

Anticipatory Eye-movements Reflect Conceptual, not Lexical, Expectations

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Background – eye movements and language

Visual World Studies have shown that language can mediate eye movements in different ways:

- REFERENTIAL EYE MOVEMENTS are directed to objects when they are mentioned and reflect lexical access (Tanenhaus et al. '95. Allopenna et al. '99)
- ANTICIPATORY EYE MOVEMENTS are directed to relevant objects before they are mentioned, e.g. in response to verb restrictions (Altmann&Kamide '99)
- Are both kinds of eye movements similar?
- Are anticipatory eye movements due to lexical expectations (e.g. "apple") or conceptual expectations (e.g. "something edible")
 - If they are due to lexical expectation, they should behave similar to referential eye movements

Background – memory

- In the BLANK SCREEN PARADIGM language mediated eye movements could be replicated when pictures had been replaced by a blank screen before a sentence was played
- Altmann&Kamide '07 ascribe both kinds of eye movements to the reactivation of a memory trace by a linguistic cue
- VISUAL WORKING MEMORY is believed to be accurate only for up to 5 objects (Luck&Vogel '97)
- The SERIAL POSITION EFFECTS describe accuracy when memorizing entities serially:
 - Entities seen early are remembered: PRIMACY EFFECT
 - Entities seen late are remembered: RECENCY EFFECT
 - Atkinson and Shiffrin '68 attribute
 - the primacy effect to long term memory (rich representations including conceptual knowledge)
 - the recency effect to short term memory (shallow representations on a perceptual level)

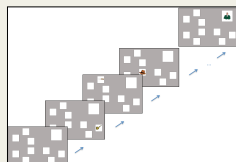
Experiments 1 – Materials and Design

Is anticipation of role fillers still possible, if number of scene objects exceed working memory capacity?
Are there different memory effects reflected by anticipatory and referential eye movements suggesting the influence of different mental representations?

Example display:



Procedure:



Der Vater raucht gleich die Pfeife.
The father smokes soon the pipe
The father will soon smoke the pipe

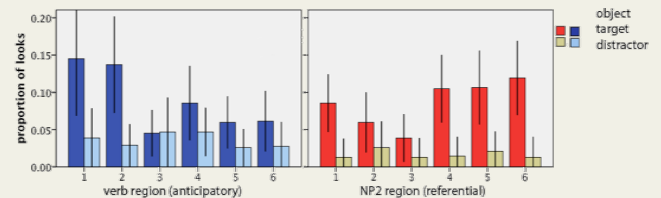
- Objects and person appear one after the other in different locations
- After the last object disappeared, the sentence is played back
- Eye movements are measured on the blank screen

Manipulation:

- Position of target object in the presentation sequence is manipulated: it can be the 1st, 2nd, 3rd, 4th, 5th, or 6th object, the last is always the person

Experiments 1 – Results

- anticipation effect found only for objects seen early: primacy effect
- referential eye-movements found mainly for objects seen late: recency effect

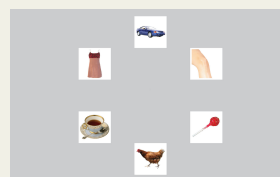


- anticipation of role fillers seems to rely on conceptual knowledge, while referential eye movements can rely on shallow, perceptual representations
- *alternatively*: objects seen early in the sequence are more likely to be fixated early in the sentence

Experiment 2 – Materials and Design

Do referential looks in response to the category of an object show the same characteristics as anticipatory eye-movements induced by the verb?
Does the different serial position effects observed in Experiment 1 rely on the temporal order of the sentence constituents?

Example display:



Procedure similar to Experiment 1

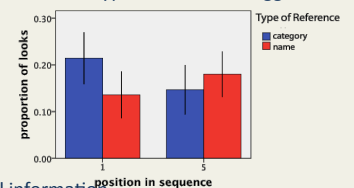
Manipulation:

- type of reference:
 - Name
 - Category
- position in sequence:
 - 1st object
 - 5th object

- a) Erinnerst Du Dich an **das Auto** und an das rote Objekt?
Do you remember **the car** and the red object?
b) Erinnerst Du Dich an **das Fahrzeug** und an das rote Objekt?
Do you remember **the vehicle** and the red object?

Experiments 2 – Results

- Significant interaction between position and type of reference suggest:
- Primacy effect for reference by category
- Recency effect for reference by name



- ⇒ Reference by category behaves similar to as anticipation
- ⇒ Anticipation relies on conceptual information

Summary

- Anticipatory eye movements behave similar to eye-movements induced by category names
 - both seem to rely on conceptual representations rather than phonological representations (as evidenced by primacy effects)
 - ⇒ anticipation of role fillers for a restrictive verb reflect high-level conceptual predictions rather than lexical expectations
- Referential eye movements may rely partly on shallow, perceptual representations

References

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