

## Eye-movement control in the Visual World Paradigm

Anna Laurinavichyute<sup>1,2</sup>, Anastasia Kromina<sup>1</sup>, & Anastasiya Lopukhina<sup>1</sup>

<sup>1</sup>National Research University Higher School of Economics, Moscow, Russia

<sup>2</sup>University of Potsdam, Potsdam, Germany

[anna.laurinavichyute@uni-potsdam.de](mailto:anna.laurinavichyute@uni-potsdam.de)

The presumably widely shared, although not often explicitly articulated assumption behind the use of the Visual World paradigm is that participants tend to automatically look at the object that undergoes linguistic processing at the current moment. The assumption is based on close correspondence in time between the onset of the reference to the object/action and fixations to its depiction. However, close correspondence in time does not necessarily imply automaticity, and lack of automaticity would affect the interpretation of experimental results: if language-mediated eye-movements are not automatic, then the absence of fixations on the object cannot be seen as absence of linguistic processing of the corresponding word.

We conducted two experiments (with 80 participants each) that tested the automaticity of language-mediated eye movements by probing whether they could be canceled by volitional control. Each experiment had two between-subjects conditions: in the *eye-movement control* condition, participants were asked to not look at the object that is currently being referred to. In the *free viewing* condition, participants had a classical 'look and listen' task. Both experiments included in each condition the same 32 short stories, each with 10 critical words – nouns and pronouns – referring to the images on the screen. Experiment 1 had no additional task, while in Experiment 2 participants had to answer yes/no comprehension questions after each story to ensure that they processed the linguistic input.

The analysis of the aggregated data from both experiments showed two main effects: execution of an incoming saccade to the referred image was less likely in the eye-movement control conditions ( $\text{prob}(\beta < 0) \approx 1$ ) and less likely when comprehension questions were asked ( $\text{prob}(\beta < 0) \approx 1$ ). Although participants exhibited some degree of volitional control over their eye movements, it was far from full: the probability of executing an incoming saccade in the eye-movement control condition decreased from 55% to 13% without questions, and from 40% to 10% with comprehension questions. At the same time, participants' abilities to suppress saccades to the referred images varied greatly: in the first experiment, 4 out of 40, and in the second experiment, 10 out of 40 individuals in the eye-movement control condition were estimated to fixate the referred images in less than 5% of cases.

Our results align with the conclusions drawn by Mishra et al. (2013): language-mediated eye-movements constitute a semi-automated process that can be controlled to some degree irrespective of comprehension questions. However, the demonstrated degree of volitional control suggests that we cannot interpret the absence of fixations as evidence for the absence of linguistic processing.

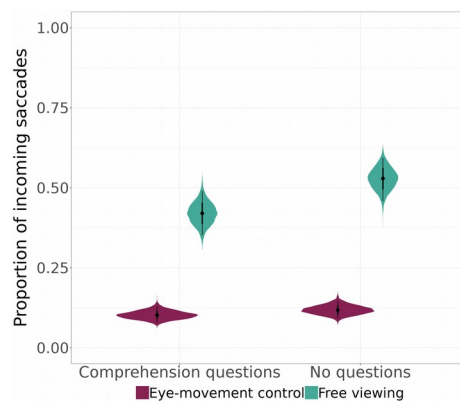


Figure 1: Estimated probabilities of fixating the referred images across experimental conditions; black lines represent credible intervals: thick – 66%, thin – 95% CrI.