

Does Thought Require Language? Insights from Eyetracking

Zella Henderson '14



Research project in collaboration with Jill De Villiers (Smith College, Psychology)

Background

- This research was inspired by the work of Wolfram Hinzen, a philosopher of language whose work suggests that it is the human language faculty that supplies the conceptual framework for seeing the equivalence across events, or the kind of propositions that underlie sentences.

- According to this theory, while a non-linguistic being could learn simple concepts such as "human" or even "tall-red-haired-human", they would not be capable of forming complex, combinatorial concepts of a propositional kind.

- A linguistic proposition is true of a set of events e.g. "Monster chase dog" is true of an infinity of different monsters and dogs in chasing events: crucially, ones in which the monster is the agent. But does this class of events exist without language to guide the perceiver?

- Our research set out to investigate the role that language, plays in the conceptualization of complex events.

- We examined how the participants' ability to recognize agent and patient was affected by the simultaneous completion of tasks that tied up their language faculty.

- We hypothesized that the language faculty is used to recognize linguistics propositions, and therefore that if the language faculty were not readily available, then the recognition of a class of events sharing a proposition would not be possible.

Design

- Subjects were shown a series of pictures of the eye-tracker screen. Each pair contained a target stimulus and non-target stimulus.

- Target: Monster chasing dog
- Non-target: Dog chasing monster or any other animals as patient or agent

- After two seconds, the target stimulus animated.

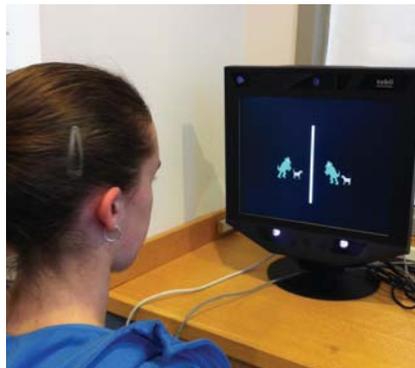
- Attributes such as size, color, ear shape, tail shape, chase direction, and side of screen were varied so that the only common factor for the subject to recognize as the pattern was which animal was the agent and which was the patient.

Task

- Subjects watched ten "training" videos to illustrate that the case in which the monster was chasing the dog (monster as agent, dog as patient) was always the one to animate.

- Subjects should then begin to watch the stimulus that they expected to animate in each video, which is known as anticipatory eye gaze.

- Using the eye-tracker's recordings of subjects' eye gaze, we found the percentage of subjects that had looked at each stimulus (target and non-target) to see how well they recognized the pattern.



Subject watching a training video on the eye-tracker. The eye-tracker tracks gaze using infra red cameras

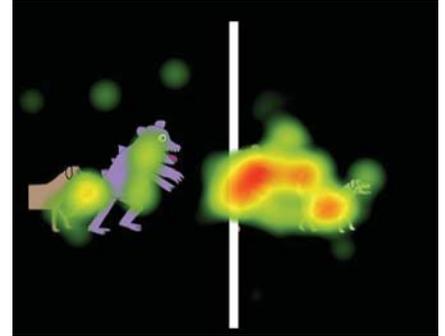
Method

- We tested 18 students enrolled in Smith College courses under one of two conditions.

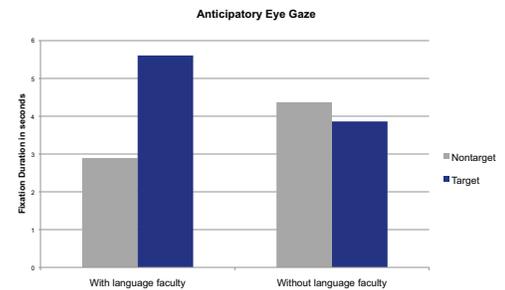
- 9 neutral subjects: Subjects watched the videos on the eye-tracker screen. (Full language faculty available)
- 9 verbal shadowing subjects: Subjects verbally repeated a story heard through headphones while watching the videos on the eye-tracker screen. (Limited language faculty available)

- Each subject watched 40 videos: 10 training videos, 20 monster-chase-dog vs. dog-chase-monster videos, and 10 with the non-target as e.g., monster-chase-cat or elephant chase-dog as a control to ensure that the subjects were recognizing both the agent and the patient rather than only one element.

Results



A heat map of eyegaze across subjects to a pair of stimuli (target is on right)



- Subjects looked more often at the target than nontarget stimulus when they had their full language faculty available ($p = 0.004$)

- Subjects looked equally at either target when their language faculty was unavailable because of shadowing. ($p = 0.45$)

- Using a paired sample t-test, we found that the difference between subjects' eye gaze on the target and nontarget areas was statistically significant only in the nonshadowing (full language faculty) case.

Discussion

- This experiment supported our hypothesis that language is used to recognize the class of events that share the proposition "monster chase dog."

- These results suggest that the language faculty may help us characterize events in the world around us.