The Gist of the Abnormal: Above chance medical decision making in the blink of an eye.
Karl K. Evans & Jeremy M. Wolfe
Brigham and Women’s Hospital, Harvard Medical School

Global structural and statistical regularities allow the gist of a real world image to be extracted after as little as 20 msec exposure. Would this work with artificial stimuli such as mammograms and/or Pap tests for cervical cancer? Experts certainly think that they can sense the presence of abnormalities before they can find them. We tested this ability in two expert populations, radiologists and cytologists. Forty-three expert radiologists were presented with 100 trials of craniocaudal or mediolateral oblique x-ray views of both breasts. Thirty-eight cytologists saw 120 Pap test images (micrographs of many cervical cells). Exposures were 250-2000 milliseconds. Each observer saw a mix of images at two different durations. Observers rated the abnormality of an image on a 0-100 analog scale. Observers also attempted to localize abnormalities on a subsequent screen showing only the outline of the image. Half of the cases were verified as not having any abnormality. The other half had various subtle abnormalities. Presence of abnormality and duration were randomized across trials.

Both groups of experts had above chance performance for detecting subtle abnormalities at all stimulus durations (cytologists D’ ~1.2 and radiologists D’ ~1). Control groups did not differ from chance. The ability to localize the abnormalities was poor, with 12% correct localization of abnormal regions for radiologists and 16% for cytologists. Of course, no one would suggest performing cancer screening in 250 msec. D’ for expert radiologists is 2.5-3.0. However, these findings suggest that there is a global signal that allows experts to detect the gist of abnormality very rapidly. The failure to localize these abnormalities suggests that this is a global signal and not fortuitous attention to a localized target. It is possible that this global signal could be exploited to improve clinical performance.