

Guidelines on using the paper version of the greyscales task

Introduction

This set of guidelines has been written to accompany the paper version of the greyscales task. The task is essentially similar to the computerised version, though the administration differs slightly. The greyscales task was devised to provide experimental and clinical psychologists with an easy-to-use and psychophysically principled means of investigating free-viewing perceptual asymmetries. The greyscales task was first described by Mattingley et al.

Mattingley, J.B., Bradshaw, J.L., Nettleton, N.C. & Bradshaw, J.A. (1994). Can task specific perceptual bias be distinguished from unilateral neglect? *Neuropsychologia* **32**: 805-817.

The version of the greyscales task described here is based on the one developed by Nicholls et al.

Nicholls, M.E.R., Bradshaw, J.L. & Mattingley, J.B. (1999). Free-viewing perceptual asymmetries for the judgement of shade, numerosity and size. *Neuropsychologia* **37**: 307-314.

We hope that this paper version of the greyscales task is of use to our colleagues in their research. However, while we have taken every care to ensure the accuracy of this programme, we can accept no responsibility for any faults that it might contain. Researchers should conduct their own checks for faults.

-Mike Nicholls
-Jason Mattingley

Overview of the greyscales task

The greyscales task requires participants to make a forced two-choice discrimination of the relative brightness of two simultaneously presented horizontal bars. The bars change incrementally from white on one side to black on the other and are arranged so that they are left/right reversals of each other. Nicholls Bradshaw and Mattingley (1999) found that, when required to select the bar that was darker, normal participants chose the greyscale that was darker on the left-hand side 67% of the time. This bias occurred despite the fact that the greyscales within each pair were equally dark. When asked to select the bar that was lighter, participants reversed their decisions and selected the bar that was lighter on the left-hand side. In addition to the response bias, leftward responses were significantly faster than rightward responses, suggesting that participants were more confident of their leftward responses.

The GS task has also proven to be a highly sensitive tool for assessing clinical disorders of spatial attention. Mattingley et al. (1994) found that patients with right hemisphere damage and left neglect show remarkably strong rightward perceptual biases on the GS task, and that this abnormal performance persists long after clinical tests of neglect are within

normal limits. Moreover, the rightward bias on the GS task is typically stronger than that on more traditional tests of neglect such as line bisection and cancellation tasks.

For a more detailed overview of the uses of the greyscales task, refer to:

Mattingley, J.B., Bradshaw, J.L., Nettleton, N.C. & Bradshaw, J.A. (1994). Can task specific perceptual bias be distinguished from unilateral neglect? *Neuropsychologia* **32**: 805-817.

Nicholls, M.E.R., Bradshaw, J.L. & Mattingley, J.B. (1999). Free-viewing perceptual asymmetries for the judgement of shade, numerosity and size. *Neuropsychologia* **37**: 307-314.

Nicholls, M.E.R., Bradshaw, J.L. & Mattingley, J.B. (2001). Unilateral hemispheric activation does not affect free-viewing perceptual asymmetries. *Brain & Cognition* **46**, 219-223

Nicholls, M.E.R. & Roberts, G.R. (2002). Pseudoneglect: a scanning, pre-motor or attentional bias? *Cortex* **38**, 113-136.

Nicholls, M.E.R., Hughes, G., Mattingley, J.B. & Bradshaw, J.L. (in press). Are object and space-based attentional biases both important to free-viewing perceptual asymmetries? *Experimental Brain Research*.

Mattingley, J.B., Berberovic, N., Corben, L., Bradshaw, J.L. & Nicholls, M.E.R. (in press). The greyscales task: a perceptual measure of attentional bias following right hemisphere damage. *Neuropsychologia*.

Nicholls, M.E.R., Mattingley, J.B., Bradshaw, J.L. & Krins, P. (in press). Trunk- and head-centred spatial coordinates do not affect free-viewing perceptual asymmetries. *Brain & Cognition*.

Description of the greyscales stimuli

The horizontal and vertical midlines of the stimulus pairs are aligned with the centre of the page. The vertical distance between the upper and lower stimuli will depend upon how the stimuli are printed. Experimenters should take measures from their print-outs. The stimuli are presented in two lengths (long or short). Once again, measurements of the exact length should be taken from the printed page. The upper and lower stimuli within the pairs are arranged so that they are left-right reversals of one another. Thus, if the upper stimulus is dark on the right, the lower stimulus will be darker on the left.

Each of the stimuli were printed from a computer screen image generated by the computerized version of the greyscales task. Each of the stimuli is defined by a thin black rectangle against a white background. The stimuli are 49 pixels high and change in 50 increments from black on one side to white on the other. Changes in brightness are achieved by adding pixels to successive increments. For example, a stimulus 400 pixels long is divided into 50 increments (each 8 pixels/lines wide). At the dark end, no white pixels are placed in the first increment. In the second increment, one white pixel is added to each vertical line within the increment. In the third increment, two white pixels are added to each vertical line. This process continues until the 50th increment is reached, where 49

white pixels are added – making this increment appear completely white. To create the impression of a smooth change in brightness, the vertical position of the pixels within each line is randomised. The randomisation procedure makes the stimuli look slightly different despite the fact that they contain exactly the same number of white and dark pixels.

The upper and lower stimuli within a pair are always equiluminant.

Greyscales procedure

We have provided 40 pairs of greyscales stimuli. The factors of length (long, short) and orientation (upper stimulus dark on left & lower dark on right - or *vice versa*) are equally represented. The order of the stimuli was randomised as they were printed out. Therefore, the stimuli can be presented in their original order from 1 - 40. The pages can be displayed either vertically so that they face the participant, or displayed horizontally on a table. Viewing distance should be approximately 500mm. Participants should be encouraged to align their midlines with the centre of the page. Care should be taken so that the number at the bottom of the page faces toward the participant. Participants should be asked to select the stimulus that appears overall darker. There is no need for participants to rush their decision, though a response time less than 3000 msec is preferable. Participants can indicate their response by calling out "upper" or "lower" or by pointing to the upper or lower stimulus.

Forty trials should be sufficient to measure free-viewing perceptual asymmetries. However, the pack can be administered again to give eighty trials.

Some further thoughts.....

Microsoft Word contains a drawing package that can be used to create greyscales stimuli.

1) Draw a shape such as a rectangle or a circle



2) Double click on it and select "fill – colour" and go down to "fill effects"

3) Pick "shading styles – vertical"



Scoring sheet for Greyscales task

No.	Orient.	Length	Upper	Lower	No.	Orient.	Length	Upper	Lower
1	1	Long			21	2	Short		
2	1	Long			22	1	Short		
3	1	Long			23	2	Long		
4	1	Short			24	1	Long		
5	2	Short			25	2	Short		
6	1	Short			26	1	Short		
7	2	Short			27	2	Short		
8	2	Short			28	1	Short		
9	2	Long			29	1	Long		
10	2	Long			30	2	Short		
11	1	Short			31	2	Long		
12	2	Short			32	2	Short		
13	1	Short			33	1	Long		
14	1	Short			34	1	Long		
15	2	Short			35	1	Long		
16	1	Short			36	1	Long		
17	2	Long			37	1	Short		
18	2	Long			38	2	Long		
19	2	Long			39	1	Long		
20	2	Long			40	2	Long		

Note: Orientation 1 = Upper stimulus dark on right & lower stimulus dark on left.
 Orientation 2 = Upper stimulus dark on left & lower stimulus dark on right

Sum of leftward responses (shaded regions)

/40

Scoring

- 1) Enter a cross under 'upper' or 'lower' indicating participants' response for each of the forty trials.
- 2) Sum all of the crosses placed in the shaded regions (i.e. 'leftward' responses)
- 3) Calculate response bias using:

$$\text{Response Bias} = \left(\frac{(20 - \text{sum.of.leftward.responses})}{20} \right) \times 100$$

Scores can range from -100 to +100. Negative scores reflect a leftward bias whereas positive scores reflect a positive bias. Scores approaching zero reflect no asymmetrical bias.