Week 3: Spoken Language Processing in a Visual Context

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Research on eye movements in reading has a history of more than a century. In contrast, eye movements have only started to become a popular measure in studies of spoken language processing within the last couple of decades. In these studies, participants' eye movements to a visual display are recorded as they follow instructions, listen to sentences, or generate utterances about the "visual world". The visual world paradigm allows researchers to study real-time language comprehension and production in natural tasks.

1 The visual world paradigm

In a typical visual world experiment, the participants hear an utterance while looking at an experimental display, while their eye movements are recorded for later analyses.

1.1 The visual display

Typically, the visual display includes the object(s) mentioned in the utterance as well as a few distractors. The visual display can take the form of a semi-realistic scene, an array of objects, or even printed words. The visual display is typically presented 1-2 seconds before the onset of the utterance (preview time) and stays in view until the offset of the auditory stimuli. In some versions of the visual world paradigm, the visual display can be presented first, and a spoken sentence follows while a blank screen is shown. Such a setup is useful in the studies of short-term memory in language comprehension.

1.2 The auditory stimuli

1.3 The task

1.4 The linking hypothesis

Data collected in a visual world experiment is essentially the gaze position at particular time points in each trial. How to link these position data with language processing? The assumption that provides the link between language processing and eye movements in the visual world is essentially that **the activation of a linguistic representation determines the probability that a participant will shift attention to the corresponding picture and thus make a saccadic eye movement to fixate it**. Therefore, when gaze positions are averaged across multiple trials, researchers can calculate the proportion/probability of looks to the target object, representing activation of the target word.

1.5 Production studies

2 Comprehension

3 Production

References

[1] Huettig F, Rommers J, Meyer AS. Using the visual world paradigm to study language processing: A review and critical evaluation. Acta Psychologica 2011;137:151–71.

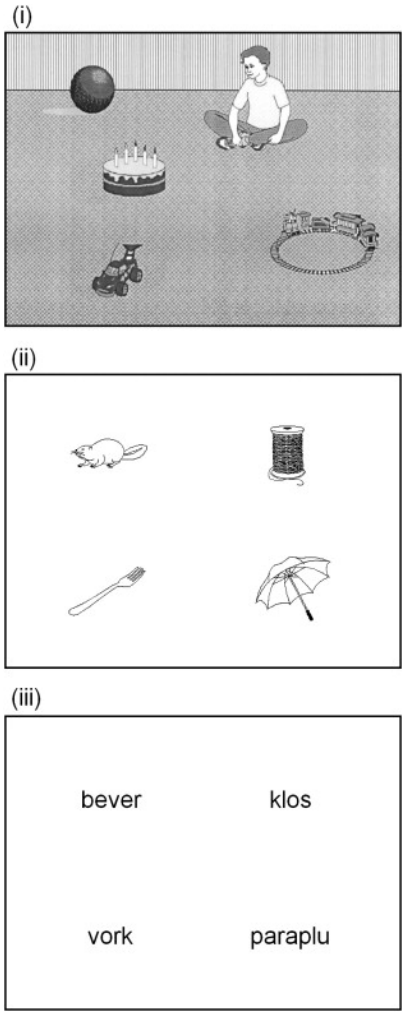

Figure 1: Typical visual world displays. Extract from [1].

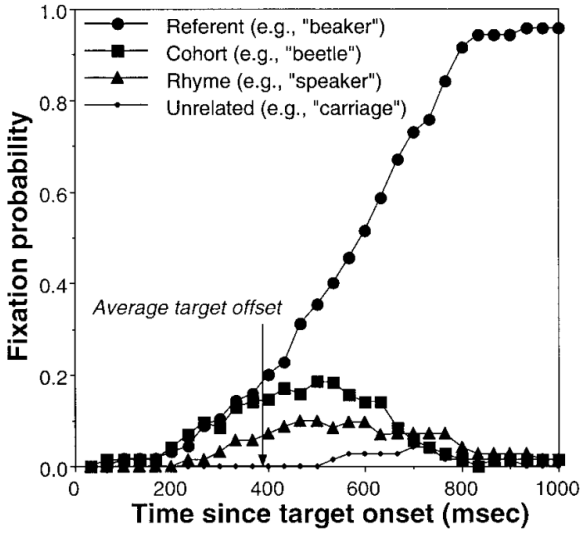

Figure 2: Proportion of looks to each object in the visual display when listening to instructions such as "Pick up the beaker". Extract from [2].

[2] Allopenna PD, Magnuson JS, Tanenhaus MK. Tracking the time course of spoken word recognition using eye movements: Evidence for continuous mapping models. Journal of Memory and Language 1998;38:419–39.

[3] Tanenhaus MK. Chapter 20 - eye movements and spoken language processing. In: Van Gompel RPG, Fischer MH, Murray WS, Hill RL, editors. Eye movements, Oxford: Elsevier; 2007, p. 443–II. https://doi.org/Mht tps://doi.org/10.1016/B978-008044980-7/50022-7.