

Visual Search Experiment

Computers and Cognitive Sciences I assignment, 2022/23

Study

In this assignment, you will measure the efficacy of **visual search**. Your participants will be searching a screen for a particular shape, and you will test how various factors affect their speed. Visual search has been studied since 80's. In the experiment, we will focus on the effect of set size (how many objects on the screen), target presence and homogeneity of the set (if the objects vary in one or two features).

- To familiarize with the terminology and common research question, read the text on http://www.scholarpedia.org/article/Visual_search

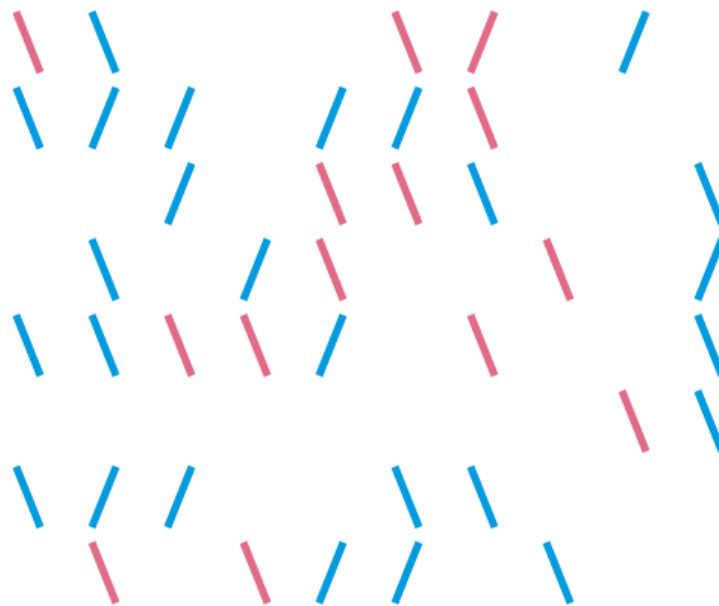
Preparations

The experiment is collected in the browser and is available at

<https://visionlabels.github.io/library/experiments/visual-search-mff.html>

It is programmed using [jsPsych](#) library – you can check the code, but it is not important here.

Your task is to search for **pink /** among pink \ (or pink \, blue \ and blue /).



[f] **Present** or **Absent** [j]

There are 16 combinations of conditions, each is repeated 20 times:

# pink /	# blue /	# pink	# pink /	Target	Set size	Search type
1	0	9	0	Present	10	Feature
1	0	19	0	Present	20	Feature
1	0	29	0	Present	30	Feature
1	0	39	0	Present	40	Feature
0	0	10	0	Absent	10	Feature
0	0	20	0	Absent	20	Feature
0	0	30	0	Absent	30	Feature
0	0	40	0	Absent	40	Feature
1	3	3	3	Present	10	Conjunction
1	6	6	7	Present	20	Conjunction
1	10	10	9	Present	30	Conjunction
1	13	13	13	Present	40	Conjunction
0	3	3	4	Absent	10	Conjunction
0	7	7	6	Absent	20	Conjunction
0	10	10	10	Absent	30	Conjunction
0	13	13	14	Absent	40	Conjunction

- Try the experiment yourself.

Notice, how much time you need to familiarize yourself with the task. Try to be both fast and accurate. You get feedback after each trial (plus feedback about time if your response is slower than 2 seconds). There is no training or break, but you can introduce them for your participants. For training, you can start the experiment and reload it after 10-20 trials. For break, you can allow the participant to make a short break – they will be warned about the long response, just remove this long trial from your analyses. Notice, the data are saved locally into the CSV file.

- Check the content of the CSV file.

Data collection

You will need the data from N=3 other people (not you). Unless there is a new wave of covid, try to be present during the experiment. Find a calm place where you can collect the data. Turn off the phone, turn off computer notifications. Sometimes people are tired/ill (work definition: if able to drive, you can collect data). Explain experiment in your own words.

- Collect the data of 3 other people

Analysis

Your data probably something like this:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	view_history	rt	trial_type	trial_index	time_elapsed	internal_node_id	response	present	setSize	conjunction	task	correct	stimulus
2	{("page_index":0,"viewing_time":0.0)}	5205	instructions	0	5205	0.0-0.0							
3		3221	canvas-keyboard-response	1	8937	0.0-1.0-0.0	j	false	30	false	response	true	
4		null	html-keyboard-response	2	10447	0.0-1.0-1.0	null						Correct! Work faster!
5		766	canvas-keyboard-response	3	11724	0.0-1.0-0.1	f	true	30	true	response	true	
6		null	html-keyboard-response	4	13237	0.0-1.0-1.1	null						Correct!
7		544	canvas-keyboard-response	5	14289	0.0-1.0-0.2	f	true	10	false	response	true	
8		null	html-keyboard-response	6	15798	0.0-1.0-1.2	null						Correct!
9		459	canvas-keyboard-response	7	16764	0.0-1.0-0.3	f	true	10	true	response	true	
10		null	html-keyboard-response	8	18272	0.0-1.0-1.3	null						Correct!
11		576	canvas-keyboard-response	9	19353	0.0-1.0-0.4	f	true	40	false	response	true	
12		null	html-keyboard-response	10	20859	0.0-1.0-1.4	null						Correct!
13		571	canvas-keyboard-response	11	21940	0.0-1.0-0.5	f	false	20	true	response	false	
14		null	html-keyboard-response	12	23448	0.0-1.0-1.5	null						Wrong
15		931	canvas-keyboard-response	13	24885	0.0-1.0-0.6	j	false	10	false	response	true	
16		null	html-keyboard-response	14	26392	0.0-1.0-1.6	null						Correct!

Notice some of the columns are not important for our analysis. Also, about half of the rows comes from the feedback trials, which we should also discard.

- Create a clean dataset with only the data you need. Put all participants together into a single table but create a new column Participant and use unique code for each of them. Don't use real names or initials.
- Import the data to the statistical program (e.g., R).
- Report the accuracy (percentage of errors for each participant). Remove the error trials for the subsequent analyses.

You will need to create a regression model predicting rt based on set size, search type (feature/conjunction) and target presence. People use the regression slope for set size as a measure of efficiency.

- Report the slope and its confidence interval both for feature and conjunction search (when target present). Do they differ?
- Calculate slope for the target absent trials. Do they differ from the respective target present trials? Why? How many objects do you need to check on average for both cases?

Note: We have only limited sample size. In a real experiment, you would test 20 to 40 people to get reliable estimates. Nevertheless, people differ in their performance, and you probably need to address this. If you have only 3 participants, compare their response times and slopes (is there some major difference?). You do not need to report statistical difference for this, just address this with table or a text paragraph. To treat the individual differences statistically you can normalize the response times by the individual mean, add the participant to regression or use [linear mixed models](#).

Report

Write a brief report about what you measured and how. Suggested structure:

1. What is Visual Search (about 1/2 page)
2. Describe the experiment (1/2 to 1 page) - describe the task, describe your setup (screen size and resolution),
3. Results (about 1 page) – what you found out, descriptive statistics, pick suitable charts (e.g., 3 charts)
4. Conclusions (1/2 to 1 page) – your interpretation (what you found and what was expected), your explanation/suggestion why this happened.

Keep the report below 4 pages.

- At least 7 days before the exam/meeting send your **report** (PDF) and **zipped data and code** to jiri.lukavsky@ff.cuni.cz