

# Eye movement control in the visual world paradigm

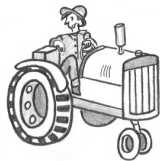
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# Visual World paradigm



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- Knoeferle et al. (2006, 2016): **referential priority** – all else being equal, there will be more fixations on the referent of the word than on the other objects.

# How automatic is this behaviour?

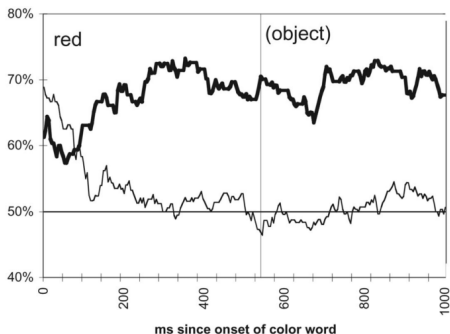
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- Huettig, Rommers, & Meyer (2011): “Whether the integration of the visual and spoken input is a deliberate or rather automatic process remains to be seen”

# Challenging Visual World paradigm

Modest 60-70% of fixations land at the referent when it is being named.



A typical result (picture taken from Arnold, Kam, & Tanenhaus, 2007)

# 'Don't look at the picture' task



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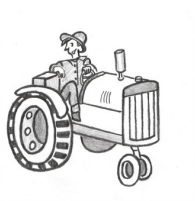
- Words trigger eye movements to the relevant picture
- Top-down control and saccadic suppression

# Direct vs. Indirect nominations

**Nouns:** driver, librarian, milkmaid, farm, etc.

**Pronouns:** he, she, her, there, who, etc.

# Direct vs. Indirect nominations



# Predictions

- Referential priority is automatic
  - Participants won't be able to suppress saccades to the relevant pictures.

# Predictions

- Referential priority can be controlled
  - Participants will effectively suppress saccades.

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- Referential priority can be controlled  
→ Participants will effectively suppress saccades.

Nouns and pronouns will be processed differently – participants will be less able to control saccades during pronoun resolution.

Eyelink 1000+ Desktop mount with chin rest



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## **Eye movement control**

- 'Don't look at the picture'
- 64 stories
- 41 participant

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- 64 stories
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## **Free inspection**

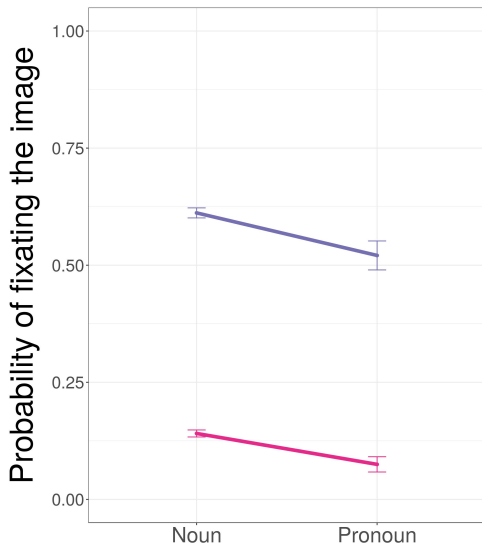
- 'Look and listen'
- same 64 stories
- 39 participants

# Stimuli



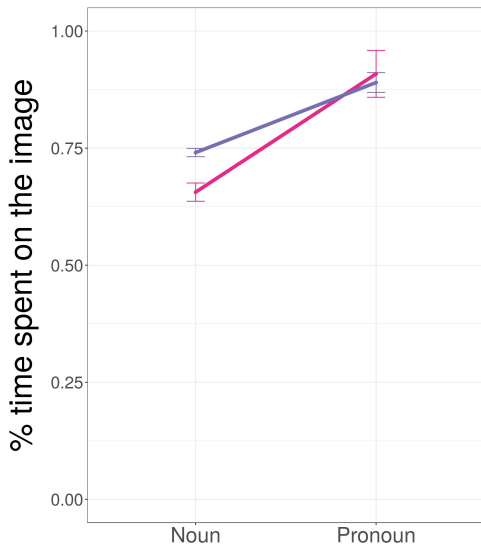
Once on a collective farm a tractor driver fell in love with a milkmaid and gave her red carnations. But she married a librarian who gave her books. Nobody knows why the milkmaid married the librarian.

# Probability of fixating target image



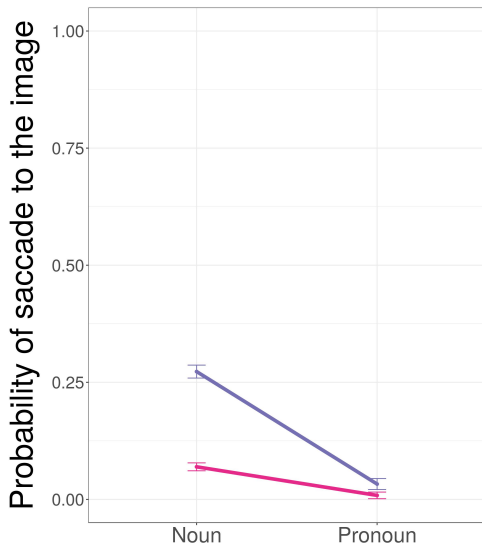
Condition — Eye-movement control — Free inspection

# Proportion of time spent at the target image



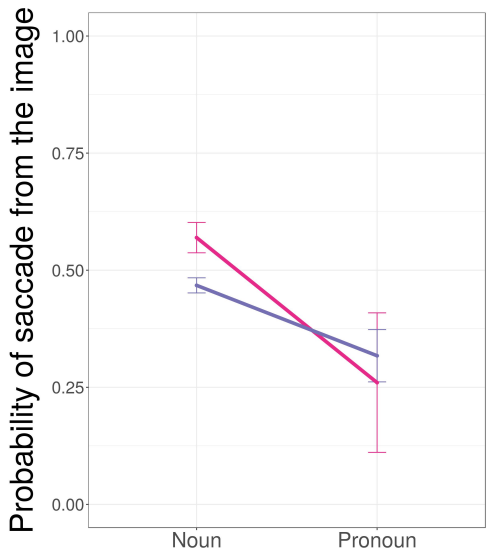
Condition — Eye-movement control — Free inspection

# Saccades to the target image



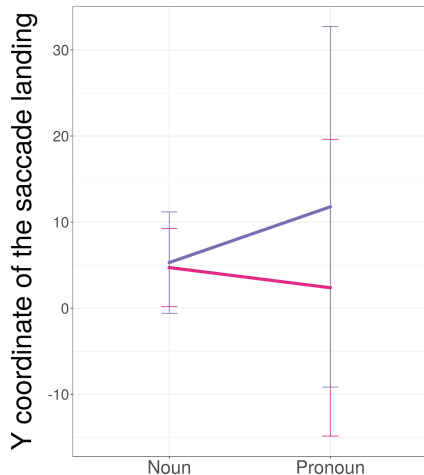
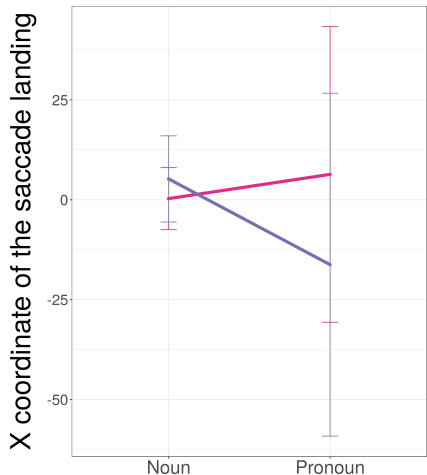
Condition — Eye-movement control — Free inspection

# Saccades from the target image



Condition — Eye-movement control — Free inspection

# Saccades outside of the target region





# Why are nouns and pronouns processed differently?

- Pronouns are shorter.  
People don't have enough time to make a saccade from the image.

# Why are nouns and pronouns processed differently?

- Pronouns are shorter.  
People don't have enough time to make a saccade from the image.
- Pronouns are harder.  
People are busy looking for the antecedent.

- Participants are not able to fully control their eye-movements
- Different processing of direct and indirect nominations (nouns and pronouns):
  - the same time spent on the image referred to with a pronoun in both conditions
  - the same probability of an outgoing saccade from the image referred to with a pronoun in both conditions

## To sum up

Link between language and visual attention is strong  
Even stronger for pronouns