Children's metonymy comprehension: Evidence from eye-tracking and picture selection

Introduction
In this paper, we investigate children's processing and comprehension of metonymy, a type of figurative use of language where an object or individual is referred to via a salient property (e.g., "*The beard* in the corner wants his check" used to refer to a man with a big beard). Similar to other types of figurative language such as metaphor and irony, the comprehension of metonyms appears to be pragmatically challenging for children due to the discrepancy between what is communicated and what is literally conveyed. The few previous studies on metonymy acquisition suggest some understanding in preschool children (Falkum, Recasens, & Clark, 2017; Nerlich, Clarke, & Todd, 1999; Rundblad & Annaz, 2010; Van Herwegen, Dimitriouc, & Rundblad, 2013), but the results are to some extent conflicting. For instance, in a picture selection task, Falkum et al. (2017) found a U-shaped development of metonymy comprehension with 3-year-olds performing better than 4- and 5-year-olds, who tended to interpret metonymic uses literally. One aim of the present study was to investigate whether we could replicate the results of Falkum et al. (2017), and if so, at what age children begin to improve their performance before they reach adult-like levels of comprehension. Another aim was to investigate whether online data from eye-tracking could shed light on possible differences in comprehension strategies between age groups, and whether such data might reveal an earlier sensitivity to metonymic uses that might be masked by offline task demands

Method
We tested 126 Norwegian-speaking children aged 3 to 8 years and an adult control group, using a novel methodology which combines an online (eye-tracking) and an offline (picture selection) measure. Participants see, for instance, the four pictures in Figure 1 on a screen and hear either story (a) or (b).

(a) Literal condition:
Her er to ting med hår. *Skjegget* er stort.
'Here are two things with hair. *The beard* is big'.

(b) Metonymy condition:
Her er to menn som forteller eventyr. *Skjegget* er morsom.
Here are two men who are telling a story. *The beard* is funny.'

Figure 1. Example stimulus

During the presentation of the audio-visual stimuli (target utterances were 2500 ms long), participants' eye gaze to the four pictures on the screen was measured. After each story, the experimenter asked the participants to point to the picture among the four pictures on the screen that fits the story best.

Results
The results from the picture selection task replicate the findings of a U-shape reported in Falkum et al. (2017), with a better performance of 3-year-olds compared to 4- to-5-year-olds, who tended to prefer literal interpretations of target metonymic utterances. From the age of 6, children performed significantly above chance on their comprehension of metonymic utterances.

The gaze data, analysed using generalized additive mixed modelling (Wood, 201) also suggests an early sensitivity to metonymy from the age of 3 (younger) as well as a continuous improvement of understanding with age, even among the 4-5-year-olds (middle) who preferred literal interpretations of metonymic target utterances. However, the increase in number of looks to the literal picture in the metonymy condition in middle and older children (6-8-year-olds) suggests that they experienced a stronger competition from the literal competitor in the metonymy condition than the 3-year-olds and adults did.
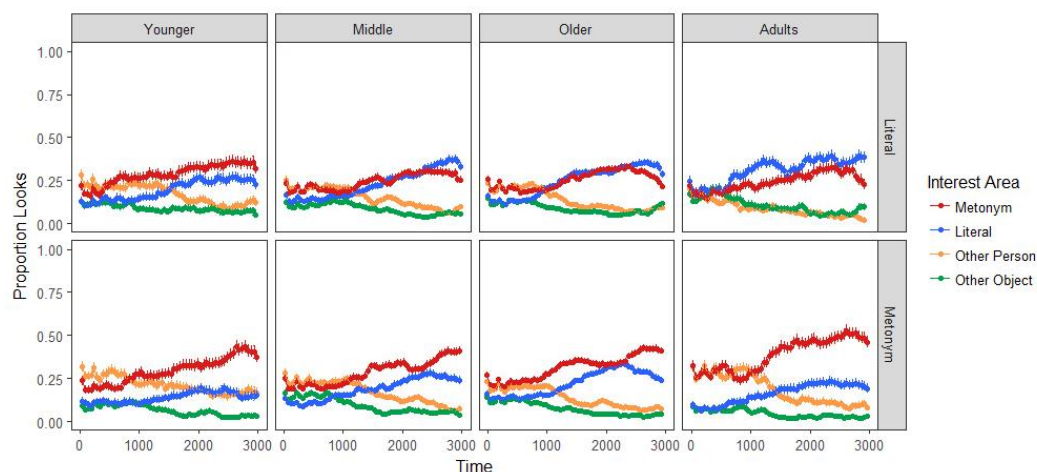

Figure 2: Proportion of looks to interest areas in the literal condition (top) and metonymy condition (bottom) in different age groups[1].

Discussion

First, our results suggest that already from the age of 3 years, children have a sensitivity to metonymy. We also find this sensitivity in the gaze data of the 4-5-year-olds, who showed a strong preference for literal interpretations of target metonymic utterances in the picture selection task. At the same time, the gaze data show that this age group experience a stronger competition from the literal interpretation than 3-year-olds and adults do. We take these results to speak against an explanation in terms of a 'primitive, literal processing of language' where children interpret language literally even when it does not make sense in the context (cf. Levorato & Cacciari, 2002). We speculate that children's growing sensitivity to sense conventions may impede their pragmatic reasoning with metonymic uses – and possibly with non-literal uses more generally – during the pre-school years. While an appreciation of sense conventions plays a crucial role in language acquisition (Clark, 1993), it may be a source of interpretive inflexibility when familiar words are used with unconventional meanings, as in non-literal uses of language.

Second, our results suggest that offline and online measures tap into different aspects of children's figurative language comprehension: while gaze data provide a window into participants' processing of figurative uses while the utterance unfolds, picture selection data might be a more conservative, cognitively demanding measure requiring more by way of reflective reasoning and decision-making. Our results indicate that offline measures of figurative language understanding which are standard in the developmental field, could potentially underestimate children's competence, and we should be cautious about concluding from children's 'literal preference' on such tasks to a lack of figurative language competence.

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[1] Children were grouped according to their performance on the offline task: Younger (3-year-olds), Middle (4-5-year-olds) and Older (6-8-year-olds).