Eye-tracking the ham sandwich:
The on-line processing of contextually instantiated metonymies

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The vast majority of words have different interpretations or senses which are semantically associated, i.e. polysemous. For example, the word *school* can refer to a place where children are educated, the school building, the period of education, the time when children are studying (e.g. before/after school), a part of a university, the school as an institution, etc. Previous research using polysemous words (Frazier & Rayner, 1990; Frisson & Pickering, 1999; McElree, Frisson, & Pickering, 2006; but see Lowder & Gordon, 2013) has shown that (adult) language users do not experience an early processing cost for conventionalized senses that are metonymically related, such as the concrete building sense and the building-for-institution metonymic sense of *school*. Concretely, *...talks to the school...* is (at least initially) read as fast as *...walks to the school...* These results suggest that understanding a derived, metonymic sense can be as straightforward as understanding a literal sense, at least as long as the different senses are already known to the reader.

However, metonymic interpretations can also be construed “on the spot” when someone or something is referred to using a typical or contextually evoked characteristic of that person or object. The best-known example is what Nunberg’s (1979) calls “reference transfer”:

(1) *The ham sandwich is sitting at table 20.*

In (1), the term *ham sandwich* is used by the waiter to refer to the customer who ordered such a sandwich rather than the sandwich itself. As there is nothing in the lexical-semantic meaning of “ham sandwich” that directly refers to customer, this novel interpretation is ad hoc and contextually determined (e.g. in a different context, *the ham sandwich* could refer to a chef who made an award-winning sandwich).

While the *ham sandwich* cases have attracted a lot of attention in the pragmatic literature (e.g. Jackendoff, 1997; Nunberg, 1995; Recanati, 1995, 2010; Ward, 2004), it remains unclear how easy or hard it is for language users to arrive at a novel metonymic interpretation. Frisson and Pickering (2007), using eye-tracking, found that, for a rule-governed metonym such as *producer-for-product*, processing is more difficult for novel metonymies (e.g. *she read Needham*) than for literal expressions, but that a prior context which could serve as input to the rule (e.g. *she has all the books by Needham*), could negate this difficulty. However, these types of metonymies are more constrained than ad-hoc, contextually determined metonymies.

Schumacher (2011, 2014) are the only experimental studies of *ham sandwich* metonymies and serve as inspiration for the present studies. Using event-related potentials (ERPs), she found that *ham sandwich* metonymies that are licensed by context (e.g. a restaurant scenario) are more computational demanding than their literal counter-parts (reflected in a Late Positive potential). Without contextual support, additional processing costs were observed (N400 for unexpected target) but the Late Positivity effect remained, suggesting that context does not represent a necessary cue for processing this type of metonymy.

We carried out 2 eye-tracking studies looking at (1) whether novel ad hoc metonymies are more difficult to process than literal expressions and (2) whether the difficulty is attenuated by a context that supports the metonymic interpretation. Concretely, we compared the processing profiles in neutral contexts (which used proper names) to those in supportive contexts (which used a description of the protagonists rather than the name, see Table 1). 40 items were constructed based on Schumacher (2011, 2014). The experiment was a between-subjects design, with the neutral context conditions tested in Experiment 1 (N=22) and the supportive context conditions in Experiment 2 (N=22). We discuss the results together.

During initial processing of the target region (first-pass reading), the metonymic condition was harder than the literal condition, but only for the neutral context conditions. Following supportive context, the metonymic interpretation did not differ reliably from the literal expression. Intermediate reading measures (regression-path and first-pass regressions) showed the same pattern for the target region. For the spill-over region, the metonymic expression took more processing effort for both types of contexts. A late reading measure (total gaze) revealed increased processing on the metonymic word for both context types.
These results indicate that (1) novel ad hoc metonymies are more difficult to process than literal expressions and (2) that having a supportive context can make initial processing of this type of metonymy easier. This fits with Frisson and Pickering’s (2007) findings for rule-governed metonymies, though their results showed hardly any processing difficulty for novel metonymies in a supportive context, which might indicate that extending a word’s meaning by applying a metonymic rule is easier than understanding contextually instantiated and determined ad hoc metonymies.

The results are also nicely in line with Schumacher (2011, 2014) who distinguished between contextual licensing (N400 effects) and later pragmatic meaning adjustment (Late Positivity effect). The current study allows us to reconcile previous data from eye-tracking and ERP studies. It further indicates that there are different types of metonymy (rule-governed vs. ad hoc) which are subject to discrete processing demands.

(Note: we are currently running the experiments using ERP in order to determine whether the English stimuli behave identical to the German ones from Schumacher (2011, 2014). We intend to include a discussion of these findings in our presentation.)

Table 1. Sample stimuli

<table>
<thead>
<tr>
<th>Condition</th>
<th>Example</th>
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<tbody>
<tr>
<td>Neutral context – Literal</td>
<td>Emma asks Jim what it is that’s new on the menu. Jim replies that the espresso is new on the menu.</td>
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<tr>
<td>Neutral context – Metonymic</td>
<td>Claire asks Liam who it was that left without paying. Liam replies that the espresso left without paying.</td>
</tr>
<tr>
<td>Supportive context – Literal</td>
<td>The waitress asks her boss what it is that’s new on the menu. Her boss replies that the espresso is new on the menu.</td>
</tr>
<tr>
<td>Supportive context – Literal</td>
<td>The attendant asks her supervisor who it was that left without paying. Her supervisor replies that the espresso left without paying.</td>
</tr>
</tbody>
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Notes: target region in bold, spill-over region underlined.

References