

## Anticipatory effects of intonation in reference resolution



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Listeners efficiently exploit prosodic information to identify the referent even before disambiguating segmental information is available. Monitoring participants' eye movements while they followed instructions to move objects in a visual display, Dahan et al. (2002) demonstrated that an accented referent is interpreted as referring to a new referent (not previously mentioned) but an unaccented referent as referring to a given referent (previously mentioned). Using the same method, Weber et al. (2006) found that an accented modifying adjective (e.g. the RED scissors) is interpreted as referring to the same type of referent as in the previous instruction (e.g. the scissors), see also Ito & Speer (in press).

The present study investigated whether listeners exploit prosodic information prior to the ENTIRE referential expression to identify the upcoming referent. A test case for this is the adverb 'now', which is used in all eye-tracking experiments of this kind and occurs frequently in natural interactions (Hirschberg & Litman 1993). The intonation of 'now' varies as a function of the loci of the contrast (Braun & Chen 2007). In Dutch, *nu* ('now') is accented in 62% of the cases when the referent is contrasted (e.g. move the book to cell 1 – now move the BAG to cell 1) and in 96% when the location is contrasted. Further, *nu* is frequently accented (88%) when both the referent and the location are contrasted. It is likely that an unaccented *nu* therefore results in more fixations to an unmentioned referent compared to an accented *nu*. However, given the overall high frequency of accented *nu*, the intonation of *nu* may not be predictive at all (in accordance with recent results on the discourse markers 'and then', 'and next', 'after that' from Ito & Speer, in press).

An eye tracking experiment similar to the one by Dahan and colleagues was conducted, using printed words instead of objects. Participants followed two kinds of instructions to move a printed word to another cell: one with an accented *nu* and a contrast in location, the other with an unaccented *nu* and a contrast in referent, as illustrated below.

First instruction	Verplaats het woord zegel naar vak 3 'Move the word stamp into cell 3'
Second instruction	
Contrast in location (accented nu)	Verplaats <b>nu</b> het woord zegel naar vak <b>4</b> 'Move now the word stamp into cell 4'
Contrast in referent (unaccented nu)	 Verplaats nu het woord <b>zetel</b> naar vak 3 'Move now the word seat into cell 3'

We observed an initial bias towards the contrastive referent regardless of condition (cf., Dahan et al., 2002). Unexpectedly, accentuation on *nu* boosted this initial bias, leading to an immediate increase in fixations to the contrastive referent. This bias was overcome when information on the accentuation of the referent became available. This suggests that an accented *nu* may have 'mised' the participants into the interpretation of contrasts in both referent and location. When *nu* was unaccented, there was a steady and significant increase in fixations to the contrastive referent, as predicted. These anticipatory effects of *nu* 'now' stand in contrast to the reported absence of anticipatory effects for a number of discourse markers (Ito & Speer). Possibly, 'now' is more effective in signaling changes in the information flow than discourse markers such as 'and then'. Our results show that listeners exploit prosodic information prior to the entire referential expression in reference resolution.

**References:**

- Braun, B. and Chen, A. (2007). And now for something completely different. Intonation of 'now' and scope ambiguity in English and Dutch. Poster presented at the 13th Annual Conference on Architectures and Mechanisms for Language Processing. Turku, Finland.
- Dahan, D., Tanenhaus, M., and Chambers, C.G. (2002). Accent and reference resolution in spoken-language comprehension. *Journal of Memory and Language* 47, 292-314.
- Hirschberg, J. and Litman, D. (1993). Empirical studies on the disambiguation of cue phrases. *Computational Linguistics* 19, 501-530.
- Ito, K. and Speer, S.R. (in press). Anticipatory effects of intonation: Eye movements during instructed visual search. *Journal of Memory and Language*
- Weber, A., Braun, B., and Crocker, M. (2006). Finding referents in time: eye-tracking evidence for the role of contrastive accents. *Language & Speech* 49, 367-392.