

Inversion effects in the ability to classify mammograms in one second.

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One hallmark of a perceptual expert is an ability to make fast, accurate decisions. People, as face experts, can detect facial expression in less than a second. Similarly, a radiologist, skilled in detecting breast cancer, can classify mammograms as normal or abnormal at above chance levels in less than a second. The visual strategies mediating fast gist perception by radiologists are not well understood. In this experiment, we asked if radiologists were subject to the inversion effect that makes face analysis much harder if the faces are inverted. Stimuli consisted of upright and inverted bilateral mammograms displayed in a mediolateral oblique or craniocaudal view. Half of the images were "normal" and half of the images contained subtle signs of breast cancer (subtle masses or "architectural distortion"). Upright and inverted faces were used as comparison stimuli. The mammogram and face stimulus were presented for 1000ms and 250ms, respectively. For mammograms, participants were instructed to decide whether the mammogram appeared "normal" or "abnormal". For the faces, participants assessed whether the face appeared to show a "happy" or "neutral" expression. 20 radiologists were tested. Results for faces showed the expected face inversion effect where discrimination of upright faces was superior to inverted faces. Mammograms seem to show an interaction between radiology experience and orientation. Whereas the 8 less experienced radiologists (< 5 years of experience) failed to show a reliable inversion effect, the 11 more experienced radiologists (> 5 years of experience) performed more accurately with upright mammograms ($t(10) = -2.8, p < 0.02$). Thus, there does appear to be an inversion effect in expert mammography. The apparent effect of experiment may indicate a processing switch towards a more holistic strategy with experience, however, this hypothesis requires further testing.

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