Radial Bias Pilot 1

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Jan 20, 2021

Contents

1 Goal of Pilot 1

To measure radial direction bias with 1D drifting gratings at 2-4 polar angle locations at a given eccentricity. A total of 4 directions of motion will be tested, 2 radial (inwards and outwards) and 2 tangential (clockwise, counterclockwise), to measure the performance differences between (1) centrifugal and centripetal motion directions, and (2) radial and tangential motion directions.

1.1 Parameters

Eccentricity from central fixation: 7 degrees
Locations tested (polar angle relative to fixation): Upper left (45 deg) and lower right (225 deg)
Stimulus: sine wave gratings w/ gaussian mask
Stimulus spatial frequency: 1 c/deg
Stimulus drift speed: 4 deg/s
Stimulus contrast: full contrast + gaussian mask
Stimulus aperature diameter: 2.5 deg
Black circular aperature was put onto screen to avoid perceptual artifacts from screen edges
Number of subjects: 1

1.2 Experimental Design

The pilot uses a 2AFC paradigm, where each trial includes a drifting grating presented at 1 of 2 possible positions, while the subject maintains fixation at the central dot. A method of constant stimuli is used which is set based on the performance of the training session (see Methods). The

angular values added to the internal reference frame is chosen at random from the following constants [-8, 6, 5, 3, 2.5, 2, 1, 0, 1, 2, 2.5, 3, 5, 6, 8]. The observer must determine whether the direction of motion if clockwise or counterclockwise relative to the internal reference. The sequence of each trial is depicted below:
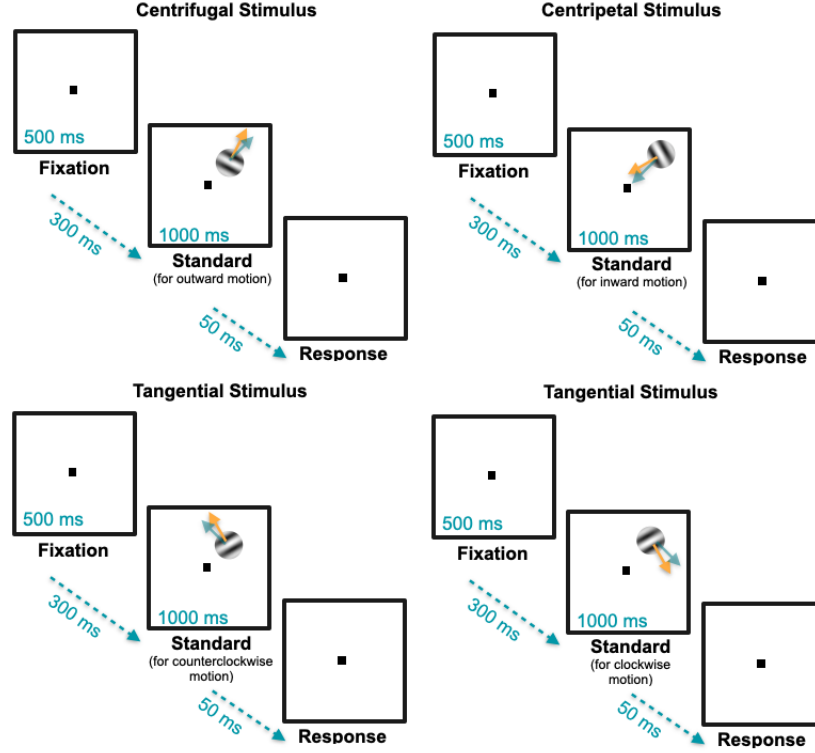
1.3   Block sequence

Four blocks were run, and each block corresponded to 1 of the 4 conditions being tested (tangential counterclockwise motion, tangential clockwise motion, radial outwards motion, radial inwards motion). The internal reference frames for each block is shown below:
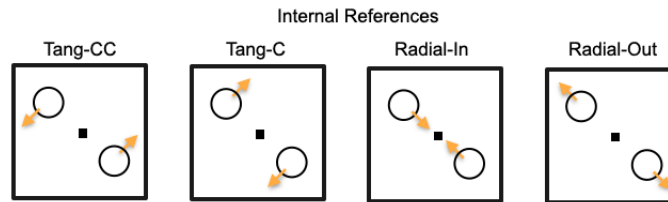
Prior to the experiment, the 2 "standard" motion directions corresponding to that block are showed to observer to use as an internal reference. Then a training session is conducted to determine how much tilt is required to meet 75% accuracy with staircase procedure (MLPest), and to allow subject to practice task with feedback. This was tested using radial motion only, and 2.5 degrees was the estimated angular value to add/subtract to the standard to achieve 75% performance of the clockwise/counterclockwise discrimination task. Constants [-8, -6, -5, -3, -2.5, -2, -1, 0, 1, 2, 2.5, 3, 5, 6, 8] were chosen to roughly center around this value for all 4 conditions. Note positive and negative values for clockwise v. counterclockwise tilt.

Each block contains (2 locations with clockwise/counterclockwise motion) x 80 repetitions = 1,280 trials. All 4 full-blocks took 80 min.
Sequence of half-blocks tested:

1. radial-out [angles: +- 8, 6, 5, 3]

2. radial-in [angles: +- 8, 6, 5, 3]

3. tang-cc [angles: +- 8, 6, 5, 3]

4. tang-c [angles: +- 8, 6, 5, 3]

5. tang-c [angles: +- 2.5, 2, 1, 0]

6. tang-cc [angles: +- 2.5, 2, 1, 0]

7. radial-in [angles: +- 2.5, 2, 1, 0]

8. radial-out [angles: +- 2.5, 2, 1, 0]

2   Data

2.1   Psychometric Function (Cumulative normal)
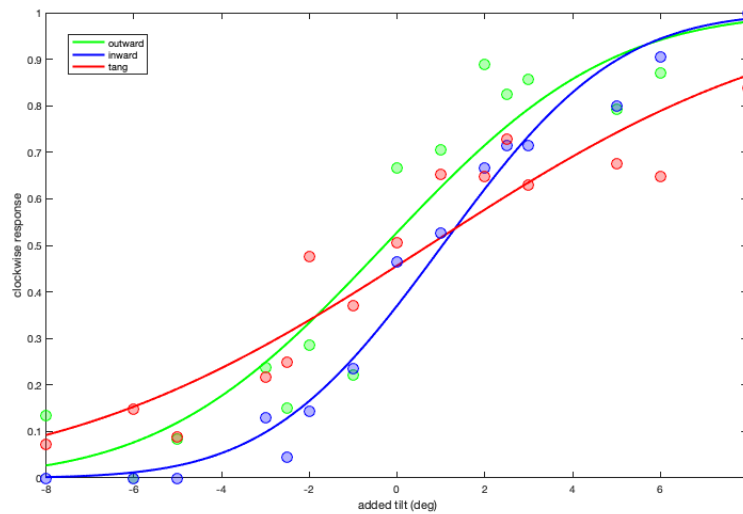
2.2 Current number of trials

N_Trials is the total number of trials for a particular condition. Ans_clock is the percentage of the observer answering clockwise out of the N_Trials for that condition.

	Radial outwards													
	-8	-6	-5	-3	-2.5	-2	-1	0	1	2	2.5	3	5	6	8
N_Trials	15	20	24	21	20	21	18	48	17	18	17	14	24	23	19
Ans_clock	.13	.0	.08	.24	.15	.29	.22	.67	.71	.89	.82	.86	.79	.87	1.0

	Radial inwards													
	-8	-6	-5	-3	-2.5	-2	-1	0	1	2	2.5	3	5	6	8
N_Trials	22	18	17	23	22	14	17	41	19	18	28	28	15	21	16
Ans_clock	.0	.0	.0	.13	.05	.14	.24	.46	.53	.67	.71	.71	.8	.9	1.0

	Tangential (combined)													
	-8	-6	-5	-3	-2.5	-2	-1	0	1	2	2.5	3	5	6	8
N_Trials	41	34	34	51	48	42	35	77	46	37	33	46	40	37	37
Ans_clock	.07	.15	.09	.22	.25	.48	.37	.51	.65	.65	.73	.63	.68	.65	.84

3 Feedback from Jon and Bas

- Calculate bias (alpha), and slope for the PFs

- Change blocks to include vectors of the same direction so the subject does not have to change internal reference frame within block

  - For example, include radial for upper left and radial inward for lower right in one block, etc.

- Run experiment 2x (once for each block) to a test-retest validation, and plot.

- Make sure to run an equal number of trials (sample without replacement).

- Leave out condition with 0 degrees added tilt (not needed).

- Include feedback for all trials to reinforce knowledge of internal stimulus.