 2000).

Researching accented pronouns is all the more relevant in view of Kothari (2007). This corpus study demonstrated that pronouns are accented in natural speech in order to change their referent to a less expected referent. Corpus data represents proof that a particular construction is used in language. Kothari (2007) concludes that her work corroborates previous experimental work (that of Venditti, Stone, Nanda, & Tepper, 2002), but she also found accenting unrelated to coherence-parallelling. *Speaker*, or more specifically *speaker style* was an important factor in determining the frequency of pronoun accenting.

Thus, we bring together pronoun reference and prosody in the form of accented pronouns. We propose that the result is a greater understanding of both pronouns and accenting.

The Resolution of Ambiguous Pronouns

The importance of understanding pronoun resolution is perhaps best demonstrated by the large amount of research that has already been done. In particular, pronoun research in psycholinguistics has focussed on parallel sentences with an ambiguous pronoun. The term *ambiguous* has traditionally referred to morphological ambiguity, in the sense that the pronoun has the same gender as two or more nouns in the preceding sentence (see Smyth, 1994; Kehler et al., 2008; Venditti et al., 2002). These are sentences with two clauses as shown in (1):

(1) John_1 saw Jeff_2, and Stephen called him.
NP_1 VP NP_2 and NP_3 VP Pro

In order to be a parallel sentence, each of the clauses must have a verb (*VP*) and a subject (NP_1, NP_3), and be conjoined by *and*.

Parallel sentences have been much explored in the literature. Many of the initial attempts to explain coreference in these sentences creatively exploited syntactic theory. Early syntactic accounts suggested that the grammatical role was the most important feature in determining pronoun reference. Smyth (1994), however, put forward the Extended Feature Marking Hypothesis (EFMH); the idea that it is the degree of match between the grammatical roles in the first and second sentences which is most important, and not the grammatical role per se. For example, in his sentences (2-a. and -b.)

both express the same idea and involve the same characters, but *the plumber* occupies a different grammatical role in each sentence (p. 202):

(2) a. The carpenter gave the plumber an invoice, and the electrician gave him a cheque.
b. The carpenter invoiced the plumber, and the electrician gave him a cheque.

Importantly the first and second clauses of (2-a.) have two objects (*the plumber*, *the invoice* and *him*, *a cheque*); but in the first clause of (2-b.) there is just one object, *the plumber*, while in the second clause there are two objects *him*, and *a cheque*.

According to Smyth (1994) the differences in Grammatical Role Parallelism between (2-a. and -b.) should have important consequences. Specifically, according to the EFMH, a pronoun will refer to the NP in the previous clause which shares the same grammatical role, as in (2-a.). However, in the event that two clauses do not match in terms of grammatical roles, the pronoun will refer to the subject of the previous clause, as in (2-b.). This hypothesis was supported by an off-line task. In this *pronoun antecedent selection task* participants read the sentence, and then had to circle the referent that corresponded to the pronoun. Any sentences that were felt to be "pragmatically biasing" were excluded. Whereas it is apparent that extra-linguistic factors play a role in pronoun attribution, the term *pragmatic factors* has been consistently applied to those sentences where pronoun reference results from world knowledge, and is beyond the scope of whatever theory is being proposed (Smyth, 1994; Caramazza, Grober, Garvey, & Yates, 1977; Garvey, Caramazza, & Yates, 1975).

Coherence Relations

Discourse relations have recently been used to account for coreference, and by extension pronominal reference. *Coherence Relations* describe the relation between two ideas (*propositions*) in a discourse (see Kehler, 2002). In this way, they are able to account for the "pragmatic factors" that other theories have avoided. Recall that while a sentence often corresponds to one proposition, linguistic syntax and logic are separate levels of analysis. In logic, a proposition is a statement which may be either true or false. Propositions therefore differ from sentences, which are purely syntactic.

Of relevance here are the Coherence Relations *parallel*, *result* and *occasion*. *Parallel* relations are used when a speaker or writer wishes to express the similarity between participants, actions, or participants and actions in two propositions. Sentence (1) above is a *parallel* relation: the similarity between *Stephen*'s participation in the action and Stephen's action (seeing) with John's action (calling) is made apparent to the comprehender. Sentences related by *parallel* can be paraphrased as *X, and similarly Y*.

Result relations are used to express a causal relationship between two events, where the first event causes the second event. In the sentence *Jessica helped Angela, and she was thankful*, the event expressed in the first clause results in the event in the second clause. The relation between the two sentences can be paraphrased by *X, and as a result Y*.

Propositions related by *occasion* are related in such that *X* represents the state of events before *Y*, although unlike *result* relations there is no causal relation between the two. An example would be *Steve went to the store, and bought a book*. Unlike in a *result* relation, going to the store does not necessarily imply that someone will buy a book.

Prosody and Coherence Relations

Kehler et al. (2008) and Kehler (2005) make strong claims about the relation of accent to coherence relations and pronoun reference. What then is accent? A word is accented if it is made acoustically prominent. This accent can be used to indicate contrast in a discourse (Dimitrova, Redeker, Egg, & Hoeks, 2008).

Prosody has a different motivation in different coherence relations: in *parallel* sentences, "Elements in the second clause that are not coreferential with their parallel elements in the first must be [accented]" (3):

(3) Mary cleaned her room, and SUE read a BOOK (Kehler, 2005, ex. 24b)

If a pronoun is accented in a *parallel* sentence this indicates that the pronoun is not coreferential with the element that is parallel to it in the first sentence (the same would be true if HER were replaced with the full noun phrase RICE (4):

(4) Condi Rice$_1$ admires Hillary Clinton, and George W. Bush absolutely worships HER$_1$. Kehler et al. (2008, ex.19)

This is different than *result* (and *occasion*) sentences, where "[Accenting] is build around Given information" (Kehler, 2005, p.10), for example (5), where the new information is accented:

(5) John pushed Bill, and he FELL. (Kehler, 2005, ex. 29)

Kehler goes on to suggest that accent is used when information is unexpected. For example, in (6), the act of falling is predictable, but that it was John who fell is not:

(6) John$_1$ pushed Bill, and HE$_1$ fell (Kehler, 2005, ex. 31)

To recapitulate, in *parallel*, a noun is stressed when it is not coreferential with something in the same position in the previous clause; in *result* relations, words that are improbable given world knowledge are stressed.

Venditti et al. (2002) tested the interaction of coherence relations and accent using the Visual World Paradigm. Prosody was used to change the referent of a pronoun. More particularly, eye-tracked participants looked at a picture as they heard a short narrative of like (7):

(7) a. The zebra and the pig wanted to wash the car together.

b. The zebra put a bucket of soapy water next to the pig near the front of the car.
c. (i) Then he got out some sponges.
(ii) Then HE got out some sponges.
d. And together they started washing the hood and the fenders. p.3

Two characters were introduced in the first sentence (7-a). In each of the critical conditions was a sentence starting with *then* (7-c). Their hypothesis is that the coherence relation between (7-b) and (7-c-i) is *occasion*, and between (7-b) and (7-c-ii) is *parallel*.

This auditory, on-line experiment provides evidence that accenting switches the referent of a pronoun under some conditions. They found that when asked which character was represented by *he* in (7-c), participants looked at a different referent in the accented condition than in the neutral condition.

There is, however, a theoretical problem with Venditti et al. (2002). They state that their stimuli are ambiguous between the relations *parallel* and *occasion*. But *then* is far from being a neutral conjunction. It explicitly encodes temporal adjacency: *X then Y* implies that *X* occurred first and *Y* followed. In comparison with *then*, *and* is coherence relation-neutral; the coherence relation is thus biased towards *occasion*. The conjunction *and* is therefore a better choice for an experiment testing *parallel* relations. Hence, in the experiment we present below, the stimuli are either unambiguously *result* or unambiguously *parallel*.

Venditti et al. (2002) also tested pronouns in subject position. In conjoined clauses where the subject of the first clause is the same as the subject of the second clause, the pronoun can be gapped. That is, when the subject of the first sentence is the same as the subject of the second sentence, there are three possibilities (8):

(8) John emailed Jeff, and...
a. *John* called Stephen. Full name
b. *he* called Stephen. Pronoun
c. ~~*John*~~ called Stephen. Gapped

Sentence (8-b) is typically claimed to be ambiguous, but in (8-a) and (8-c) the subject of the second sentence is unambiguously the subject of the first sentence (i.e., *John*). Since pronouns are used as a labour saving device (Ledoux et al., 2007; Gordon et al., 1993; Hendriks et al., 2008), as is gapping (Hoeks, Redeker, & Hendriks, 2009), speakers may prefer gapping in situations like (8). The study that we present below avoids the complication of gapping by examining object pronouns, which, unlike subject pronouns, cannot be gapped in English.

Our experiment constitutes a necessary clarification of the results in Venditti et al. (2002). Unlike this previous study, our stimuli were unambiguously of one coherence relation or another, and two coherence relations were tested. And, as mentioned, while subject pronouns have most often been experimented on, we experimented on object pronouns. For these pronouns, gapping is not an option and thus we could be completely certain that pronominalization was the most natural choice.

In this experiment, we tested whether the existence or absence of accent on an object pronoun changes the referent. Kehler et al. (2008) suggested that accent will change the referent of an ambiguous antecedent in *parallel* and *result* sentences. This experiment constitutes an empirical test of intuitions presented by Kehler et al. (2008) regarding the interaction of Coherence Relations, Accent and Pronoun Reference.

Method

Participants

Twenty-seven native speakers of English (nine women, one left-handed) residing in Edmonton (Western Canada) participated in the experiment.

Materials and design

The experiment used a 2×3 design, taking Coherence Relation (*result*, *parallel*) as one factor, and Accent (No–accent, NP_3–accent, Pro–accent) as another. In the NP_3– and Pro–accent conditions there was an L*+H accent on NP_3 (the subject) and the pronoun (Pro) respectively. The No–accent condition contained no accent. No other accents were present in the second clause. The participants heard only one version of a given stimulus; there were 60 sentences in total, presented in a pseudo-randomized manner. In order to assure that *parallel* -related sentences could not also be *result* sentences, the second verb in *parallel*-related sentences was a near synonym (e.g. phone–email), following Kehler et al. (2008). In the result sentences, the verb in the second clause was the result of the first clause (e.g. foul–eject from the game)

We thought it possible that participants would just pick the NP_2 as the referent in No–accent and NP_3–accent conditions and NP_1 heard as the referent in Pro–accent condition. To prevent this strategy, there was a nested factor in the *result* condition. This factor, NP-bias, had two levels, NP_1 and NP_2. The stimuli took the form shown in Figure 1.

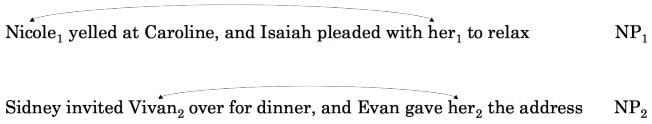

Figure 1: NP_1 and NP_2 sentences.

There were 17 items in NP_1 and 14 in NP_2. In NP_1 sentences, antecedent preference is in the direction of the first NP, and for NP_2 towards the second NP, as determined by an off-line rating task (seeFigure 1).

Additionally, following Kehler et al. (2008) we tested Smyth's EFMH hypothesis as a nested factor within the *parallel* condition. This factor had the levels Partial and Complete. As per the the discussion above, the two clauses either

had exactly the same grammatical roles, or there was additional material in one of the clauses. In table (9) we see that the grammatical roles are not parallel, because in the Complete condition the syntactic structure of both clauses is the same. In the Partial condition the pronoun was expressed with a preposition.

(9) a. Sally called Monica, and Robert summoned her. Complete

b. Amanda wrote Alisha, and Stevie made amends with her. Partial

Six sentences in the *parallel* condition were drawn from Smyth (1994), and eight from Kehler et al. (2008). Only one of Kehler et al.'s sentences was used in the *result* condition, because the other sentences included intransitive clauses, and were therefore not amenable to this experiment. The proper names in the first sentence had the same gender so that there was a potential ambiguity in the referent of the pronoun. The proper names used were chosen to be unambiguously male or unambiguously female. All items were recorded by a native speaker of English for presentation over speakers or headphones.

Procedure

For practical reasons, some participants were tested as individuals (nine), and others in groups (18 participants, in three different groups). Those tested as individuals heard items through headphones, and those tested as a group heard the stimuli presented over speakers. Individuals paced themselves and were told they could freely listen to a stimulus item several times. In group testing the experimenter paced the presentation of items to the speed of participant responses, assuring that all participants had answered before continuing. People participating as part of a group were told that they could ask for the stimuli to be re-played. Participants rated which person named in the previous sentence they felt to be the antecedent of the pronoun using a seven-point scale.

The names of the characters of the first two sentences were included on the response sheet, allowing participants to deal with the large number of names presented. Prosodic naturalness ratings from 1–5 were also collected (One was unnatural, five was natural). Participants were asked to go with their first intuition and not to over-think their answers.

The instructions were read by participants and explained orally by the experimenter. Particular efforts were taken to assure participants that there was no prescriptive rule and that their intuitions would not be judged for correctness, but simply analysed.

Results

We present below a series of ANOVA analyses. To compensate for violations of the sphericity assumption, we applied the Greenhouse Geisser correction where appropriate. The original degrees of freedom are reported.

Prosodic naturalness

In order to ascertain that any results found in further analyses were not attributable to unnatural prosody, an ANOVA analysis was performed on the naturalness ratings of the items (Figure 2).

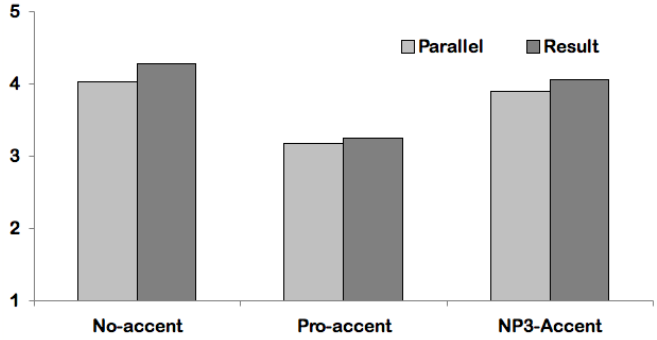

Figure 2: Analysis of prosodic naturalness. 1 = Unnatural, 5 = Natural.

While there was no overall interaction ($F_1(2,5) = 1.7, p = .186; F_2(2,114) = .265, p = .8$) there were main effects of Coherence Relation ($F_1(1,24) = 37.0, p < .001; F_2(1,57) = 8.4, p < .01$) and Accent ($F_1(2,48) = 36.7, p < .001$; $F_2(2,114) = 33.8, p < .001$). For Coherence the level *result* ($3.9, SE = .1$) was higher ranked than *parallel* ($3.7, SE = .1$). For Accent, the No–accent condition ($4.2, SE = .1$) was rated highest, followed by the NP_3–accent condition ($4.0, SE = .2$), with the Pro–accent condition ($3.2, SE = .2$) ranked least natural.

Antecedent Preference

We took the ratings performed by the participants, and averaged them by condition. The ratings in this form were considered the preference for a particular NP as antecedent. The scores were then analysed by items and by participants using a 2×3 ANOVA designs, taking Coherence Relation (*parallel*, *result*) as one factor, and Accent (No–accent, NP_3–accent, Pro–accent) as the other, shown in Figure 3 (see also ex.1).

There was a main effect of Coherence Relation ($F_1(1,26) = 32.8, p < .001; F_2(1,57) = 18.4, p < .001$). The participants were more certain of the antecedent of pronouns in *result* ($1.8, SE = .1$) than in *parallel* ($1.0, SE = .1$). There was also a main effect of Accent ($F_1(2,52) = 85.5, p < .001$; $F_2(2,114) = 97.8, p < .001$).

Contrasts indicated that participants preferred the non-preferred NP as antecedent in Pro–accent condition ($0.2, SE = 0.2$) relative to the NP_3–accent ($2.0, SE = 0.1$) and the No–accent conditions (all ps $< .001$, $2.0, SE = .1$). The No–accent condition and the NP_3 accent condition, however, were not significantly different from each other (Fs< 1). These main effects were, however, qualified by the existence of an interaction between Coherence Relation and Accent. This interaction was highly significant in both by par-

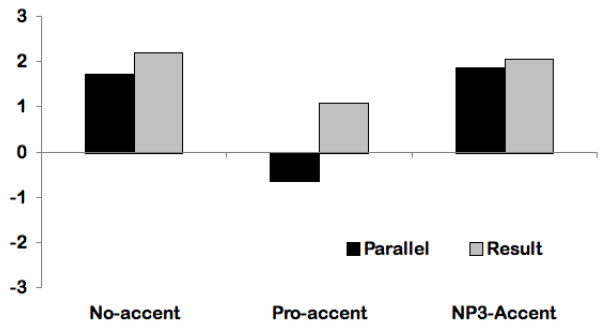

Figure 3: Likelihood of choosing the preferred referent by Coherence Relation.

ticipant and by items analyses ($F_1(2,52) = 30.186.0, p < .001; F_2(2,114) = 18.0, p < .001$).

To better understand the nature of these interactions we performed further analyses. First we looked at the effect of Accent of the *parallel* and *result* conditions separately: For *parallel*–related sentences, there was a significant effect of Accent ($F_1(2,52) = 81.4, p < .001, F_2(2,54) = 84.4, p < .001$). Bonferroni post-hoc analyses indicated that this effect was due to significant differences between the Pro–accent condition and the other two conditions (all ps $< .001$); the difference between the No–accent condition and the NP_3–accent conditions was not significant. (true for F2)

For the *result* sentences there was also a significant effect of Accent ($F_1(2,52) = 28.8, p < .001, F_2(2,60) = 19.3, p < .001$). The post-hoc analyses showed that here too the relationship between the Pro–accent condition and the other two conditions was the locus of this effect. So, in both conditions we find a similar pattern, which is more pronounced in the *parallel* than in the *result* condition. To find out whether this was true, we compared *parallel* and *result* conditions at each of the levels of Accent. We found that there was a significant difference between the *parallel* and *result* relations in two of the Accent conditions: significant results were found in No–accent ($F_1(1,26) = 10.2, p < .005$, but only a trend by participants, $F_2(1,57) = 3.8, p = .06$) and Pro–accent ($F_1(1,26) = 51.8, p < .001$; $F_2(1,58) = 39.1, p < .001$), but not in NP_3–accent (Fs< 1.6).

Visual inspection suggested that although the difference between the Accent conditions was significant in all three conditions, the difference was most pronounced in the Pro–accent condition; This was confirmed by post-hoc pairwise comparisons of the effect of Coherence Relation between the different levels of Accent. All analyses taking NP_3–accent and Pro–accent as levels were statistically significant ($F > 12, p < .001$). When No–accent and NP_3–accent were taken as a factor alongside Coherence, the interaction of Accent and Coherence is not significant, showing instead a trend of interaction ($F_1(1,26) = 3.8$, $p = .06$; $F_2(1,58) = .3$, $p = .56$).

In order to determine whether a referent switch had in fact occurred, we tested the means of the different groups against the value zero, the central value of the scale. Values significantly different from zero have therefore changed referent as a result of Accent. All of the *result* conditions and two of the *parallel* conditions were significantly greater than zero (all ts$> 5.0, p < .001$). Object–accent had, however, reduced the mean of participant responses below zero in *parallel* ($t_1(26) = -2.9, p < .01; t_2(28) = -3.1, p < .005$).

NP_1 and NP_2 verbs

To make sure that participants were not blindly choosing the second NP in the no–accent condition and subject accent conditions, we included the variable NP. To that end, we took NP_1 vs. NP_2 (henceforth NP) as a factor in an ANOVA. Thus, NP was a factor on the one hand, and Accent (No–accent, Pro–accent, and NP_3–accent) on the other, yielding a 2×3 design.

ANOVA analysis showed that there was no main effect of NP for subjects or items ($F < .04$). There was an interaction of NP and Accent in the by items $F_2(2,58) = 2.4, p = .5$) but not by subject condition ($F_1(2,52) = 2.9, p = .07$). Visual inspection indicates that this results from the NP_2 preference being weaker in the Pro–accent condition and stronger in the subject accent condition, relative to the NP_1 condition; in the NP_3 accent condition, the reverse was true.

Grammatical Role Parallelism

In order to further assess the correctness of the EFMH (Smyth, 1994), we included the nested variable Grammatical Role Parallelism with the factors Complete and Partial, within the Parallel condition. Combined with Accent, this gave a 2 x 3 design. An ANOVA analysis comparing Complete ($1.0, SE = .1$) and Partial ($1.0, SE = .1$) found no main effect ($F < .1$).

Grammatical Role Parallelism was not significant in the by subject or by items analysis ($F_1(2,52) = .07, p = .8$; $F_2(1,26) = .2, p = .6$).

Discussion

Our findings were not totally in line with the expectations of Kehler et al. (2008). Whereas they predicted that both *result* and *parallel* relations would respond the same way to pronouns, we found that it was in fact only in *parallel*-related sentences that accented pronouns selected a different referent than their unaccented analogues.

Furthermore, this experiment clarified the results of Venditti et al. (2002). Because our experiment separated Coherence Relation from Accent, and examined object pronouns, our results gave a more effective account of the interaction of prosody and coherence relation. Accented pronouns in a *parallel*-related sentence change referent, those in result-related sentences do not.

Taking the perspective that the results of Venditti et al. (2002) refer strictly to *occasion*-related sentences (as we do), the present study and the previous study are therefore complementary, because our study shows the effect of accenting

pronouns in two more types of coherence relations: *parallel* and *result*.

The results suggest that Coherence Relations determine how pronouns are interpreted, and how accented pronouns are interpreted. Accenting object pronouns switched the referent in the *parallel* condition, but not in the *result* condition. Again, this interaction was modified by neither grammatical role parallelism, nor NP. These results demonstrate that accenting plays a different role in *parallel*-related sentences than it does in *result* sentences.

These inferences are mitigated by the multiple control conditions we included, and by previous research. With regards to control conditions, the prosodic naturalness rating showed that the stimuli used were possible and natural sentences of English. We ensured that Grammatical Role Parallelism was not responsible by including a nested factor within the *parallel* condition. This demonstrated that with respect to Grammatical Role Parallelism, partially parallel structures were interpreted no differently than fully parallel structures. We tested the effect of accenting pronouns in the result condition that referred to the the first or the second NP: Again we found no difference.

Research has so far investigated *parallel*, *occasion* and *result* relations, showing differences between the first two and the last. Moreover, there are various other coherence relations discussed in the literature that remain completely unstudied psycholinguistically in relation to coreference, and by extension pronominalization. Another obvious step in this line of research is to investigate whether there is any interaction of Coherence Relations with other factors—particularly in on-line experimentation. It seems possible that other factors, like syntax, play a role in on-line processing which did not surface in our off-line study. Future studies should sort out differences between output and the on-line processes that achieve this output.

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References

Caramazza, A., Grober, E., Garvey, C., & Yates, J. (1977). Comprehension of anaphoric pronouns. *Journal of Verbal Learning and Verbal Behavior*, *16*(5), 601–9.

Dimitrova, D., Redeker, G., Egg, M., & Hoeks, J. (2008). Linguistic and extra-linguistic determinants of accentuation in dutch. In B. C. Love, K. McRae, & V. M. Sloutsky (Eds.), *Proceedings of the 30th annual conference of the cognitive science society* (p. 2191-2196). Austin, TX: Cognitive Science Society.

Fodor, J. (2002). Psycholinguistics cannot escape prosody. In B. Bel & I. Marlien (Eds.), *Proceedings of speech prosody 2002, international conference.*

Garvey, C., Caramazza, A., & Yates, J. (1975). Factors influencing assignment of pronoun antecedents. *Cognition*, *3*(3), 227–243.

Gordon, P., Grosz, B., & Gilliom, L. (1993). Pronouns, names, and the centering of attention in discourse. *Cognitive Science*, *17*, 311–347.

Hendriks, P., Englert, C., Wubs, E., & Hoeks, J. (2008). Age differences in adults' use of referring expressions. *Journal of Logic, Language and Information*, *17*(4), 443–466.

Hoeks, J., Redeker, G., & Hendriks, P. (2009). Fill the gap! Combining pragmatic and prosodic information to make gapping easy. *Journal of Psycholinguistic Research*.

Kehler, A. (2002). *Coherence, reference, and the theory of grammar*. Stanford, CA: Center for the Study of Language and Information Publications.

Kehler, A. (2005). Coherence-driven constraints on the placement of accent. *Proceedings of the 15th Conference on Semantics and . . . .*

Kehler, A., Kertz, L., Rohde, H., & Elman, J. (2008). Coherence and coreference revisited. *Journal of Semantics*(25), 1–44.

Kothari, A. (2007). Accented pronouns and unusual antecedents: A corpus study. In S. Keizer, H. Bunt, & T. Paek (Eds.), *Proceedings of the 8th sigdial workshop on discourse and dialogue* (pp. 150–157). East Stroudsburg, Pa: Association for Computational Linguistics.

Ledoux, K., Gordon, P., Camblin, C., & Swaab, T. (2007). Coreference and lexical repetition: Mechanisms of discourse integration. *Memory & Cognition*, *35*(4), 801–815.

Shneiderman, B. (2000). The limits of speech recognition. *Communications of the ACM*, *43*(9), 63–65.

Smyth, R. (1994). Grammatical determinants of ambiguous pronoun resolution. *Journal of Psycholinguistic Research*, *23*(3), 197–229.

Venditti, J., Stone, M., Nanda, P., & Tepper, P. (2002). Discourse constraints on the interpretation of nuclear-accented pronouns. In B. Bel & I. Marlien (Eds.), *Proceedings of speech prosody 2002, international conference.*