

Development and validation of an AI-generated real-world stimulus set for visual working memory research

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INTRODUCTION

- The availability of real-world object stimuli that meet researchers' needs is an ongoing challenge in visual cognition research
- We used artificial intelligence (AI) to generate **200 images** of unique, real-world objects for use in visual working memory research
- An online validation study was designed to assess the characteristics of the stimuli for use in future research

IMAGE GENERATION METHOD

- Adobe Firefly (Image 2 and 3 models) was used to create over 200 images of unique, real-world objects
- The images were created to be neutrally coloured, with no readable text, and of similar orientation and size range
- Text prompts were developed to generate the images (e.g., "typical [item name]. Light grey colour. Front (or side) view on tabletop. Plain white background. Item only")
- Brightness, contrast, and saturation were refined to gain uniformity across stimuli
- After team review, a set of 200 stimuli were deemed sufficiently recognisable and realistic
- Useable images were edited in Adobe Photoshop to remove backgrounds, desaturate them to a consistent neutral base colour, and create 6 colored versions (Figure 1)

VALIDATION STUDY OVERVIEW

- We assessed the extent to which the stimuli set comprises nameable, recognisable objects
- We also examined to what extent these objects are perceived as **realistic and familiar**
 - Realism scores show if AI has utility in generating realistic, high-quality stimuli
 - Familiarity scores show potential age-related differences in familiarity of certain stimuli

VALIDATION STUDY METHOD

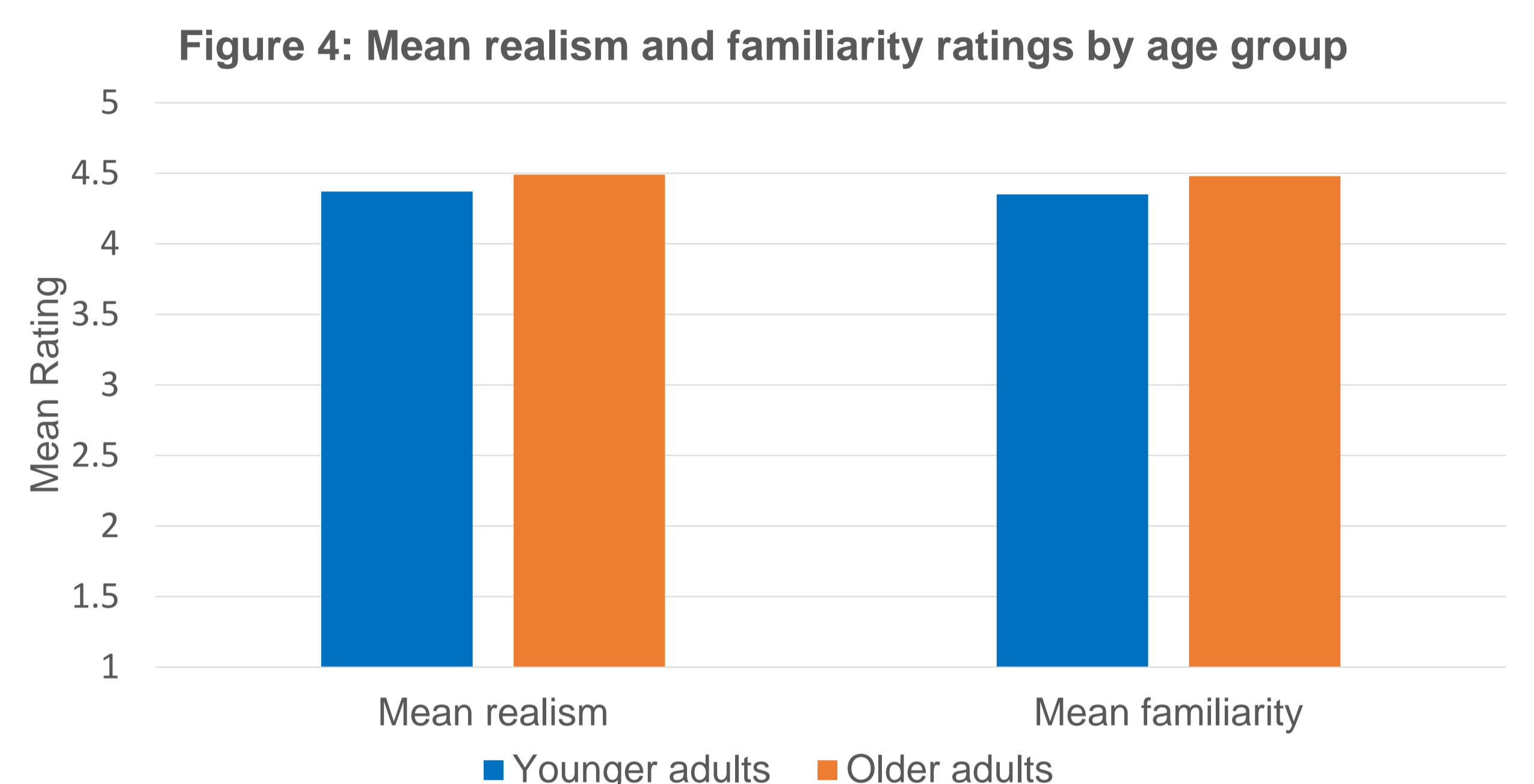
- Conducted online using Prolific
- Participants were 45 young (18-35 yrs) and 45 older (65-85 yrs) adults who were native English speakers and UK residents
- Participants were paid £5 for participation (approx. 25 mins)
- Participants were shown a random subset of 80 stimuli (see Figure 2)
- For each object, participants were asked to type in its name to indicate the extent to which the images represent nameable, recognisable objects
- Participants also rated each image on realism (1 = not at all realistic, 5 = extremely realistic); and familiarity (1 = not at all familiar, 5 = extremely familiar)

VALIDATION STUDY: PRELIMINARY RESULTS

Object nameability

- For each object, we will examine the percentage of 'matched' responses (i.e., responses that match the intended object)
- Based on preliminary analysis, Figure 3 shows an example of an object which showed high nameability (i.e. lamp; all participants identified the object as a 'lamp' or 'light')
- Figure 3 also shows an example of an object with low nameability (coasters). A variety of names were provided ('coasters', 'mats', 'plates', 'biscuits'), and several participants indicated that they could not recognise the object

Realism and Familiarity ratings



- A by-item analysis will be conducted to explore each object's realism/familiarity ratings across the two age groups

CONCLUSIONS AND NEXT STEPS

- Preliminary results suggest that the stimuli were generally recognisable and perceived to be highly realistic
- AI may have significantly utility in generating custom-made, real-world object stimuli for use in memory and cognition research
- Further analysis will be conducted to establish the nameability of all objects in the set
- We will also examine realism and familiarity scores for each object across age groups
- We aim to make the stimulus set publicly available for future use by others

AI has significant potential for generating custom-made, real-world object stimuli



Figure 1: Example of an AI-generated object (teddy bear)

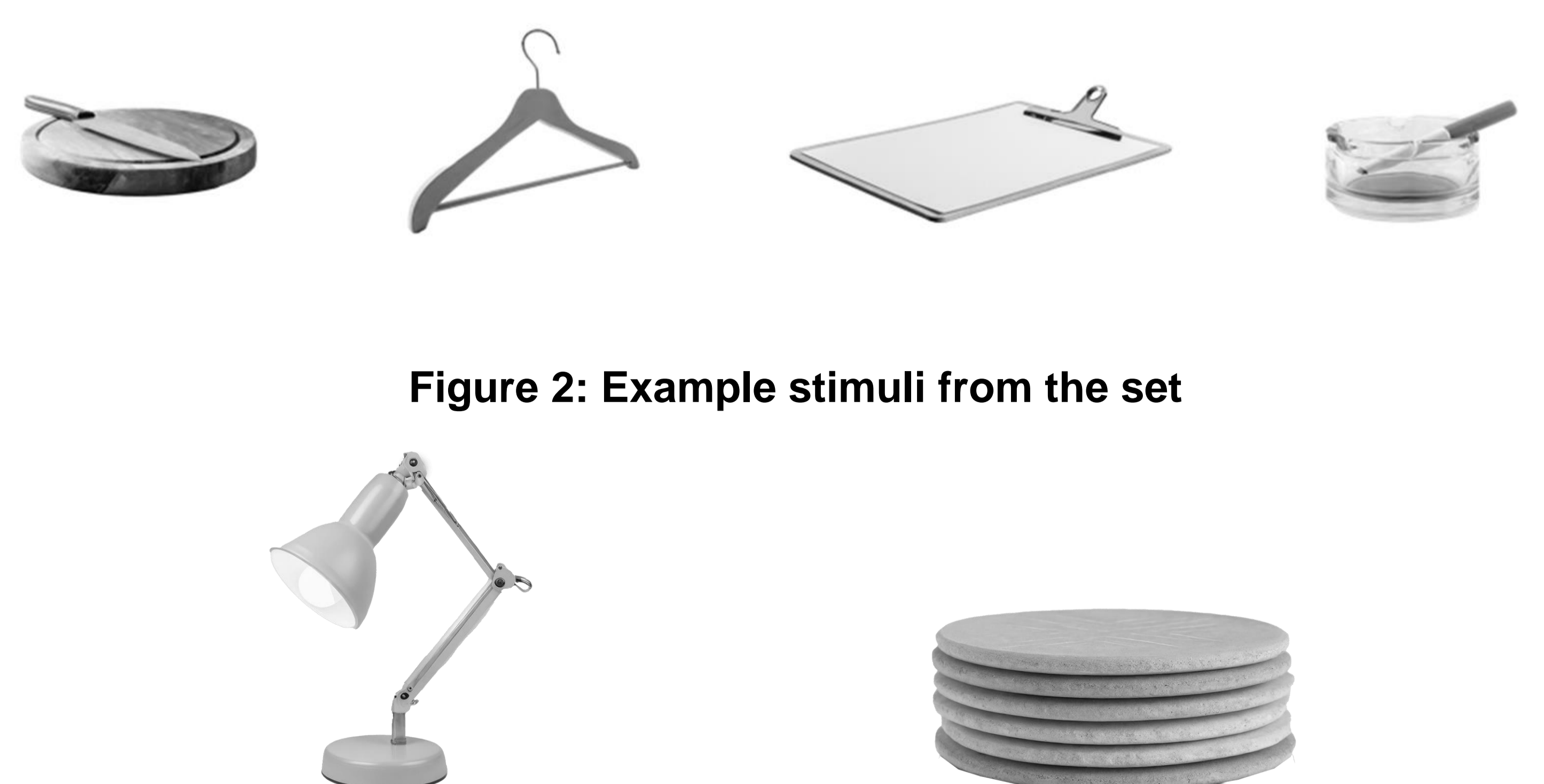


Figure 3: Example stimuli that were well recognised (light/lamp) or not (coasters)

Figure 2: Example stimuli from the set