I can see what you say

Eye-Tracking in Language Production

Overview

- Introduction

- Experimental Background so far

- Theoretical Background (Models)

- Problems / Motivation

- Experiment

Introduction

Using the eye-tracker for analyses of language production processes is not an obvious thing to do.

Link of language processing and eye movements is much clearer

- pattern of eye movements as reaction to auditive input
- linguistically motivated eye movements (projections)
- pattern of eye movement as indicator for processing difficulties in reading

Introduction

Basic assumption:

      Eye movements and language production
      are linked

      Measures of eye-tracking give rise to
      underlying (production) processes
      (different parameters like viewing time,
      amount of fixations, fixation duration,
      first fixation, ...)

Introduction

One possible link:
> in picture description, people tend to fixate
> what they are talking about

Hypotheses:

→ object fixation supports naming processes

→ lexical acces takes place during fixation

Experimental Background

1. Meyer, Sleiderink & Levelt (1998)

- presented pairs of pictures which were to be named from left to right using the conjunction "en" (e.g. a scooter and a hat)

- varied the frequency of the referring expression and the quality of the drawing using contour deletion

Experimental Background

1. Meyer, Sleiderink & Levelt (1998)

- frequency affects speed of naming

  → if eyes stay longer at low frequent left objects it could be assumed that lexical access takes place during fixation

Experimental Background

1. Meyer, Sleiderink & Levelt (1998)

- contour deletion affects speed of object identification

  → if eyes stay longer at half contoured objects (without a frequency effect), presumably only identification takes place during fixation

Experimental Background

1. Meyer, Sleiderink & Levelt (1998)

Results:

Naming latencies and viewing times depended on the contour type and on name frequency of the objects.

These effects seemed to be additive.

Experimental Background

2. Griffin & Bock (2000)

- presented action pictures which were to be described (e.g. a postman being chased by a dog)

- thematic roles of depicted objects were varied (e.g. postman chasing dog vs. dog chasing postman)

- compared pattern of eye movements and subjects' utterances

Experimental Background

2. Griffin & Bock (2000)

Results:

Order of fixations anticipated the order of mention regardless of sentence structure. (sentential subjects are fixated longer before subject onset than after)

eye voice span ca. 915ms (resembles latencies for isolated objects)

Experimental Background

3. V.d. Meulen, Meyer & Levelt (2001)

• presented auditory preambles (e.g. this is the picture of an actor and an object; what is happening? What is the actor doing?) followed by action pictures (e.g. a man throwing a ball)

• subjects were instructed to use either a noun phrase or a pronoun

Experimental Background

3. V.d. Meulen, Meyer & Levelt (2001)

• context information should affect viewing times

• less time should be needed to produce pronouns than noun phrases, therefore viewing times on respective objects should differ

Experimental Background

3. V.d. Meulen, Meyer & Levelt (2001)

Results:

In 61% of the trials, the agent was fixated before speech onset.

Looking rates were significantly lower when pronouns were produced.

(extending the "agent region", looking rates rose up to 93% before onset and was similar for pro and np)

Experimental Background

Summary:

- Naming latencies and viewing times seem to be linked and depend on the contour type and on name frequency of the objects.

- Order of fixations seems to resemble the order of mention regardless of sentence structure.

- For known objects looking rates are lower; this effect seems to be stronger for linguistic than for visual context.
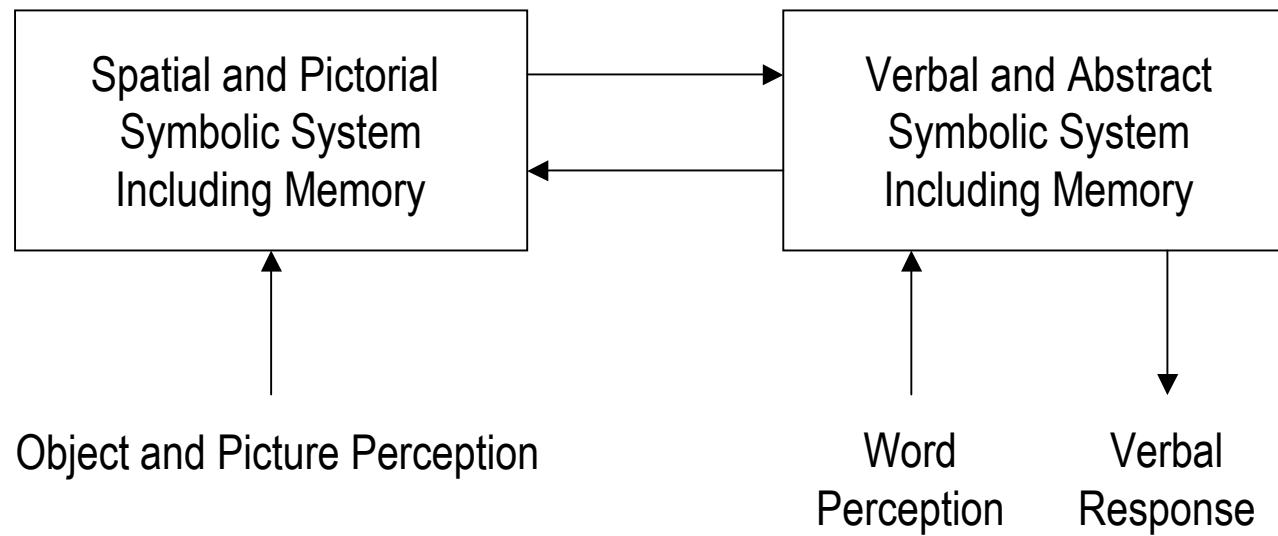
Theoretical Background

Theories of language production so far do not predict that addressing visual attention to an object should be necessary or of any use in linguistic formulation.

Different attempts to link a visual and a linguistic system; mainly concerning the form of representation. (e.g. Deese, 1962; Paivio, 1969, 1978; Seymore, 1976; Snodgrass, 1984; Glaser & Glaser, 1989)
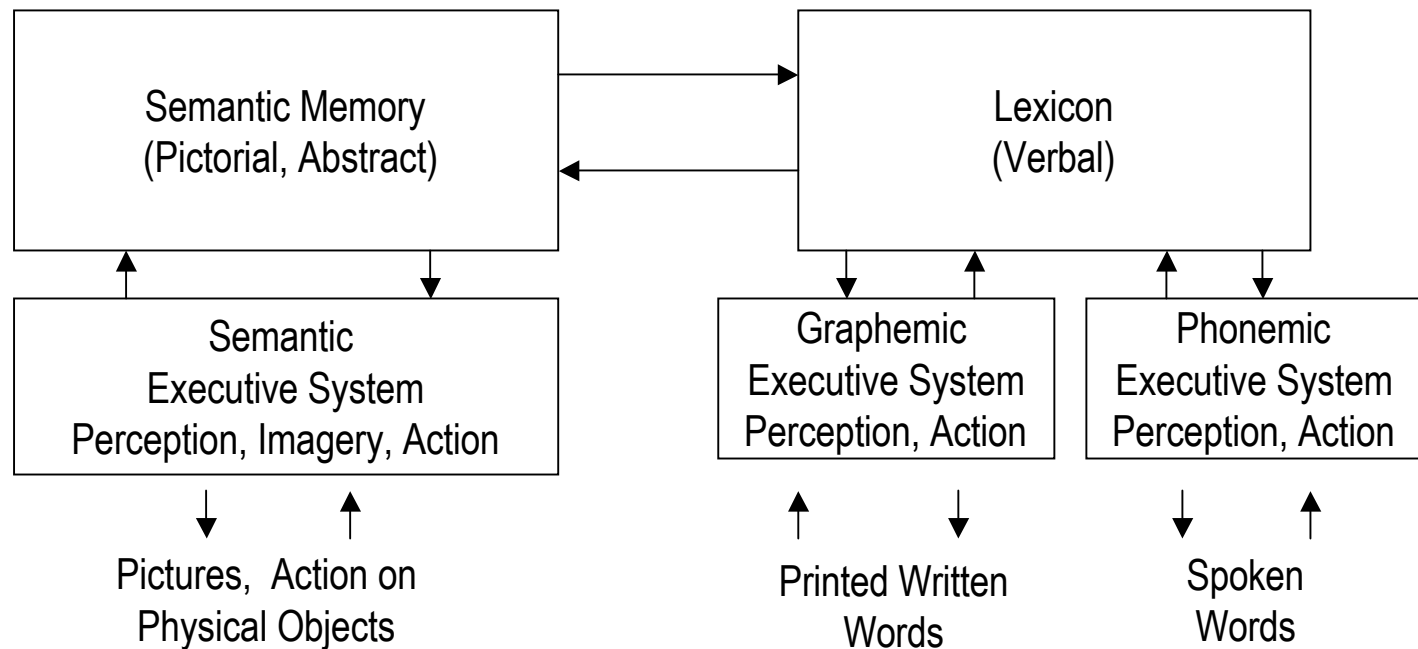
Theoretical Background
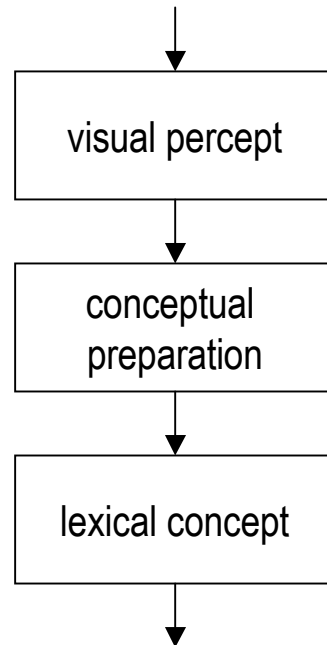
Dual-code model (Paivio, 1971, 1978):

Theoretical Background

"lexical hypothesis" model (Glaser & Glaser, 1989):

Theoretical Background

Levelt-model (V.d. Meulen, 2001):

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                    │
                    ▼
          ┌───────────────────┐
          │   visual percept  │
          └───────────────────┘
                    │
                    ▼
          ┌───────────────────┐
          │    conceptual     │
          │    preparation    │
          └───────────────────┘
                    │
                    ▼
          ┌───────────────────┐
          │  lexical concept  │
          └───────────────────┘
                    │
                    ▼
```

Problems / Motivation

- None of the models accounts for the supportive
  effect of visual attention in naming.
  This effect is not only present in the above
  experiments, but also in neuropsychological cases.

- The link between visual input and language
  production is a necessary assumption for the use of
  the eye-tracker. But the influence of visual input on
  language structure is not fully clear.

Problems / Motivation

- Repetitive presentation of objects can influence lexical selection (use of pronoun, naming latencies) and may even affect word order.

- To analyse the effects of given information, mostly linguistic contexts (auditory preambles) have been used. Visual stimuli may also be used as priming material.

Experiment

Questions:

Does given visual information influence scanning patterns? (in the case that subjects do not know in advance that they have already seen one of the objects)

Does visual priming influence word order?

Is the longer fixation of sentential subjects before utterance onset a subject-first fixation or does it reflect the order of mention?

Experiment

Material:

- Black and white drawings
  depicting actions between humans and
  animals (e.g. devil, female punching a kangaroo)

- pictures are to be named using one sentence
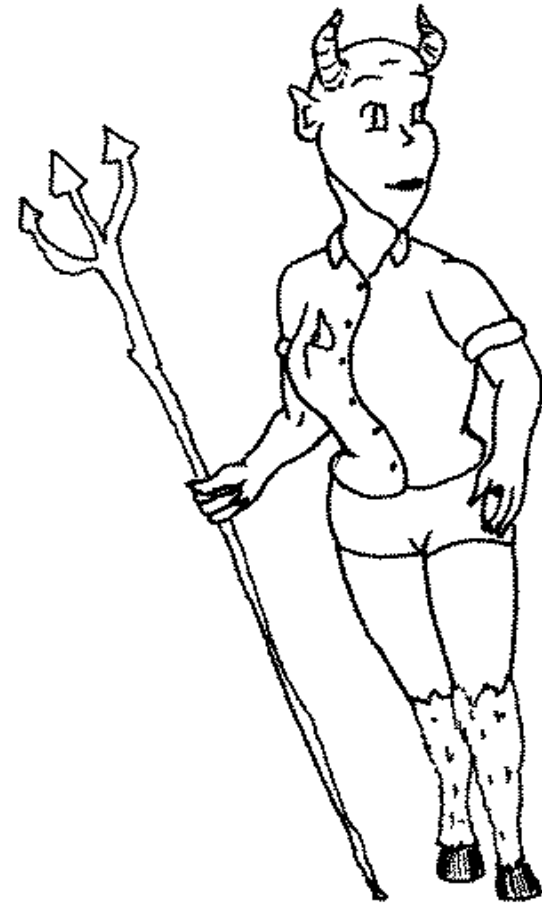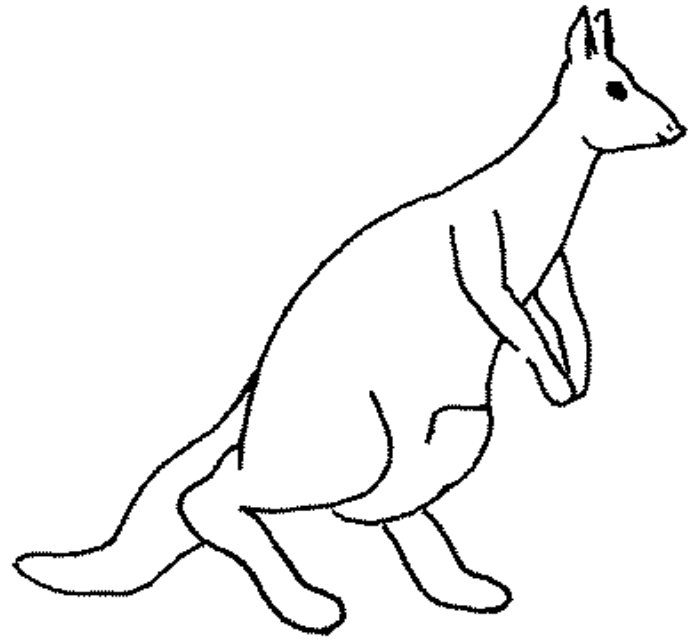
Experiment

Material:
- thematic roles of objects vary
  (a kangaroo punching a devil, female
    a devil, female punching a kangaroo)

- pictures are preceded either by a prime or
  by no prime

- the prime is identical to either the agent or the
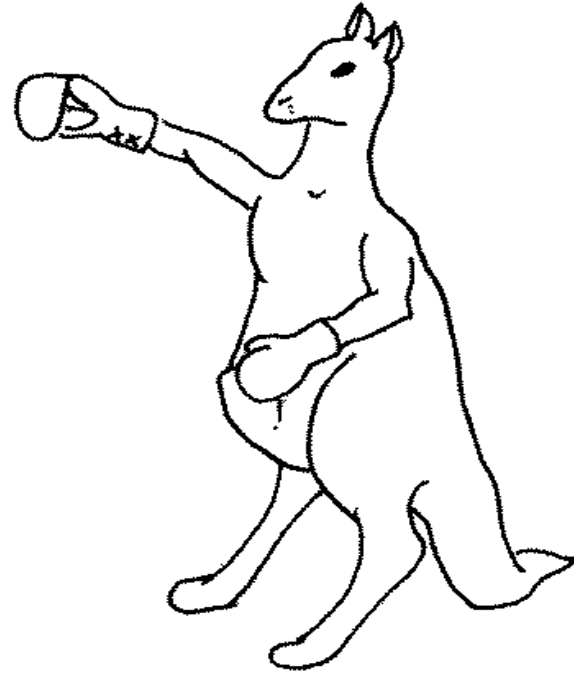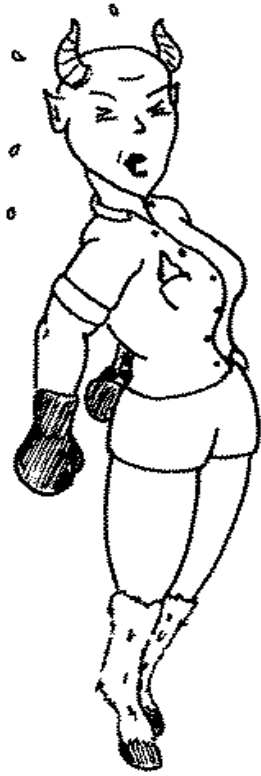 patient of the following action picture
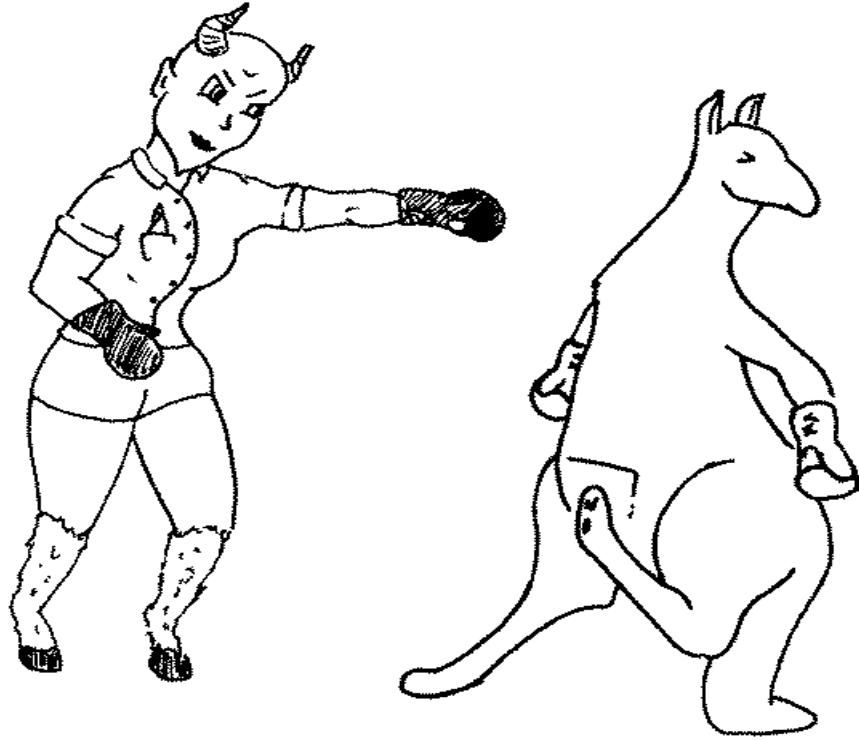
⟶ six conditions

Experiment

Prime	no prime	devil, female	kangaroo
human agent	a devil punching a kangaroo	a devil punching a kangaroo	a devil punching a kangaroo
non-human agent	a kangaroo punching a devil	a kangaroo punching a devil	a kangaroo punching a devil

Experiment

Expectations:

- visual priming influences scanning
  pattern; given information will less
  often be fixated

- visual priming influences word order

Experiment

Prime	no prime	devil, female	kangaroo
a devil punching a kangaroo	SVO	SVO	OVS
a kangaroo punching a devil	passive	passive	SVO

Experiment

Expectations:

- visual priming influences scanning pattern; given information will less often be fixated

- visual priming influences word order

- order of fixation reflects the order of mention, independent of sentential subjecthood

Experiment

Further questions:

- How long does visual priming last? (intervening pictures / time)

- Does the repetetive presentation of a visual stimulus affect intonation of the referring description?

- Is the priming effect purely visual (simple recognition of contours)?

Experiment

Further questions:

- Can different entities of one referring expression serve as a prime?

- How strong is the effect of visual priming and where is it to be located within a model?