Examining Visual Perception and Attention Processes: An Experimental Study within the Scope of the EU Project

Based on the expertise of our collaborators at LMU, a series of visual perception experiments have been implemented that will enable us to conduct simultaneous eye-tracking and EEG measurements in the future. In the visual search task, a set of shapes (typically circles along with a target diamond shape) is presented on the screen. The participants' task is to locate the target shape (the diamond) as quickly as possible and indicate the orientation of the line inside it (e.g., horizontal or vertical). This task represents a classical feature search paradigm, in which the target is defined by a specific feature (shape) while distractors stand out due to another feature (color).

Within the LMU project team, Dr. Artyom Zinchenko shared his Matlab-based codes with us. The experimental codes, along with the supplementary programs required for running the paradigm, were successfully executed. After adapting the codes into Turkish, seven participants (4 female, 3 male, Mean Age = 20.8) completed the experimental paradigms.

In these preliminary studies, participants detected and reported the orientation of the line inside the target shape (a red diamond) with comparable reaction times across conditions ($t(6) = 0.12$, $p > .05$) (Figure 1).

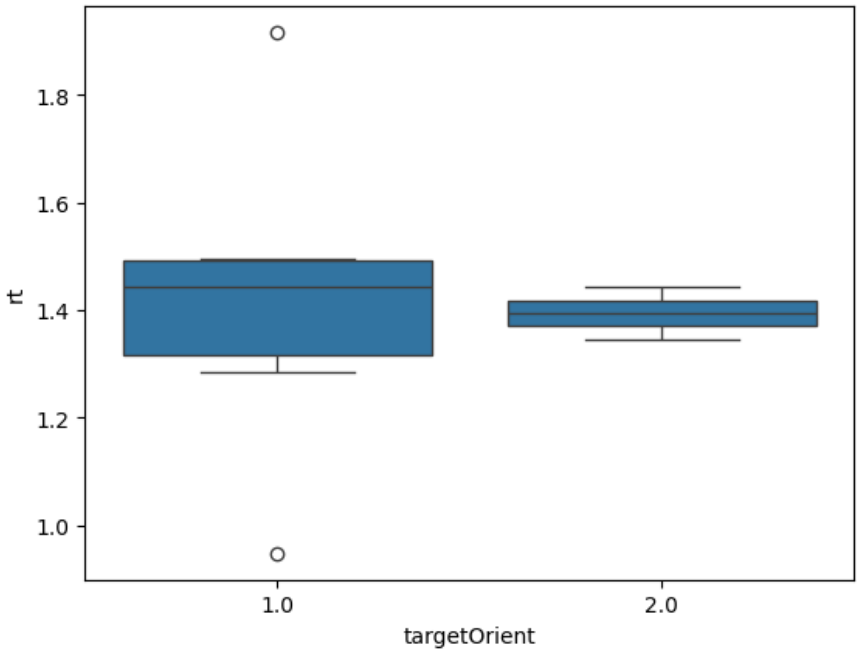

Figure 1. Mean reaction times for determining the orientation of the line within the target stimulus in the visual search paradigm are displayed. The identification of vertical (1) and horizontal (2) line orientations occurred with comparable reaction times.

However, differences emerged in terms of accuracy when identifying the horizontal versus vertical lines inside the target stimulus. While the accuracy rate for horizontal lines reached 100%, the accuracy rate for vertical lines remained at 71% (Figure 2).

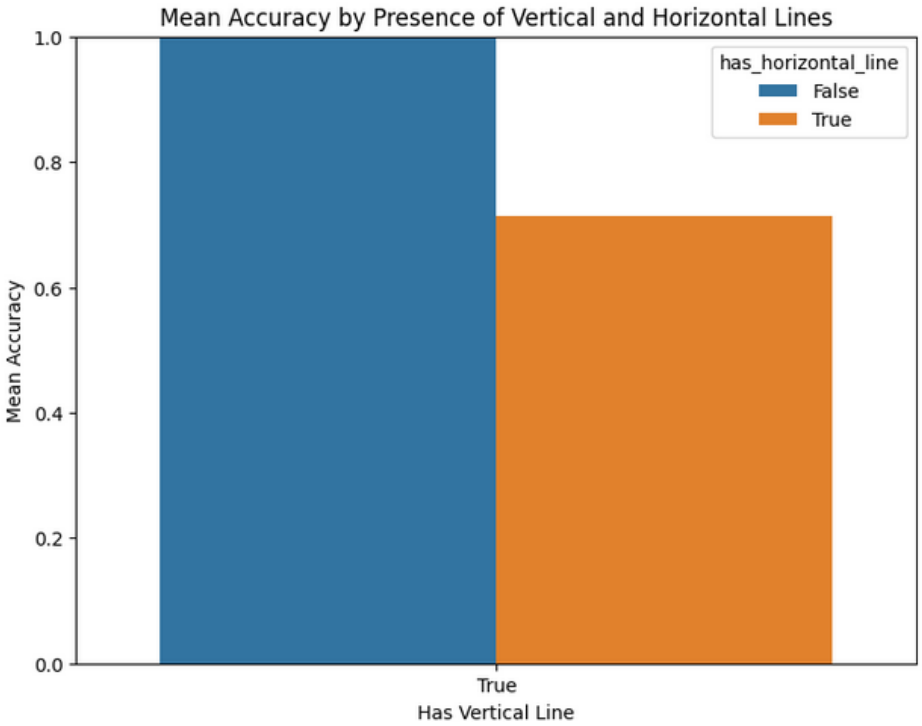

Figure 2. Mean accuracy rates are displayed according to the orientation of the line within the target stimulus.

When examining the reaction times for the red distractor stimuli, similar mean reaction times were obtained ($F(2) = 0.112$, $p > .05$). However, it should be noted that the variation in reaction times differed depending on the type of shape (Figure 3).

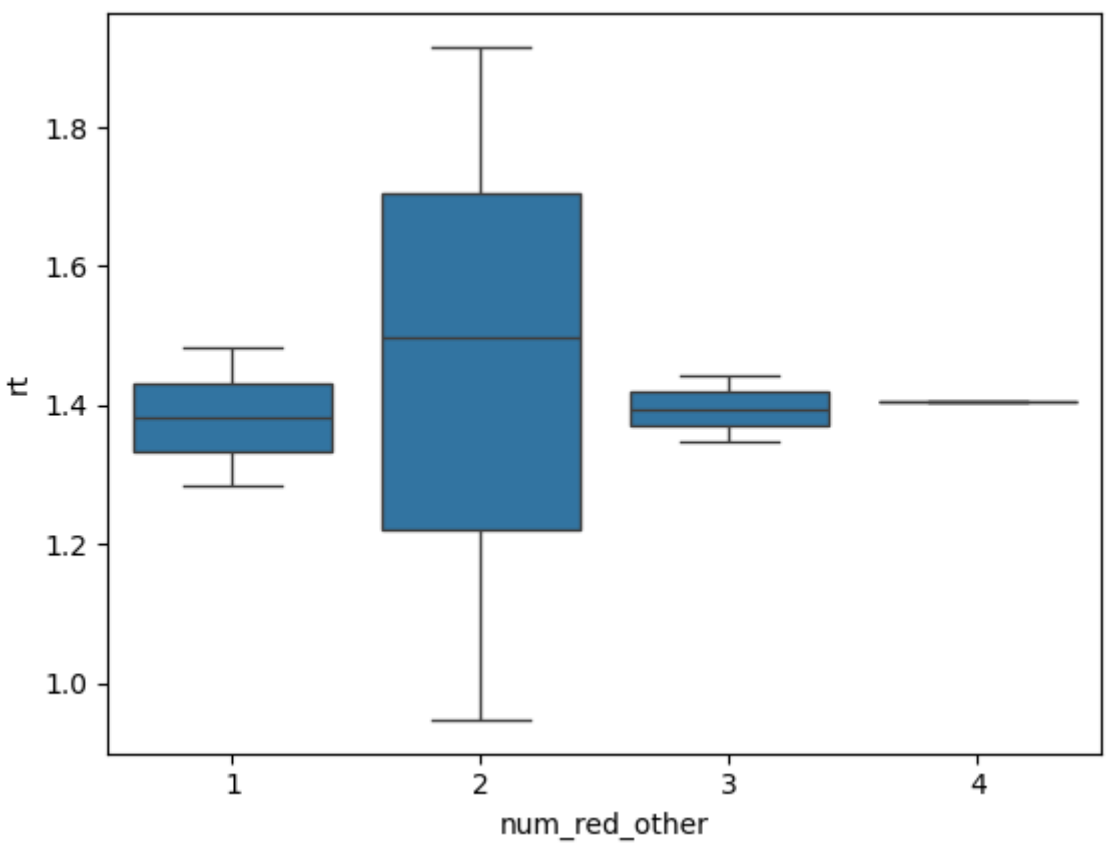

Figure 3. Reaction times are displayed for distractor stimuli presented alongside the red diamond target stimulus, including a red circle (1), red triangle (2), red square (3), and red pentagon (4).

Based on these experiments, the following key gains can be summarized:

- We acquired practical experience in constructing experimental paradigms that are widely used in cognitive neuroscience research and adapting them through coding to suit specific research questions.
- We developed knowledge regarding potential challenges encountered in computer-based cognitive experiments and strategies for addressing them.
- We gained experience in conducting Python-based analyses of computer-based cognitive experiments and in utilizing applications such as Google Colab for these analyses.