

Memory capacity meets expertise: increased capacity for abnormal images in expert radiologists

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Memory capacity depends on prior knowledge, both in working memory and long-term memory. Furthermore, abnormal or surprising items tend to be better remembered, in large part because they attract additional attention (Friedman, 1979). Radiologists have greater long-term memory for medical images compared to novices (Evans et al., 2010), and they do not need to see a physical lesion to know that an image is abnormal: an image of the breast contralateral to the actual lesion (“contra-abnormal”), can be sufficient for radiologists to label a case as abnormal (Evans et al., 2016). We investigated whether expert radiologists (N=32) show an increased capacity in working memory for abnormal images, and to what extent an image must have a focal abnormality for such additional processing to be engaged. Stimuli were single-breast mammograms with 80 abnormal cases and 40 normal (non-cancerous) cases. Half of the abnormal images were of the breast containing a visible abnormality, and the other half were from the breast contralateral to the visible abnormality. Images were presented for 3 seconds each, followed by two questions. (1) Was the image normal or abnormal? (2) Have you seen this image before? Confidence was rated on a six-point scale. Images were either new or a repeat from 3 items or 30 items back. Detecting 3-backs indexed working memory, and detecting 30-backs indexed longterm memory. Expert radiologists have a d' of 1.6 for detecting 3-backs and a d' of 1.0 for detecting 30-backs. We found a d' of 0.2 benefit for focally abnormal images at 3-back, and d' of 0.3 at 30-back, which suggests experts have better memory for abnormal images. Overall, radiologists showed no memory benefit for the contralateral abnormal images. Interestingly, however, high expertise observers were more likely to rate these images as abnormal.

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