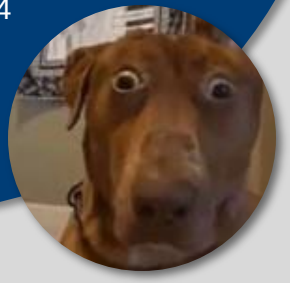
University of Stuttgart
Germany

Attentional spatial bias in two image tasks

Acquisition and analysis of eye-tracking data
Summer term 2024

Final Presentation – 15.07.2024



Attentional spatial bias in two image tasks

Team Dog

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Research question

Does diagonal positioning of stimuli eliminate the left-bias in viewing images?

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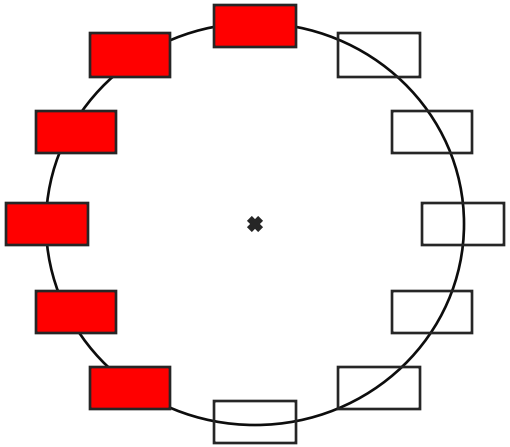
Hypothesis



H1: People tend to look left first, even with different positioning of stimuli

H2: A stimulus placed bottom left is more appealing than a stimulus placed top right and will still be focused on first

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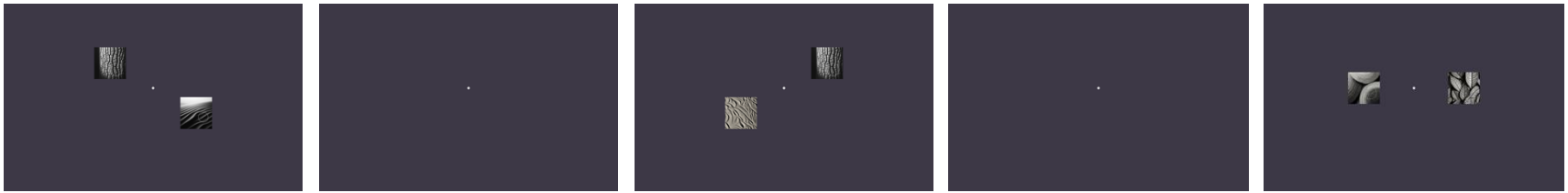
Design & Logic

- Show images in fixed 12 positions which lay on the circle
- Always use the opposite positions
- 48 trials in 6 minutes
  - 24 unique trials with 24 trials of counter balancing
  - 5 seconds of displayed stimulus with a break of 1 seconds
  - Next stimulus shows up after participants focus on the dot in the middle



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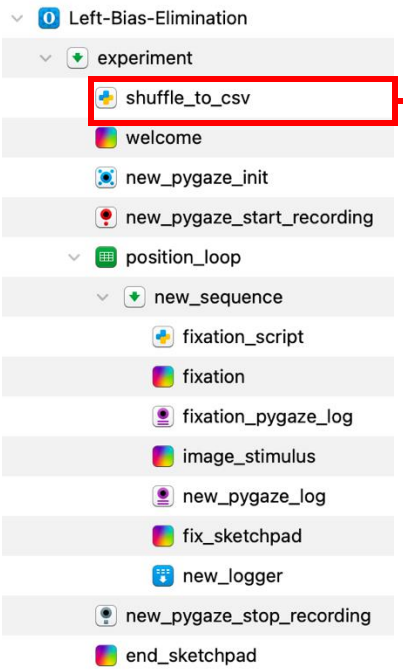
Implementation




```
stimulus1 = [f'{i:03}.png' for i in range(22)]
stimulus2 = [f'{i:03}.png' for i in range(22)]

random.shuffle(stimulus1)
random.shuffle(stimulus2)

second_half_stimulus1 = stimulus1[::-1]
second_half_stimulus2 = stimulus2[::-1]

final_stimulus1 = stimulus1 + second_half_stimulus1
final_stimulus2 = stimulus2 + second_half_stimulus2

filename = 'stimuli.csv'
file_path = os.path.join(pool.folder(), filename)

coordinates = [[-320, 0, 320, 0], [0, 320, 0, -320], [277, -160, -277, 160], [160, -277, -160, 277],
[-277, -160, 277, 160], [-160, -277, 160, 277], [-320, 0, 320, 0], [0, 320, 0, -320], [277, -160, -277,
160], [160, -277, -160, 277], [-277, -160, 277, 160], [-160, -277, 160, 277]]
random.shuffle(coordinates)

def reverse_coordinates(coord):
    return [coord[2], coord[3], coord[0], coord[1]]

changed_second_half_coordinates = [reverse_coordinates(coord) for coord in coordinates]
reversed_second_half_coordinates = changed_second_half_coordinates[::-1]

with open(file_path, mode='w', newline='') as csvfile:
    writer = csv.writer(csvfile)
    writer.writerow(['x1_cor'] + ['y1_cor']+['x2_cor'] + ['y2_cor']+['stimulus1'] + ['stimulus2'])

    for i in range(0, 24):
        writer.writerow([
            final_coordinates[i][0], final_coordinates[i][1], final_coordinates[i][2],
final_coordinates[i][3],
            final_stimulus1[i], final_stimulus2[i]
        ])
```

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Challenges

Challenge	Solution
Flawless execution of our experiment	Put the start and end of the eye-tracker recording outside of the loop.
Plotting of 150hz experiments	Decrease the rate from 150hz to 60hz to reduce file size.
Fixation detection with algorithms	Use the algorithm implemented within the eye tracker instead of dispersion or velocity-based algorithm.
Detection of first fixation	Trial and error with different approaches and a lot of debugging.

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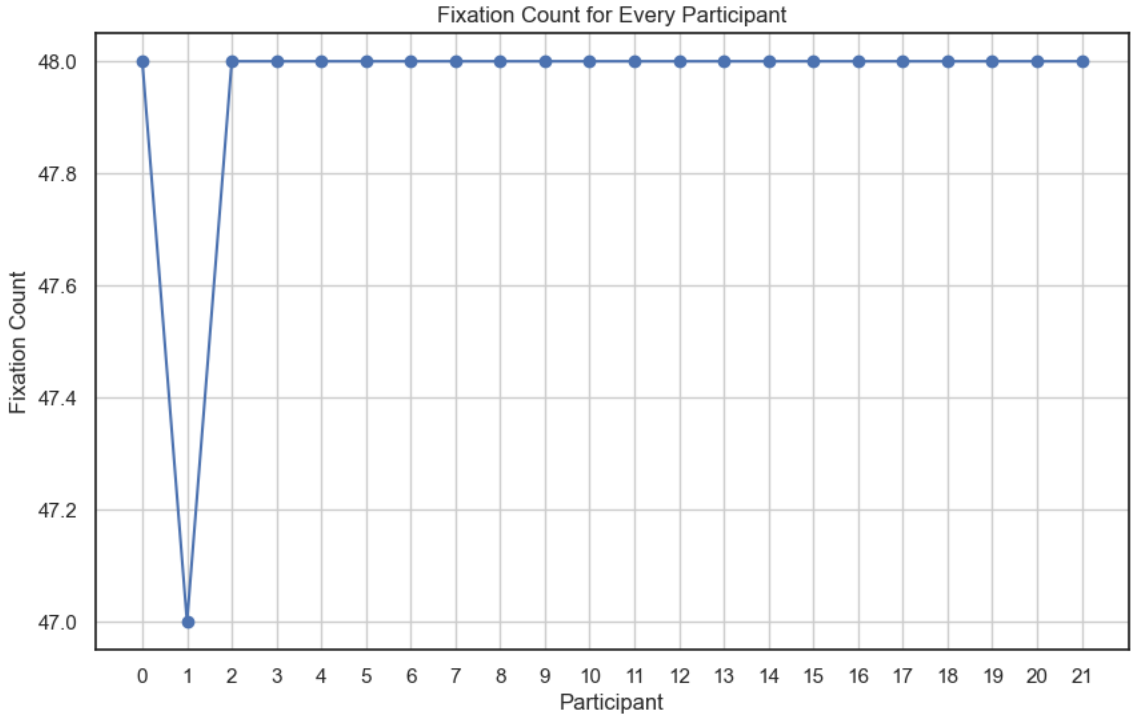
Sanity checks



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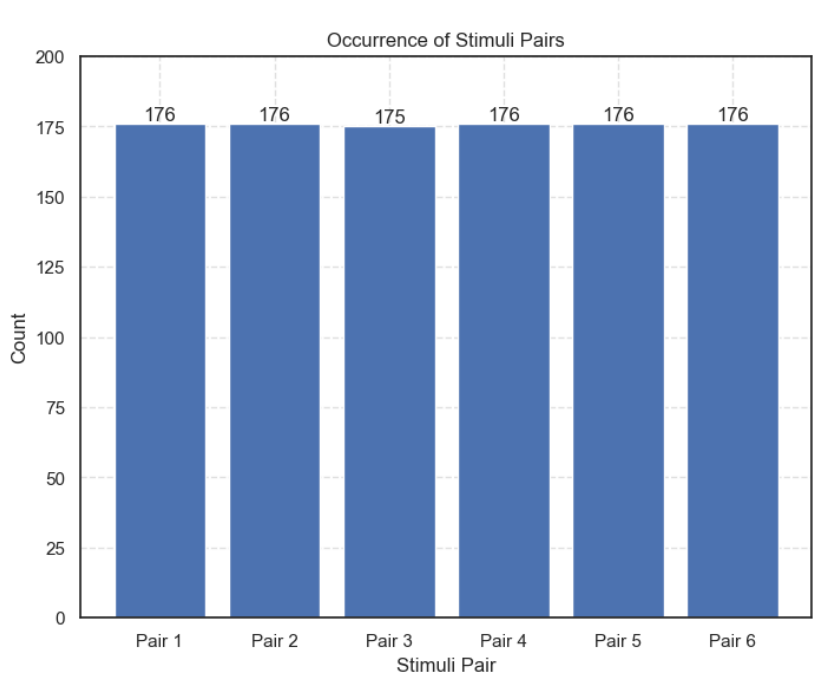
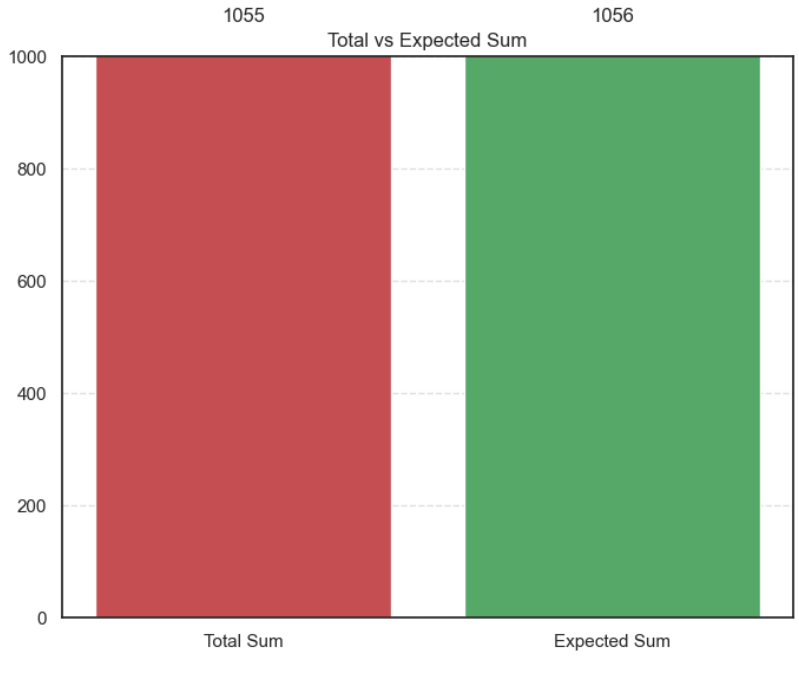
Sanity checks





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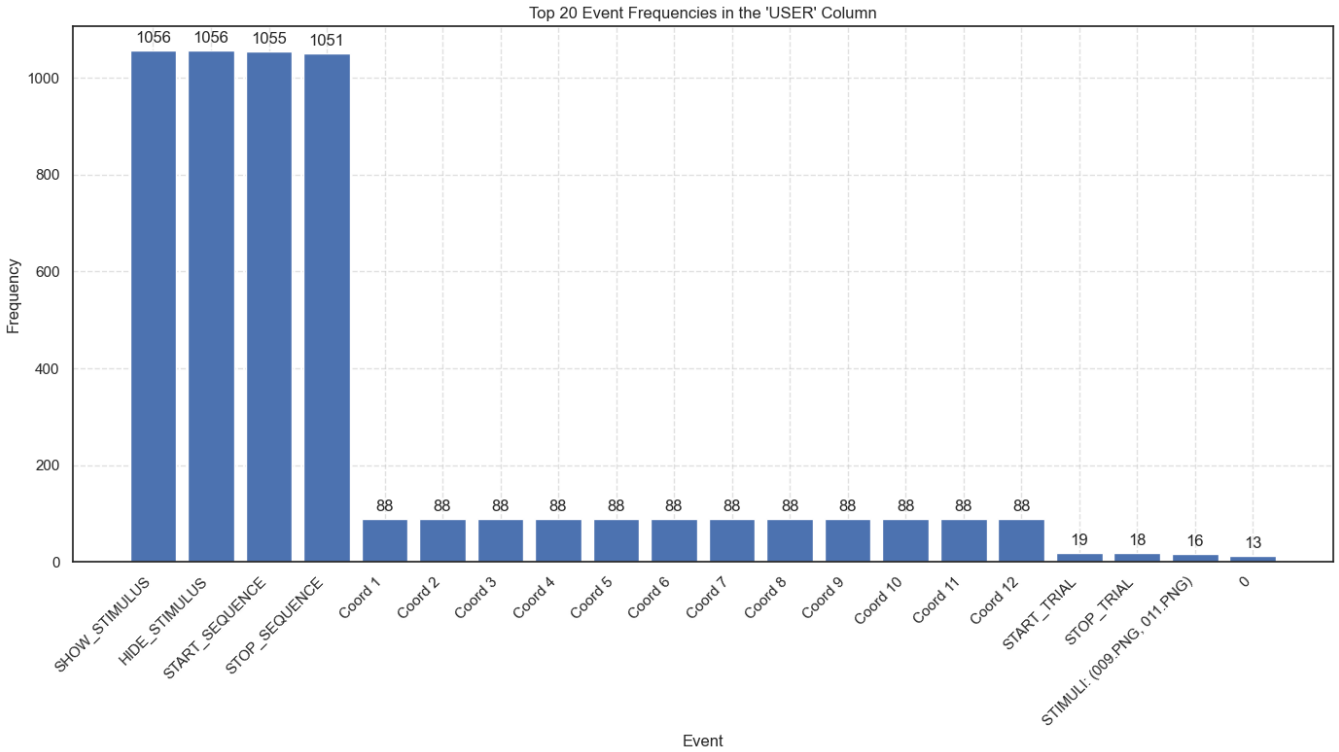
Sanity checks



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Preprocessing and planned analysis

- Drop all irrelevant columns
- Normalize time

→ Improve data quality, clarity and performance

Precision to answer the question:

- High, because we have all the first fixations and can analyse the results.

Possible outcomes:

- Different positioning does eliminate the left bias
- Left bias still exists

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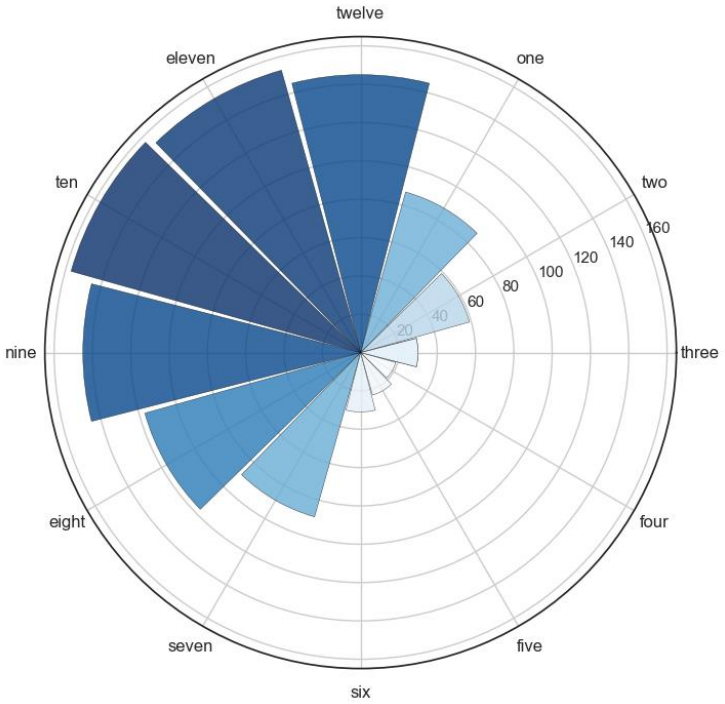
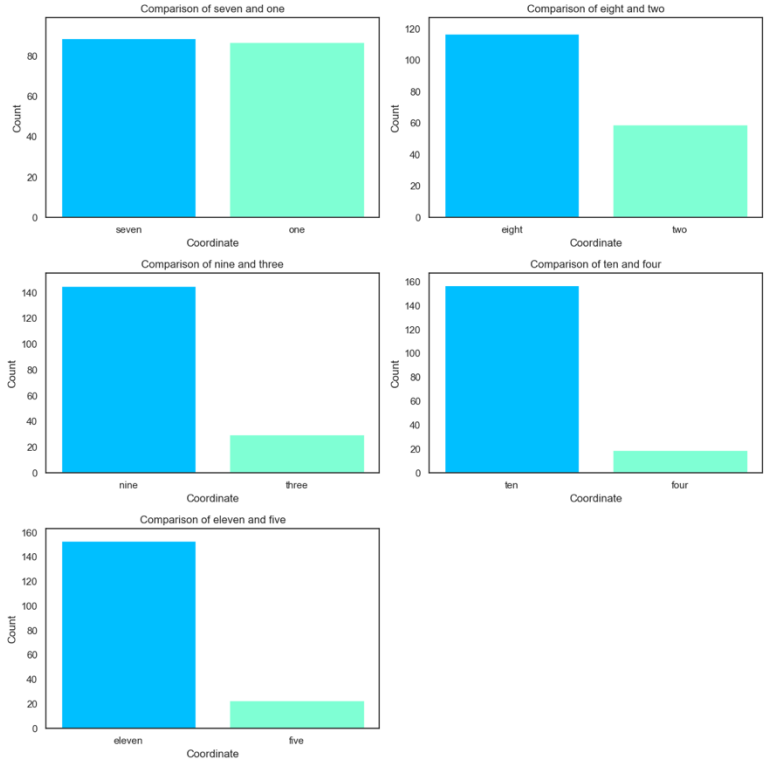
Results I





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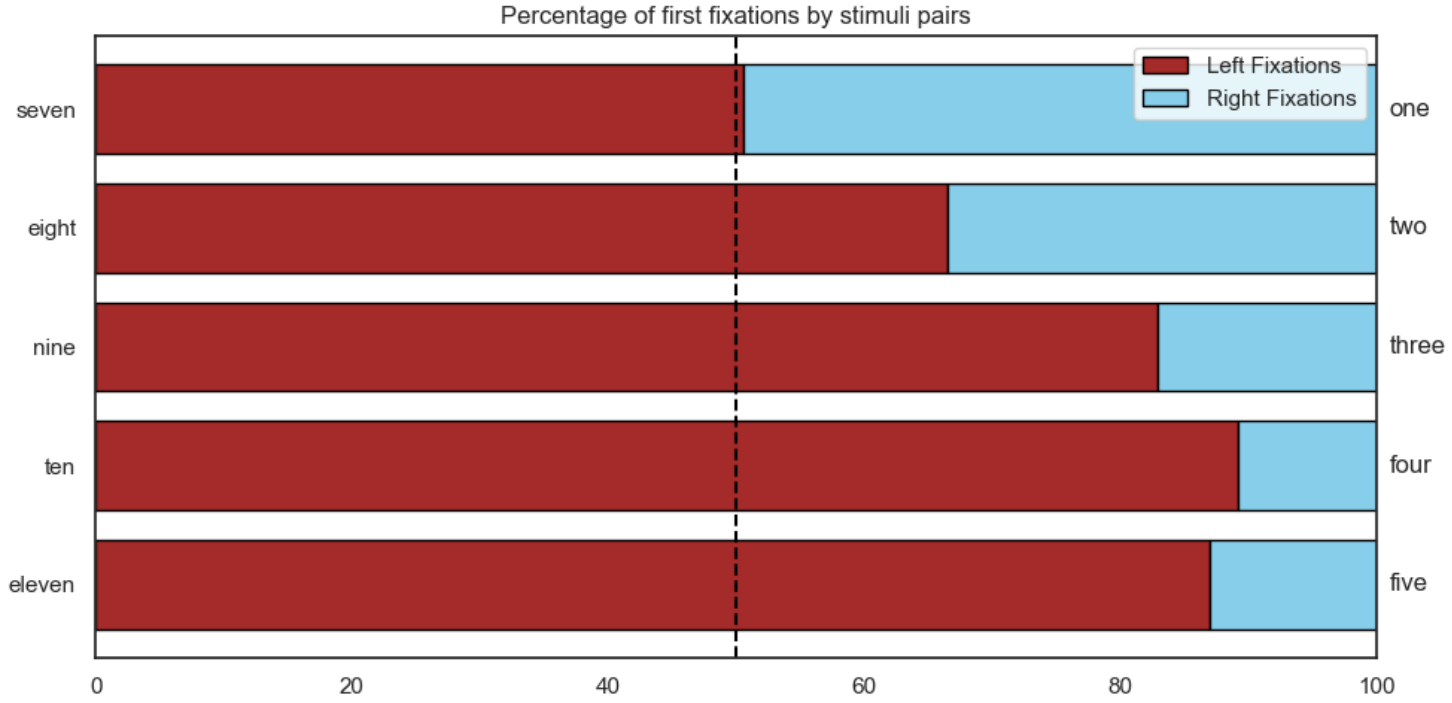
Results II



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Interpretation of the results

- Participants tend to look on the left side of the fixation dot first
- Due to the left bias in human perception, stimuli displayed on the same height or higher as the fixation dot, are the ones receiving the highest attention
- Stimuli on the right side are less common to be fixated first
- Stimuli placed bottom right of the current fixation are the ones to receive the lowest attention

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Limitations

- Limited number of participants (22)
- 21 participants were within the same age group (20 – 30), only one was older than 50
- All participants grew up in a country/culture reading left to right
- Even with counter balancing, there is a chance that the different pictures affected the choice for first fixations

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Conclusion

- With our pilot data, the left bias can be confirmed
- Even with diagonal positioning, participants tend to look on pictures displayed on the left side of the fixation dot first
- Stimuli displayed on the same heigh and above are the most appealing ones for the human eye, while pictures displayed below tend to be less appealing

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Thank you!

Team Dog