

## On Line Processing of ACD Gives No Evidence for QR

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Antecedent Contained Deletion (ACD) as in (1) has been used as evidence for a level of LF at which the object is raised out of the matrix since at least as early as Sag (1976):

- (1) Sarah read the/every newspaper that Katie did (while visiting Spain).

Conventional wisdom is that the relative clause in (1) requires *read t* to be present or supplied at the ellipsis site, and an antecedent supplying this is available only if the object undergoes QR. But there are alternatives. Cormack, (1984), Jacobson (1992, 2003) and others show that under assumptions in Categorical Grammar (and related theories), all that needs to be supplied in (1) is a 2-place relation which is available as the meaning of *read* in the matrix.

Recently, Hackl, Koster-Hale and Varvoutis (HKV) (2012) revisit ACD, and attempt to provide new evidence for the QR analysis based on on-line processing results. Assuming that the processor applies the minimal steps necessary to compute a meaning, then – in the version of (1) with *the* as determiner – QR will not apply until the ellipsis site is encountered. There should thus be a cost at that site, which would be absent for the *every* case, since QR would have already applied. HKV did find a slowdown in reading times after the ellipsis site in the *the* condition compared to the *every* condition, and also the *the* condition has lower acceptability in off-line judgments. They further considered cases like (2) (a portion of their Exp. 2):

- (2) Sarah was reluctant to read the/every newspaper that Katie was.

Here they claim that *every* should have no advantage, reasoning as follows: As known since Sag (1976), these require a *de re* reading in which the object has widest scope. The "do as little as possible" processor will indeed have already applied QR to *every* but only to the edge of the *read* clause. But this does not resolve the antecedent containment paradox. In both conditions, then, the processor needs to perform QR at the ellipsis site. Their prediction was borne out: in Big Ellipsis as in (2), *every* had no advantage over *the* (actually, the reverse held).

We present experimental evidence that the HKV effect has nothing to do with QR. We show that the effect is due to reduced acceptability of stimuli like (1) with *the* because of heavy pressure to insert *also* or to use *the same*. (Similar cases requiring *also* or *too* are discussed in, e.g., Kaplan 1984, Amsili 2012). The pressure is absent or greatly reduced with *every*, and we hypothesize that when the events are "the same" there is pressure in this configuration to call attention to that fact unless some other connection can be established (e.g., a causal connection or a connection given by context). We show that *every* naturally allows speakers to establish a causal connection, much more so than does *the*. Finally we show that HKV's result that *every* loses its advantage over *the* in the "big ellipsis" Exp. 2 is predicted by our account, but is actually not predicted by theirs, and we speculate on why *the* has a greater advantage here.

By way of elaboration: First there are weaknesses in the reading time data. Some of this is addressed separately in Gibson, Mahowald, Piantadosi, and Levy (submitted). Moreover, an attempted replication of HKV's Experiments 1 and 2, using 80 participants in each (more than HKV's experiments: 50 and 48) demonstrated no reliable effect.

We did, however, replicate the judgment contrast in cases like (1), using a judgment task run on Amazon's Mechanical Turk with 80 speakers, and using the exact stimuli used in HKV. We conclude that the acceptability contrast is real, but is independent of QR. Note that while HKV compared (1) to a case with a full verb, they used a different verb (with a different meaning) than the one understood at the ellipsis site. They did not compare sentences like (1) to corresponding ones with the full verb *read* (rather

than ellipsis) in the relative clause. They (very briefly) defend the lack of running this control by positing that use of the same verb may cause the processor to supply deaccented prosody, which itself - under a certain set of assumptions - would trigger QR (to satisfy the conditions on deaccenting). But this logic is invalid. First it is not at all clear that deaccenting in the corresponding spoken materials (with a full identical verb) would require identity of LF (and hence force QR). Actually, it is well known (see, e.g., Lakoff 1971, Rooth 1992) that deaccenting in general does *not* require identical LFs or any kind of linguistic identity; material can be deaccented in virtue of information which is inferred. But suppose that deaccenting of the full verb in the case at hand does require identity of LF (and hence QR). It is still true that there is no reason to think that the *processor* would supply deaccented prosody - for the processor cannot "know" to deaccent unless it has already inferred the meaning, which is of course what it is trying to do. (Note that not every instance of a repeated verb allows deaccenting; deaccenting is allowed only when the overall semantics is right.) In fact, if identity of LF is required here then there is no reason to conclude that full repeated verb (*read* in (1)) *must* be deaccented, and so again no reason to speculate that the processor would supply deaccented prosody. After all, if deaccenting is licensed only when QR occurs, then - since nothing (in the grammar) forces QR in the *the* case - deaccenting would simply be optional; its conditions need not be met. We therefore conclude that the same verb condition is an essential control. We ran this, and there remains an advantage for *every* over *the* (albeit weaker). Since the same verb condition does not force QR, we conclude that the HKV effect is not driven by QR. Our hypothesis predicts that the advantage remains, and we will show that it is also consistent with the advantage being weaker.

Since we posit that the effect is due to a pressure to insert *also* (or some similar form such as *the same*) in the *the* condition, we also tested cases like (1) where the object has the form *the/every newspaper that Katie also did*. Indeed the advantage for *every* disappears. While the presence of *also* would (under a certain set of assumptions) itself trigger QR in the *the* condition, this is no different than the situation with ellipsis. The *also*-driven QR does not happen until later (when *also* is encountered), so the same penalty should be present. But it isn't.

But why is there no (or less) pressure to insert *also* with *every*? We hypothesize that this pressure disappears if an independent connection can be established between the events, and use of *every* allows for a natural causal connection (which we label the "copycat" reading). We tested this on Mechanical Turk (40 subjects and 20 items for each condition) using a judgment task asking subjects the likelihood of (for example) the following sentence being true following the *every* and the *the* condition (with full verb in the frame sentence): *Sarah read The Globe because Katie read the Globe*. Subjects rated the *because* sentences as significantly more likely to be true in the *every* condition, confirming that *every* more easily supports a causal connection. That the establishment of an independent connection (such as a causal connection) is sufficient to remove the pressure for *also* is shown by additional experimental evidence: the penalty for *the* (without *also*) disappears entirely if prior context establishes a connection.

The full paper will address in greater detail HKV's Experiment 2. Here we address just one aspect: the lack of advantage for *every* over *the* in the "Big Ellipsis" condition in 2. First, contrary to HKV's claims, their model predicts that *every* should still have an advantage. Although QR is needed in either case, the "minimal processor" hypothesis predicts that in the *the* condition 2 QRs are necessary, because the processor cannot "know" in advance that the low QR will not result in a good antecedent, and so it would perform that first. Hence the *every* condition requires 1 instance of QR while the *the* condition requires 2. In our account, though, the availability of the "copycat" reading is absent in Big Ellipsis for *every*. This is because Big Ellipsis requires a *de re* interpretation. In any example where the matrix verb/adjective expresses an attitude on the part of the subject, the possibility of "copycat" reading is absent if the object DP is out of the scope of that attitude. Indeed at least 65% of the HKV stimuli have this property (and others are also such that the *de re* interpretation removes the copycat reading). In sum, then, the HKV effect seems to be independent of QR; the consequences of this is that grammatical architectures making no use of LF are perfectly consistent with the HKV effect.