PROCESSING EVIDENCE FOR DIFFERENCES BETWEEN DEEP AND SURFACE ANAPHORA IN GERMANIC LANGUAGES

Hankamer and Sag (1977) discovered systematic distinctions between surface anaphors (SA) - exemplified by reflexive pronouns, traces, and VP-ellipsis - and deep anaphors (DA) - exemplified by expressions such as “do it”, “do so”, “the same thing”. In particular, antecedents of SA are determined by and highly contrained by the syntactic form of the expressions containing them and anteceding them, whereas DA find their antecedents in non-syntactic, propositional discourse representations, and are less constrained by grammatical form. In terms of sentence processing, this leads to the expectation that SA should show evidence of highly automatic and reflexive processing (i.e show immediate antecedent reactivation), whereas DA resolution should be more sensitive to context effects and have a “drawn out” time course for anaphora resolution, a characteristic of slower and less automatic higher cognitive processing. We examined the predictions with experiments using behavioral and electrophysiological measures of the time course of antecedent reaccess.

An all-visual lexical decision RT experiment was run to replicate findings by Nicol and Swinney (1989) that reflexive pronouns immediately reactivate their antecedents. Subjects were presented with Norwegian sentences as in (i) on a word-chunk by word-chunck basis, and the probe word appeared displaced on the screen in either the temporal position [1] or [2].

(i) Journalisten i rommet[1] hentet vann til seg selv[2] fordi han var tørst.
‘The journalist in the room[1] fetched water for himself[2] because he was thirsty.’
Probes: AVIS/LAKRIS (‘newspaper/licorice’)

Subjects had to determine whether the probe was a word or a non-word by pressing a button as fast as possible. An ANOVA with probe position as group factor and probe relation as within-subject factor revealed a significant main effect of probe relation, $F(1,34)=7.82$, $p<.011$ (mean RT to related probes: 820ms; to unrelated probes: 865ms). Furthermore, in position[2], RTs to related probes were significantly shorter than RTs to unrelated probes, and RTs to related probes were significantly shorter in position [2]than in position [1], as verified with t-tests ($p <.005$ and $p<.045$).

Another experiment similar in design was run but with the Norwegian deep anaphor “gjöre det” (‘do so/do it’) instead of a reflexive pronoun, and with probe positions before the anaphor, immediately after the anaphor, and in a “down-stream” position 1000 ms after the onset of the anaphor to test for late reactivation (see (ii)).

(ii) Lederen kritiserte brannmannen og kvinnene i terapirgruppen[1] gjorde også det[2] uten[3] at noen brydde seg.
‘The leader criticized the fireman and the women in the therapy group[1] did also so[2] without[3] anyone caring.’
Probes: ILD/DILL (‘fire/spice’)

We here found no effect of probe relation immediately after the anaphor or in the downstream position. Together, the RT experiments show that surface anaphors but not deep anaphors immediately activate their antecedents during on-line sentence processing.

In addition, an ERP experiment was conducted with stimuli from the surface anaphora reflexive experiment, partly in order to explore the suitability of this measure for reaccess studies, and partly to provide possibly more finegrained data about the time course of reactivation. In this experiment, subject were watching the sentence being presented on a screen, and the probe was flashed in a displaced position as in the RT-experiments. Subjects were however instructed to delay their word/non-word decision until the end of the sentence. We expected that if a probe was unrelated to the information activated by the reflexive, a semantic incongruity effect should be generated at that position (but not in the pre-anaphor position), and an N400 should occur. If the probe was related, however, no semantic incongruity effect was expected. Data were analyzed in difference waveforms (ERPs to unrelated - related probes) as mean amplitudes in time ranges. Amplitudes at Cz in the time ranges 400-500, 500-600 and 600-700 ms were significantly negative from zero (one-tailed t-tests) in position 2, only. These effects evidence that ERPs are sensitive to reaccess of the antecedent to reflexives. Furthermore, the obtained effect is probably indicative of a N400-like component to semantic anomalies that is more subtle and indirect than in the classical N400 experiments.

To conclude, our results provide experimental support for the theoretical distinction between deep and surface anaphors originally proposed by Hankamer and Sag, and supports the emerging picture in psycholinguistics of a distinction between form-driven linguistic processing and processing that requires access to pragmatics and discourse representations. Furthermore, as shown by Shapiro and Hestvik (1995), English VP-ellipsis does show immediate antecedent reactivation effects. When this result is taken together with the findings reported here, we have comparative evidence from psycholinguistics for the difference between overt VP-anaphors (as illustrated by Norwegian, probably indicative of non-English germanic languages), and "empty-category" VP-ellipsis as found in English. This leads to the expectation that for example English overt VP-anaphors like "do so" should behave as the Norwegian counterpart.

References

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