

The Visual-World Paradigm Adult Language Processing

SS16 - (Embodied) Language Comprehension

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So far ...

- Using the VWP to study **situated** language comprehension
 - Eye-tracking in visual scenes w/ auditory sentence comprehension
 - Integration of linguistic and concurrent & previous scene information (and world knowledge)

Summary

- Eye-movements
 - are a result of (incremental) information integration activated contents
 - index predicted contents predicted contents
 - help (?) memory retrieval
 - index online up-to-date **representations** of the context

Lexical access again

- Are eye-movements to objects, generated during the recognition of a spoken word, mediated by **structural**, as opposed to **phonological**, representations of these objects?
- Concurrent eye-movements to related objects reveal activated contents

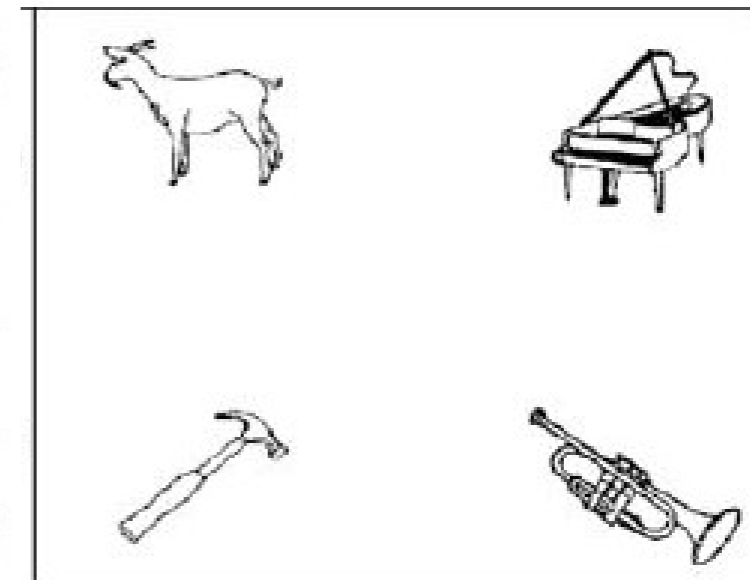
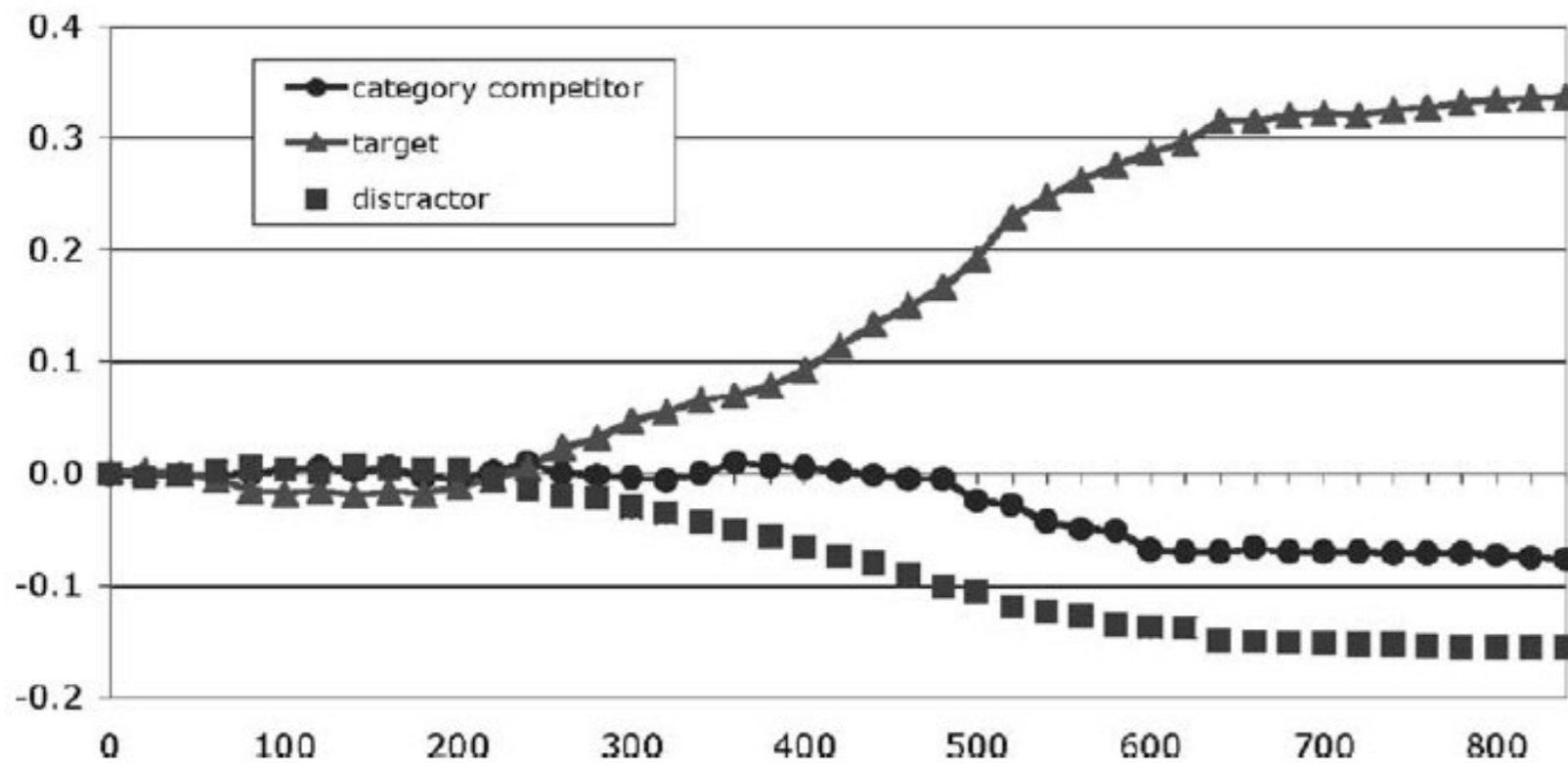
Activation of Semantic Category

(Altmann & Huettig 2005)

- “An object with meaning that is found in the same semantic category as a spoken word should attract more eye movement during the course of that word than an object with no overlapping meaning”

Activation of Semantic Category

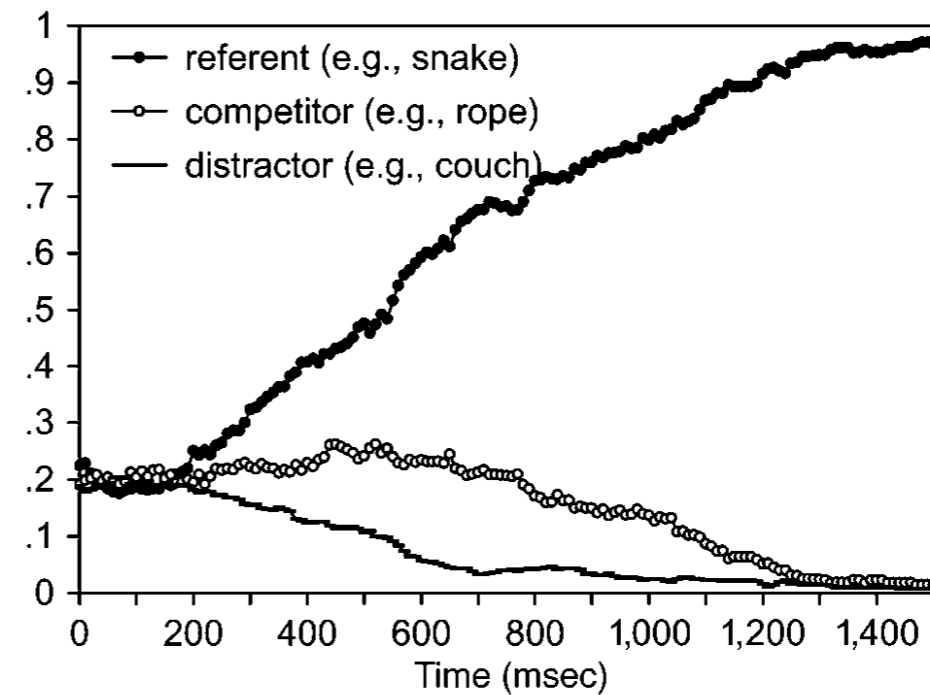
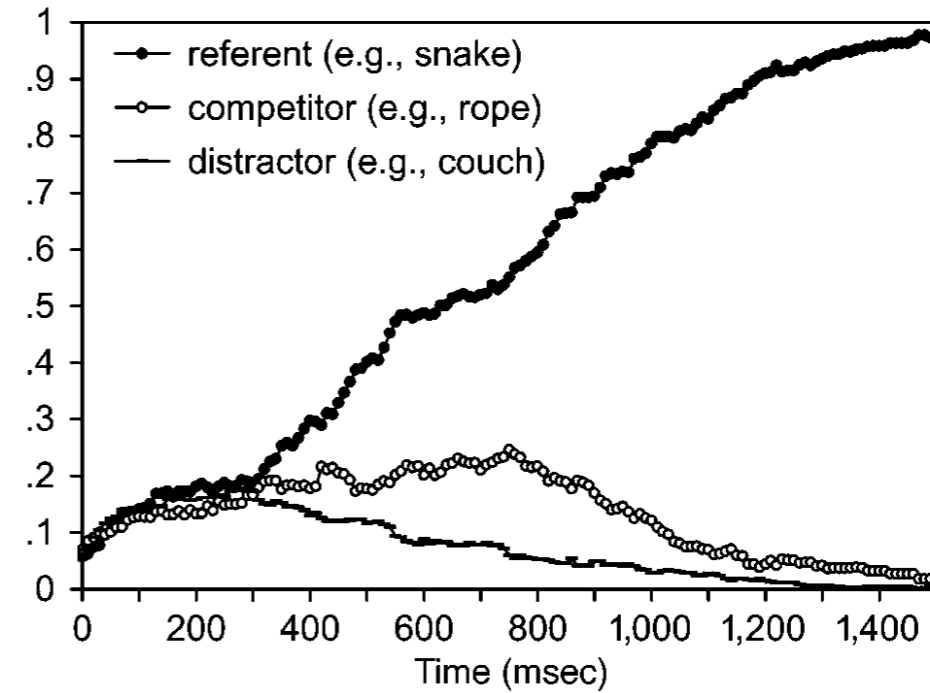
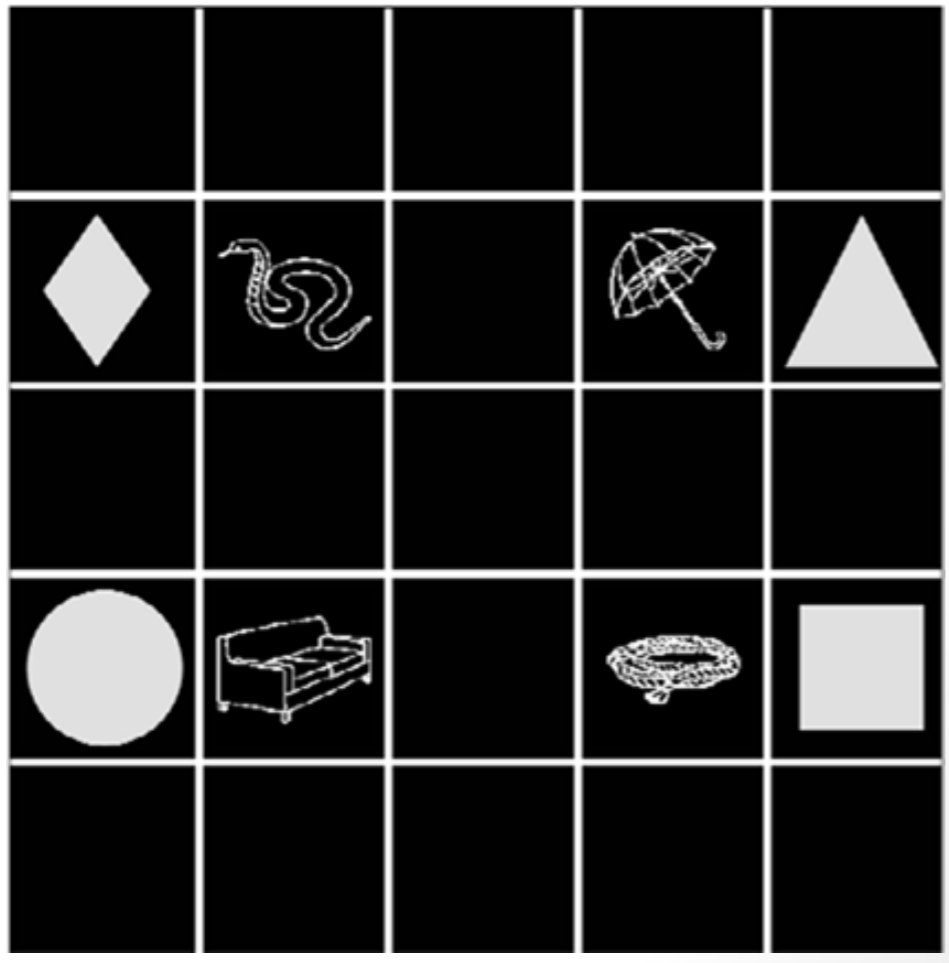
- “Eventually, the man agreed hesitantly, but then he looked at the piano and appreciated that it was beautiful”



Both

Activation of Shape

(Dahan & Tanenhaus, 2005)



Predictions

- Verbal arguments
 - Semantic (verb selectional preference)
 - Stereotypical info (agent + verb)
 - Specific object? object label? category?



“motorbike”

motorized vehicle

Prediction of Semantic Category

(Federmeier & Kutas, 1999)

- (For the sake of completeness, here no eye-movements...)
- Compare EEG on within-category and between-category violations

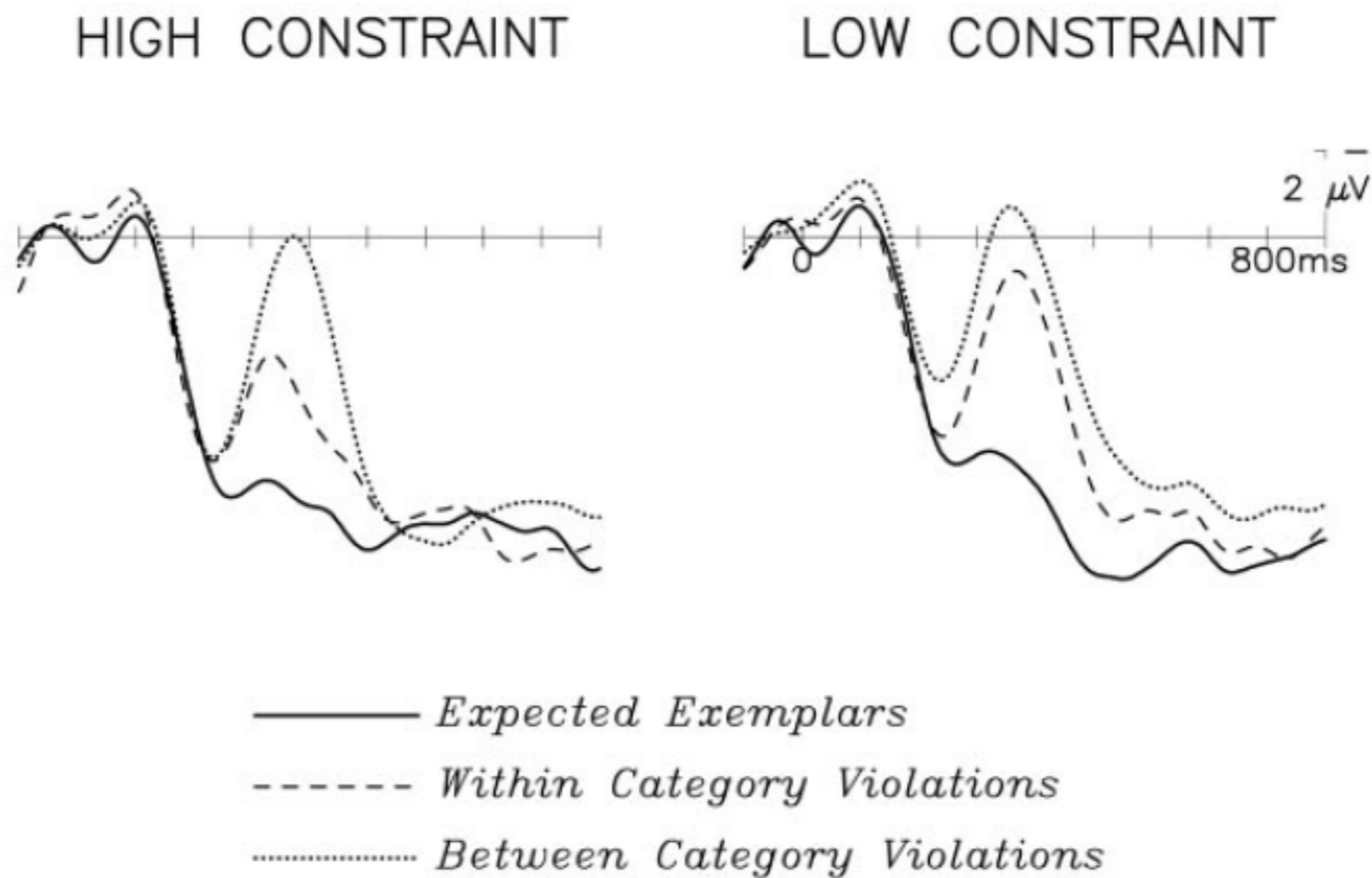
Prediction of Semantic Category

(Federmeier & Kutas, 1999)

- They wanted to make the hotel look more like a tropical resort. So along the driveway, they planted rows of **palms/pines/tulips**.
- The air smelled like a Christmas wreath and the ground was littered with needles. The land in this part of the country was just covered with **pines/palms/roses**.
- The gardener really impressed his wife on Valentine's Day. To surprise her, he had secretly grown some **roses/tulips/palms**.
- The tourist in Holland stared in awe at the rows and rows of color. She wished she lived in a place where they grew **tulips/roses/pines**.

Prediction of Semantic Category

(Federmeier & Kutas, 1999)



Prediction of Shape

(Rommers et al. 2013)

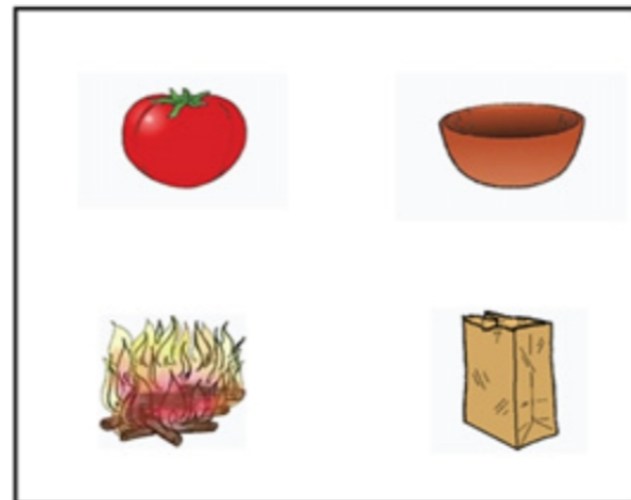
- Shape similarity detected upon processing of word
- Is shape also predicted?
- Predictive sentences (.72 cloze probability)
- See 4 object (1 target) then hear sentence
- Eye-movements before (VWP) / EEG on critical word

Prediction of shape

(Rommers et al. 2013)



Target



Competitor

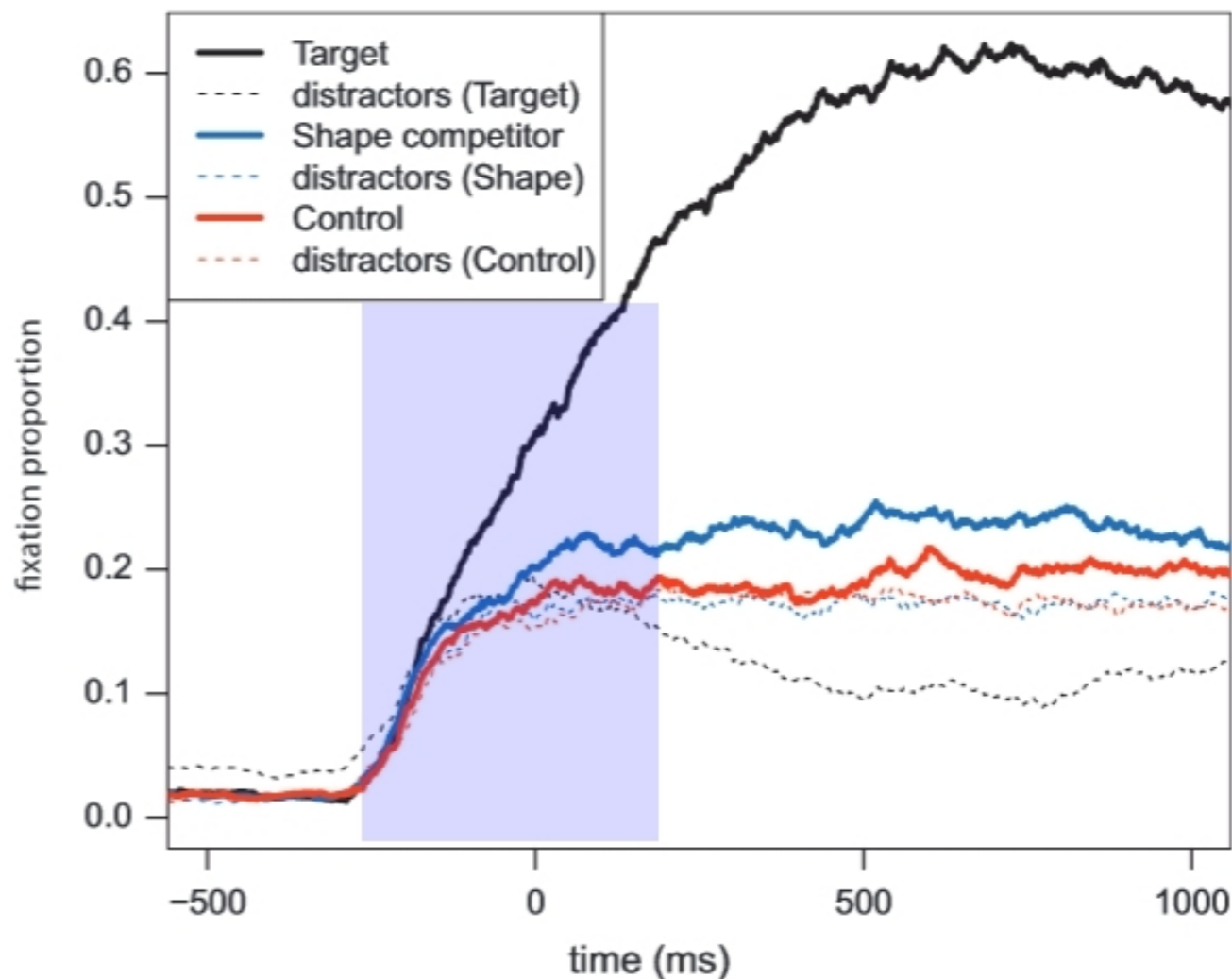


Control

“In 1969, Neil Armstrong was the first man to set foot on the moon.”

Prediction of shape

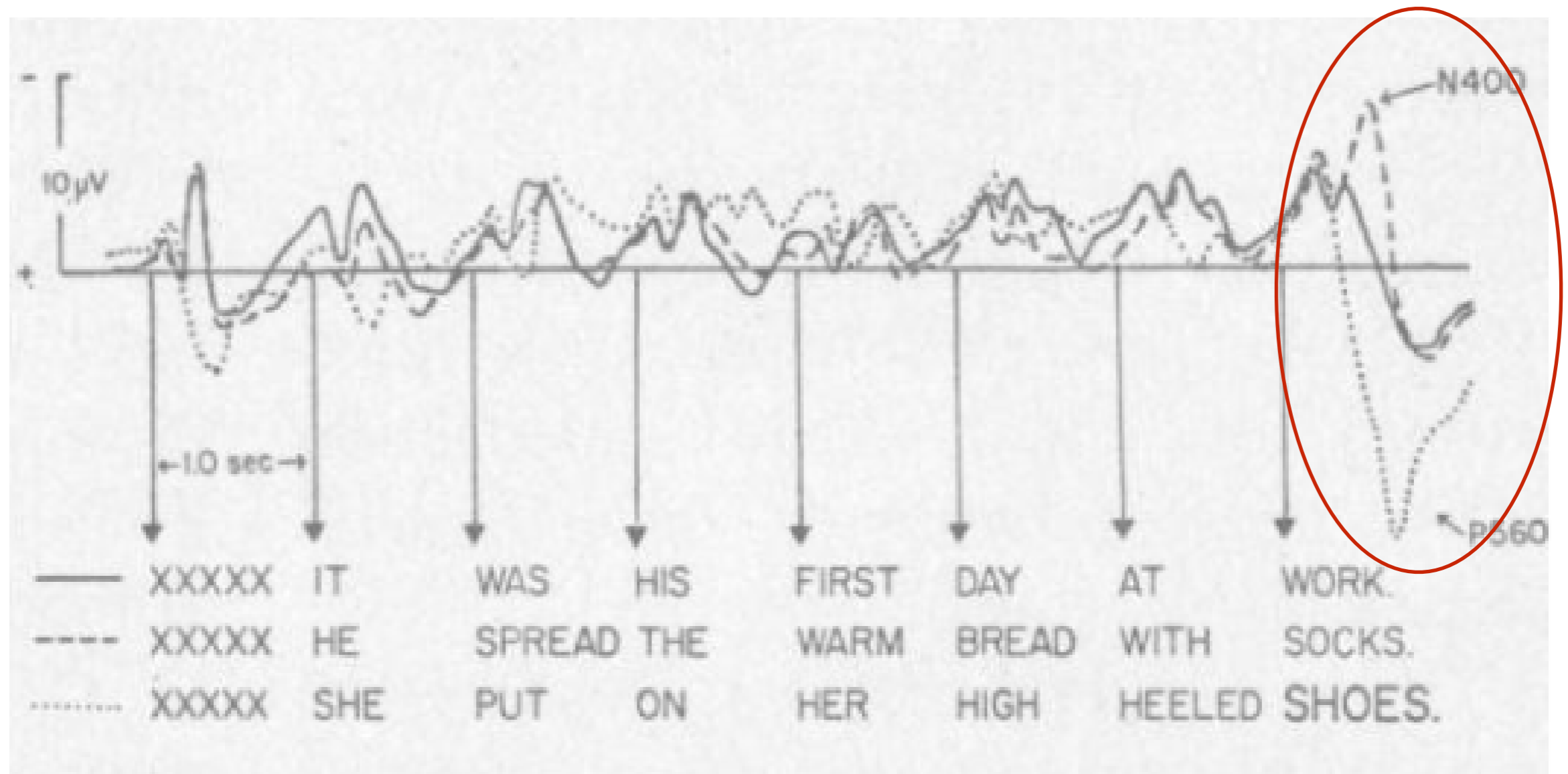
(Rommers et al. 2013)



- More fixations on shape competitor than control
- But: visual objects may enforce shape effect
- Measure in absence of visual world (N400!)

Prediction of shape

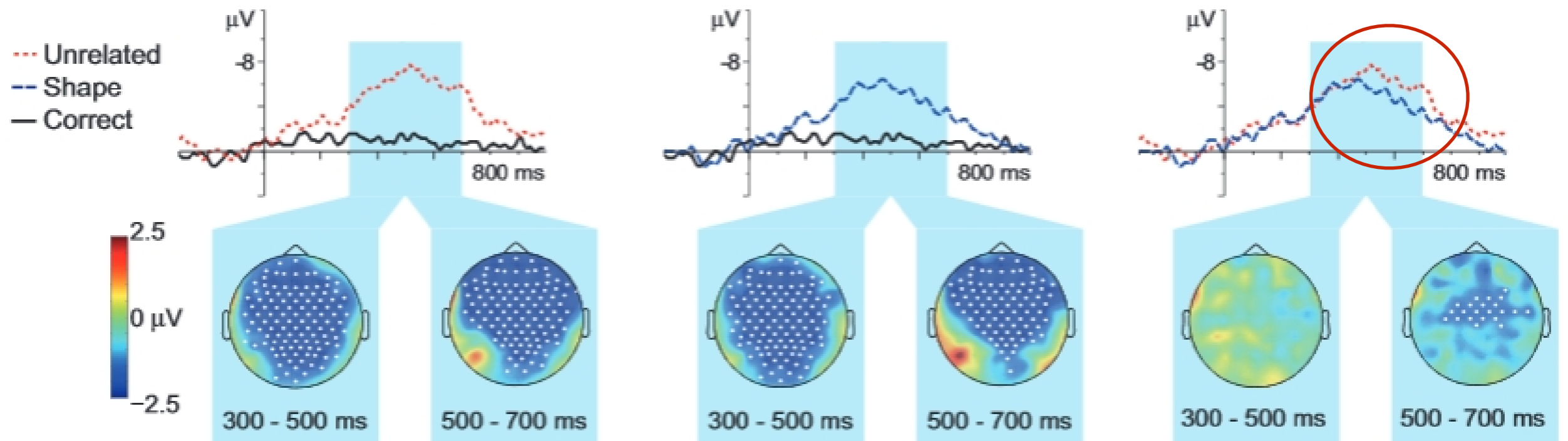
(Rommers et al. 2013)



Prediction of shape

(Rommers et al. 2013)

- “In 1969, Neil Armstrong was the first man to set foot on the moon / tomato / rice.”



Interim Summary

- (?)Activation of shape during lexical access
- Activation of semantic category
- Prediction of semantic (verb-based) features
- Prediction of stereotypical information
- Prediction of shape of target object
- Prediction of semantic category ?

Beyond Comprehension

- VWP for investigating cross-/multi-modal language comprehension
 - Drawing on various resources
 - at different points in time
 - to predict upcoming (verbal) contents
- Visual world also crucial / insightful during production?

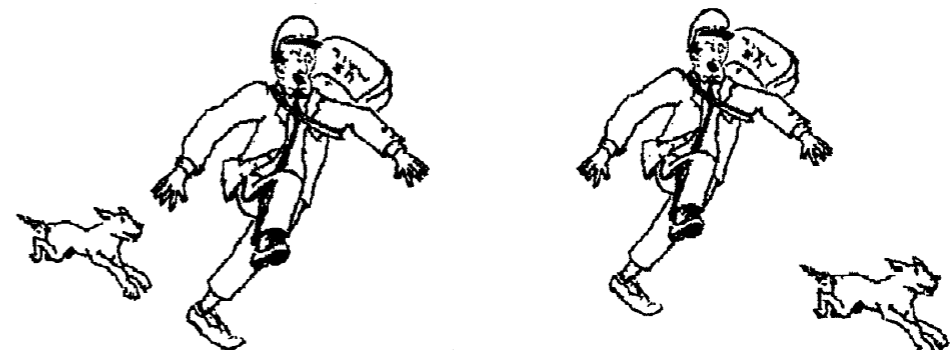
Language Production

- Again: two-way interaction in production?
 - Do eye-movements in visual scene reflect planning process (cf. *prediction* earlier) in production?
 - Does visual scene influence planned contents?

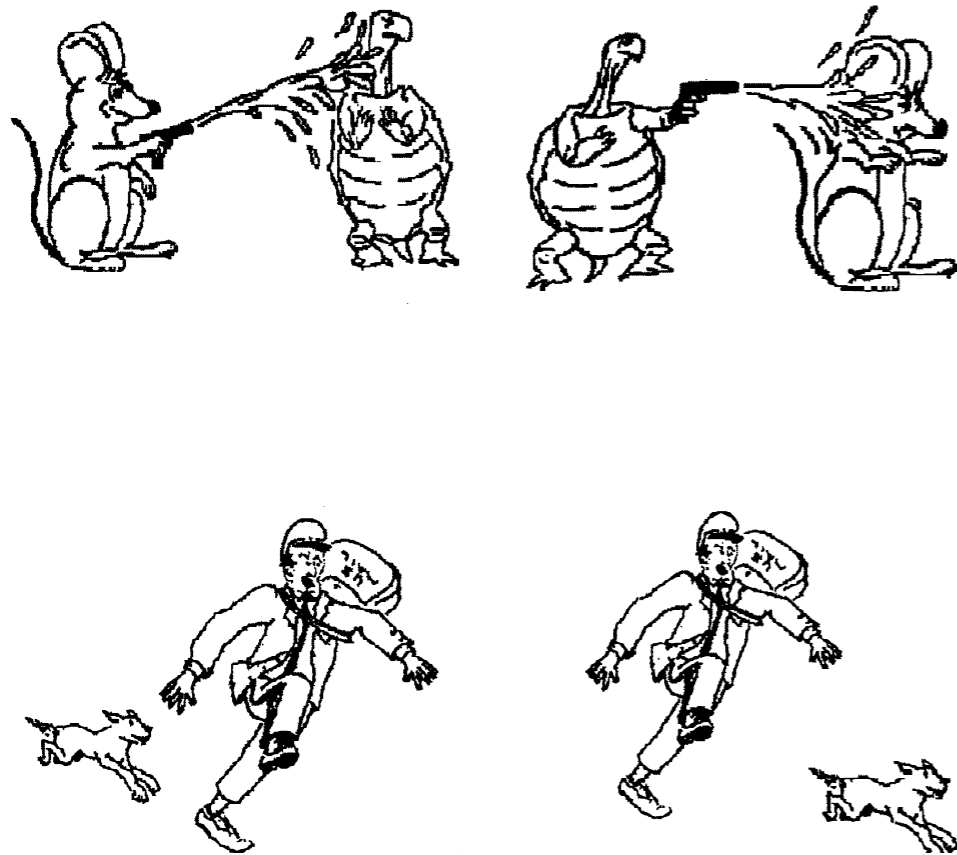
Referential Eye-movements?

(Griffin & Bock, 2000)

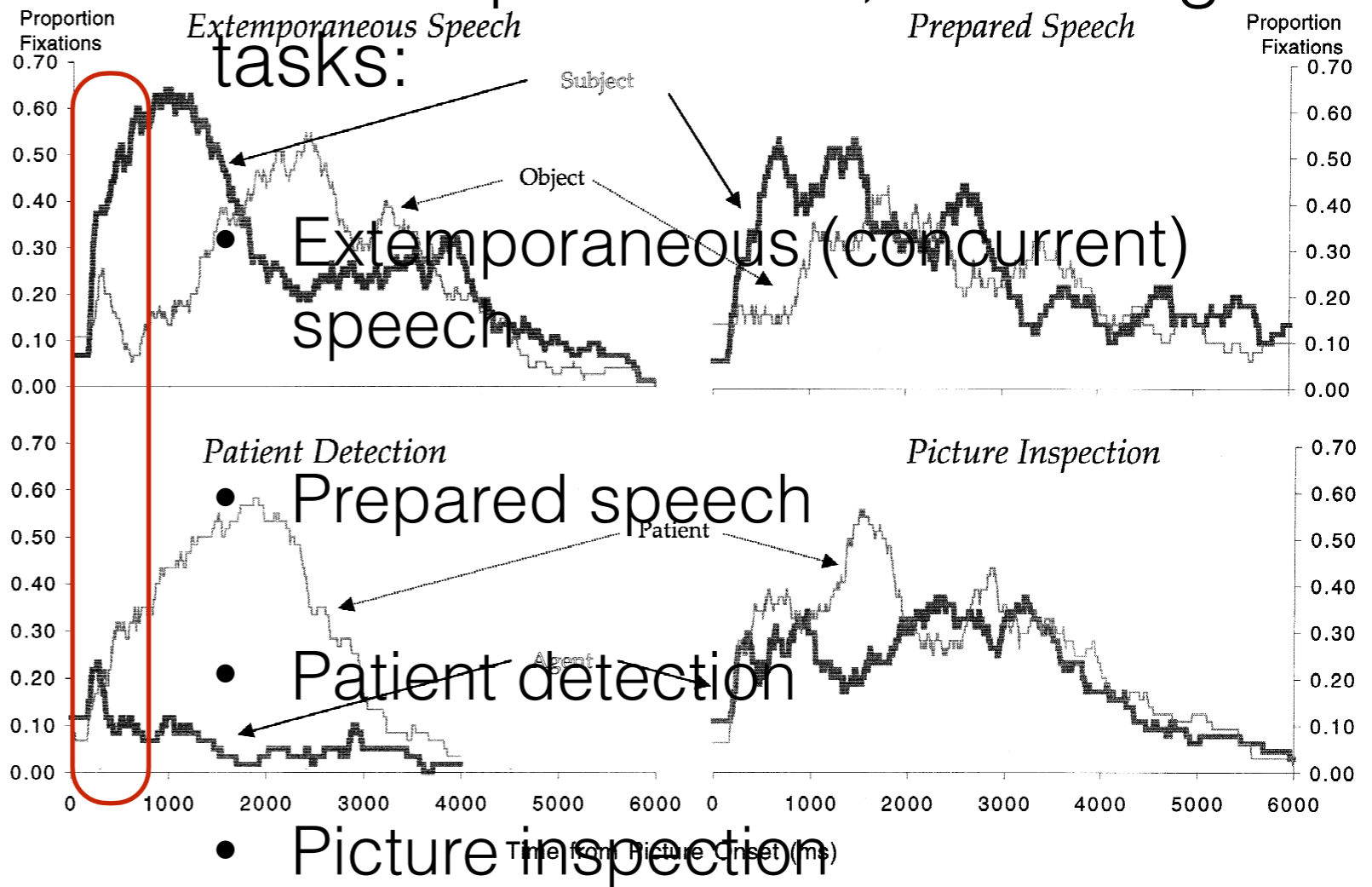
- Referring in image description
- Distinguish:
 - Scene apprehension (Image schemas, who chases whom?)
 - Planning linguistic formulation? (“The dog chases the mailman” vs “The mailman is chased by the dog”)



Referential Eye-movements



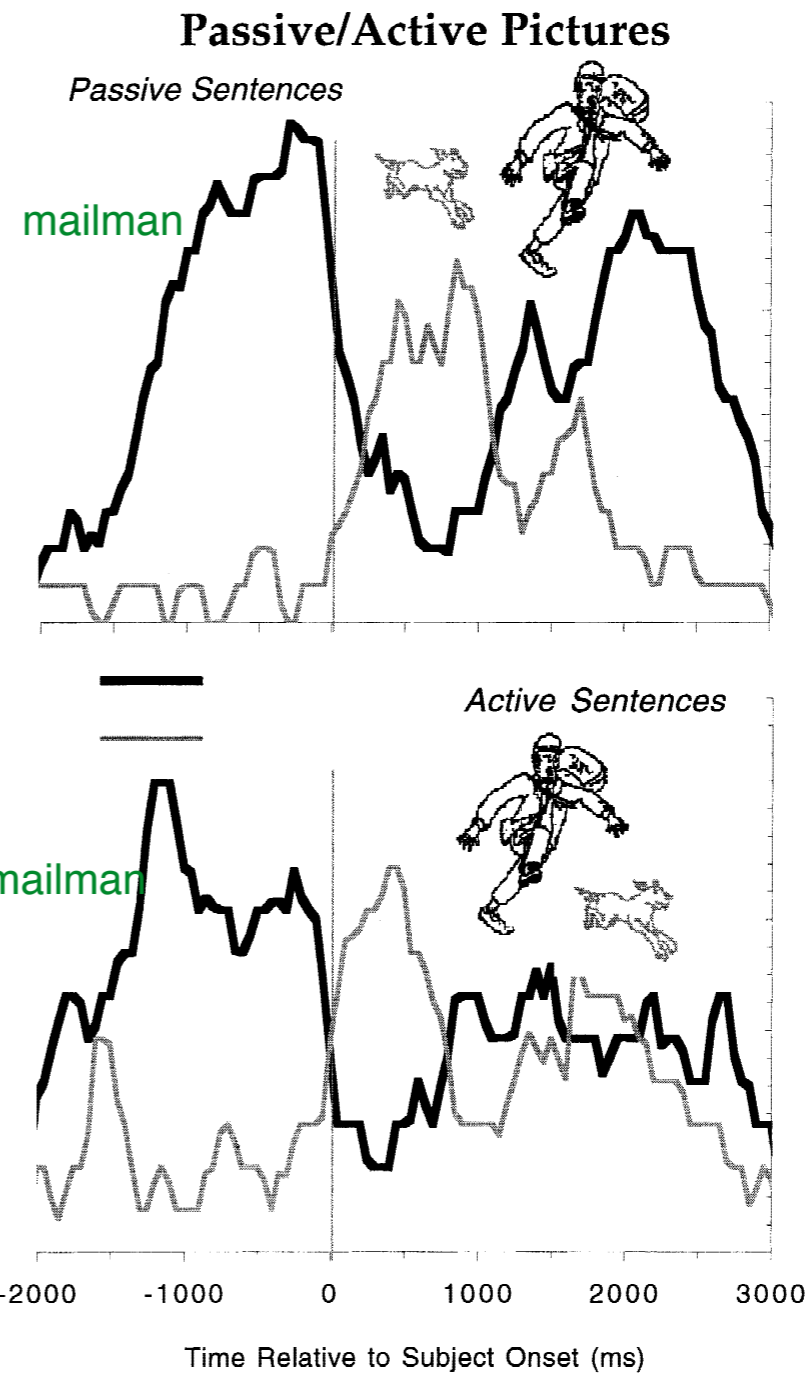
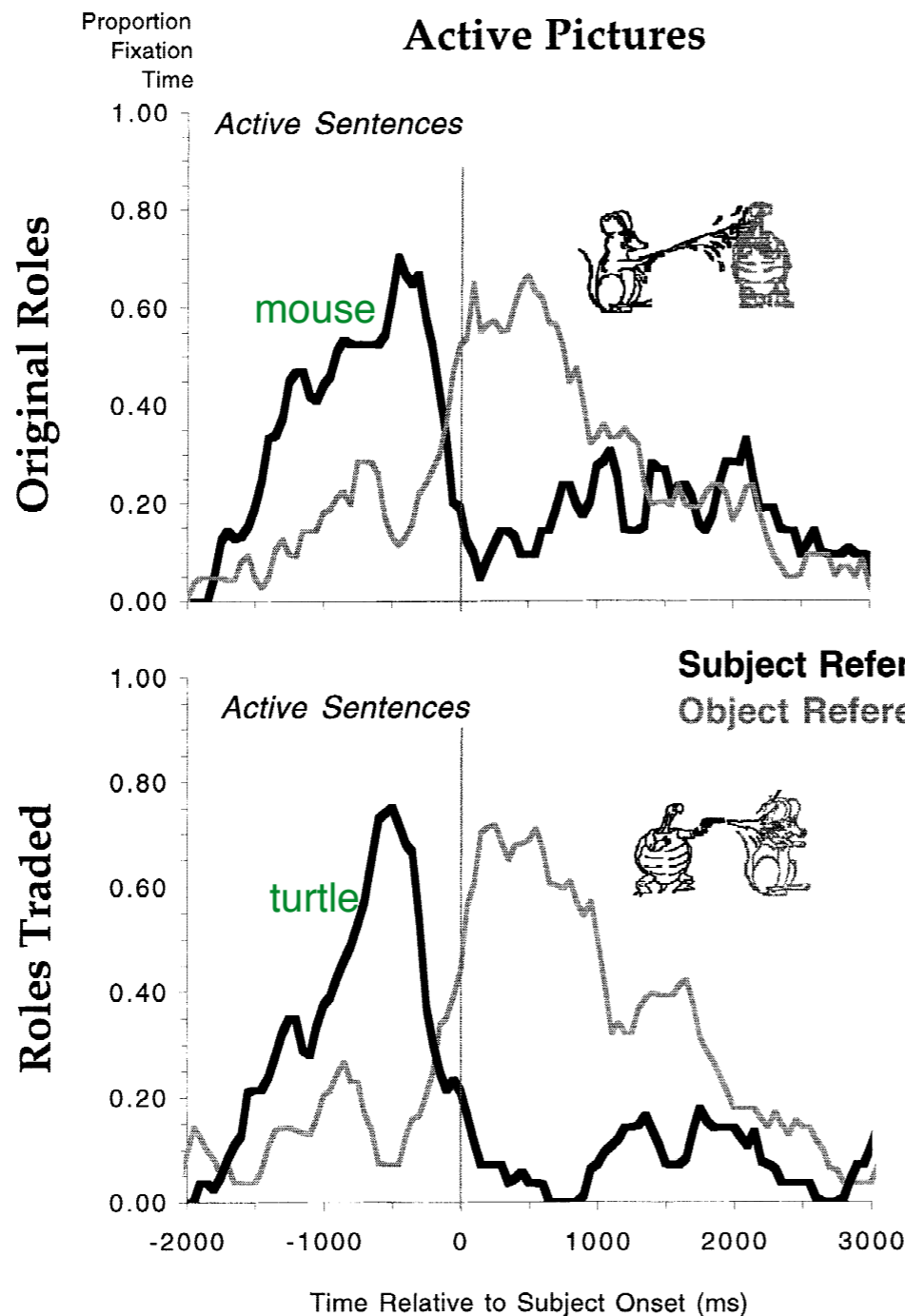
- 2 description tasks, 2 viewing tasks:



Agent-patient divergence: 456ms vs 336ms
 Detection/speech start: 1690ms vs 1686ms

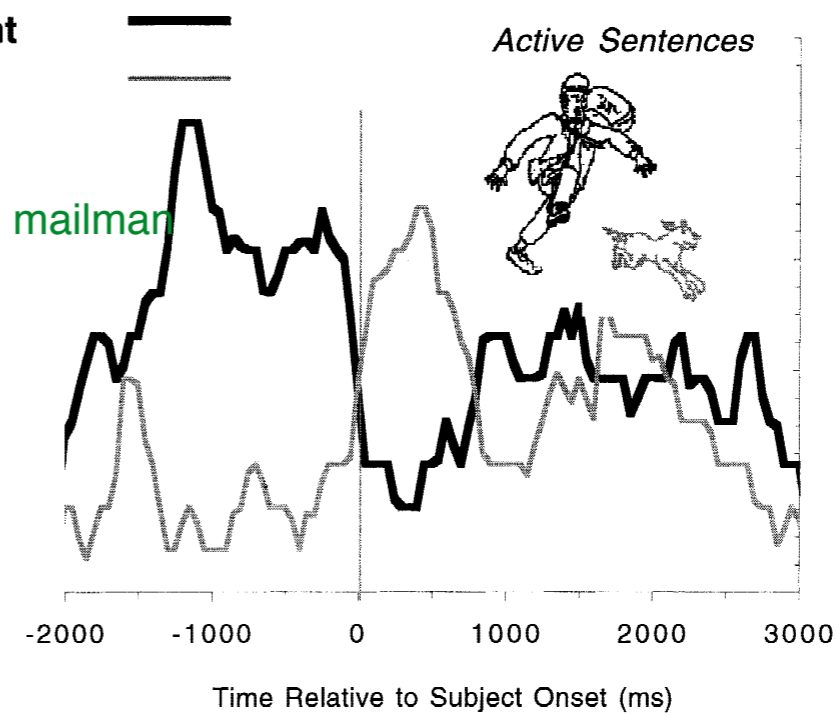
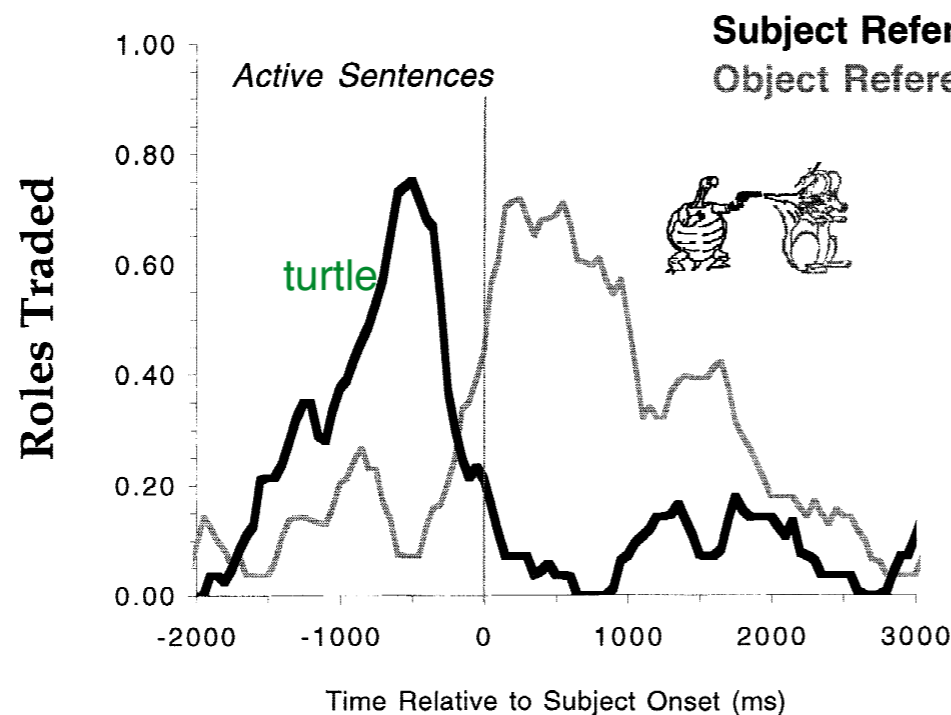
Referential Eye-movements

The mouse
squirts the
turtle with
water.



The mailman
is chased by
the dog.

The turtle
squirts the
mouse with
water.



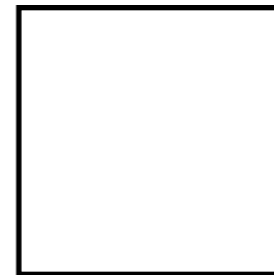
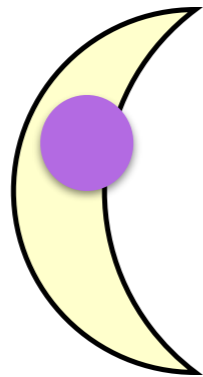
The mailman
chases the
dog.

Referential Eye-movements

- Speakers look at each object they mention
- They look at the objects in the order of mention
- They look at each object until they have generated the phonological representation of the corresponding expression
- The moon next to the square is pale.

Function of eye-movements

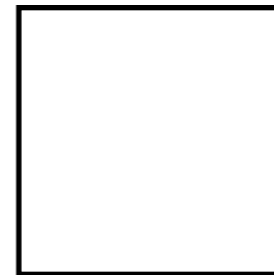
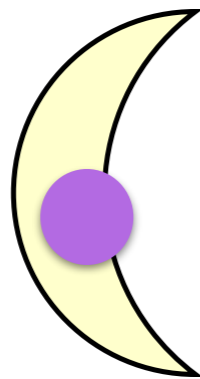
(Meyer, van der Meulen, Brooks, 2004)



The moon next to the square is pale.

Function of eye-movements

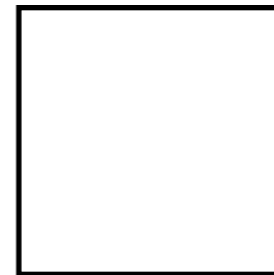
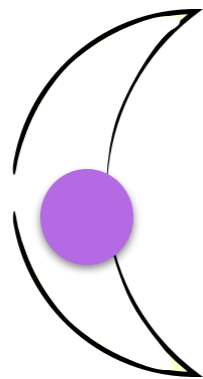
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Function of eye-movements

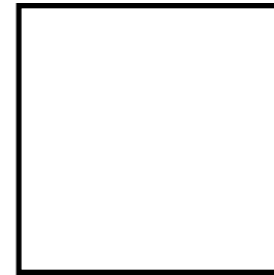
(Meyer, van der Meulen, Brooks, 2004)



The moon next to the square is pale.

Function of eye-movements

(Meyer, van der Meulen, Brooks, 2004)



The moon next to the square is pale.

Eye-movements during speech (planning)

- Scene apprehension & speech planning are separate processes reflected in eye-movements
- Speakers look at the objects they name, sequentially
- ... on order to? / until they have retrieve(d) a suitable referring expression
 - Object identification & facilitated memory retrieval
 - Preference for depicted over memorised info

Eye-movements during speech (planning)

- Scene apprehension & speech planning are separate processes reflected in eye-movements
- Speakers look at the objects they name in order to?
 - Do object identification & facilitate memory retrieval
 - Visual complexity (Meyer et al., 1998)
 - Ease of lexical selection (Belke et al., 2005)
 - Name frequency & length (Meyer et al., 2003, 2005)

Summary (revisited)

- Eye-movements
 - are a result of (incremental) information integration ✓
 - index predicted contents ✓
 - help (?) memory retrieval ✓
 - index online up-to-date **representations** of the context ✓
 - index scene apprehension and speech planning ✓

Overview & Outlook

- Word-learning, nouns and verbs, is embodied & situated
- Embodiment theories
- Situated (adult) language processing in the visual world
- Common ground and perspective-taking in interaction
- Speaker/Listener as part of the 'situation'
- Social/applied factors in LC

References

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