RSNA Press Release

AI Helps Radiologists Spot More Lesions in Mammograms

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OAK BROOK, Ill. — Artificial intelligence (AI) improves breast cancer detection accuracy for radiologists when reading screening mammograms, helping them devote more of their attention to suspicious areas, according to a study published today in *Radiology*, a journal of the Radiological Society of North America (RSNA).

Previous research has shown that AI for decision support improves radiologist performance by increasing sensitivity for cancer detection without extending reading time. However, the impact of AI on radiologists' visual search patterns remains underexplored.

To learn more, researchers used an eye tracking system to compare radiologist performance and visual search patterns when reading screening mammograms without and with an AI decision support system. The system included a small camera-based device positioned in front of the screen with two infrared lights and a central camera. The infrared lights illuminate the radiologist's eyes, and the reflections are captured by the camera, allowing for computation of the exact coordinates of the radiologist's eyes on the screen.

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Jessie J. J. Gommers, M.Sc.

"By analyzing this data, we can determine which parts of the mammograms the radiologist focus on, and for how long, providing valuable insights into their reading patterns," said the study's joint first author Jessie J. J. Gommers, M.Sc., from the Department of Medical Imaging, Radboud University Medical Center in Nijmegen, Netherlands.

In the study, 12 radiologists read mammography examinations from 150 women, including 75 with breast cancer and 75 without.

Breast cancer detection accuracy among the radiologists was higher with AI support compared with unaided reading. There was no evidence of a difference in mean sensitivity, specificity or reading time.

"The results are encouraging," Gommers said. "With the availability of the AI information, the radiologists performed significantly better."

Eye tracking data showed that radiologists spent more time examining regions that contained actual lesions when AI support was available.

"Radiologists seemed to adjust their reading behavior based on the AI's level of suspicion: when the AI gave a low score, it likely reassured radiologists, helping them move more quickly through clearly normal cases," Gommers said. "Conversely, high AI scores prompted radiologists to take a second, more careful look, particularly in more challenging or subtle cases."

The AI's region markings functioned like visual cues, Gommers said, guiding radiologists' attention to potentially suspicious areas. In essence, she said, the AI acted as an additional set of eyes, providing the radiologists with additional information that enhanced both the accuracy and efficiency of interpretation.

"Overall, AI not only helped radiologists focus on the right cases but also directed their attention to the most relevant regions within those cases, suggesting a meaningful role for AI in improving both performance and efficiency in breast cancer screening," Gommers said.

Gommers noted that overreliance on erroneous AI suggestions could lead to missed cancers or unnecessary recalls for additional imaging. However, multiple studies have found that AI can perform as well as radiologists in mammography interpretation, suggesting that the risk of erroneous AI information is relatively low.

To mitigate the risks of errors, Gommers said, it is important that the AI is highly accurate and that the radiologists using it feel accountable for their own decisions.

"Educating radiologists on how to critically interpret the AI information is key," she said.

The researchers are currently conducting additional reader studies to explore when AI information should be made available, such as immediately upon opening a case, versus on request. Additionally, the researchers are developing methods to predict if AI is uncertain about its decisions.

"This would enable more selective use of AI support, applying it only when it is likely to provide meaningful benefit," Gommers said.

"Influence of AI Decision Support on Radiologists' Performance and Visual Search in Screening Mammography." Collaborating with Gommers were Sarah D. Verboom, M.Sc., Katya M. Duvivier, M.D., Cornelis Jan van Rooden, M.D., Ph.D., A. Fleur van Raamt, M.D., Ph.D., Janneke B. Houwers, M.D., Dick B. Naafs, M.D., Lucien E. M. Duijm, M.D., Ph.D., Miguel P. Eckstein, Ph.D., Craig K. Abbey, Ph.D., Mireille J. M. Broeders, Ph.D., and Ioannis Sechopoulos, Ph.D.

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For patient-friendly information on screening mammography, visit *RadiologyInfo.org*.

Images (JPG, TIF):

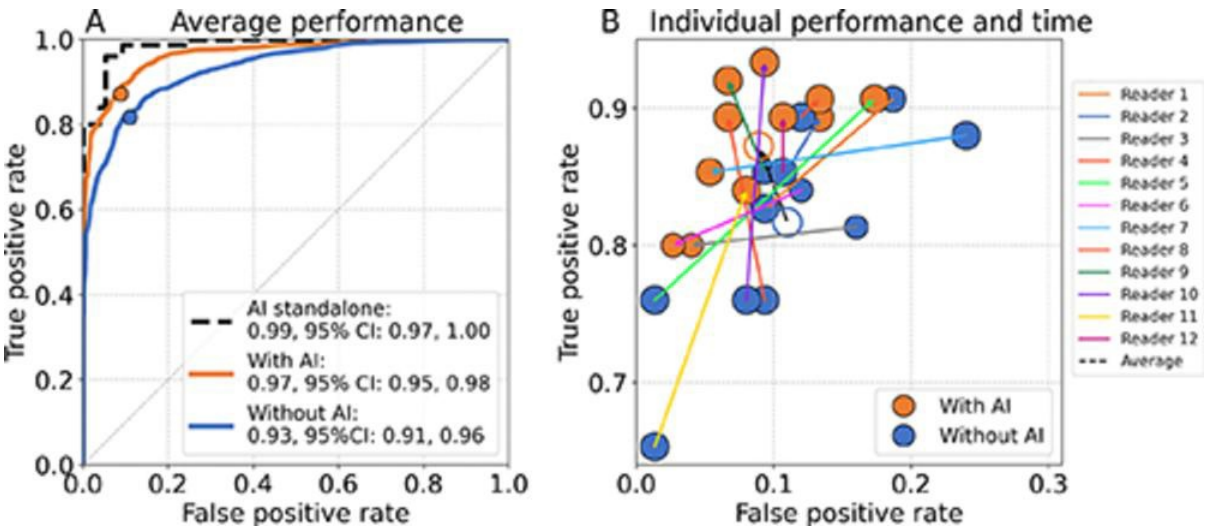

Figure 1. (A) (Reader-averaged receiver operating characteristic curves of radiologists reading with and without AI support and the standalone receiver operating characteristic curve of the AI system. Colored dots indicate the mean true- and false-positive rates of the radiologists. **(B)** Bubble chart shows changes in true-positive rate, false-positive rate, and reading time for each radiologist. The size of the colored disks is proportional to the mean reading time of each radiologist. Arrows point from the performance when reading without AI support to reading with AI support. Open circles represent the mean across all radiologists. Reading with AI support resulted in a higher reading performance than when reading unaided.
High-res (TIF) version

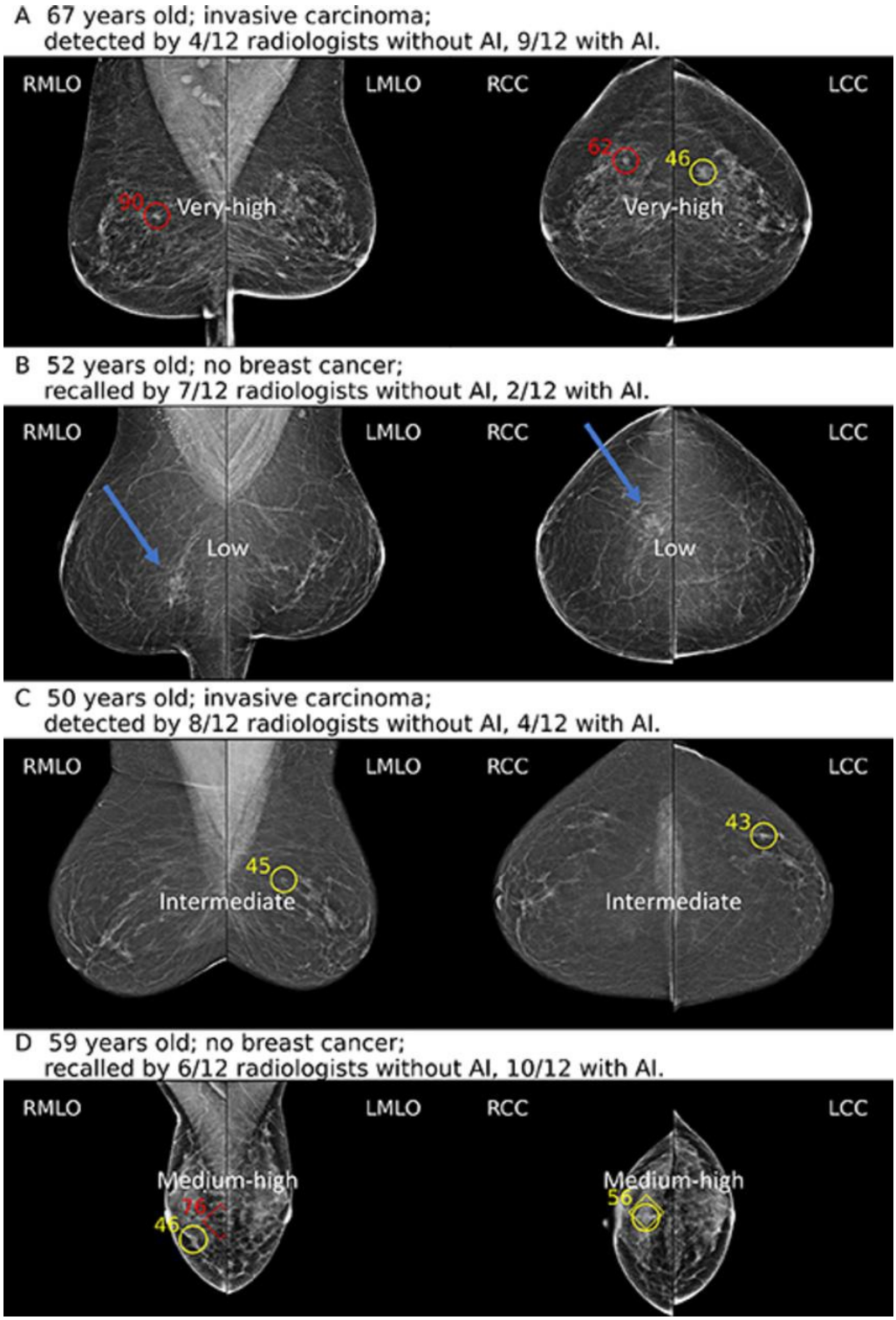

Figure 2. (A) Screening mammograms in a 67-year-old woman with a mass in the upper outer quadrant of the right breast. The AI tool classified this examination as very high risk, with a maximum region score of 80 or higher at the cancer location. **(B)** Screening mammograms in a 52-year-old woman without breast cancer who was recalled by seven of the 12 radiologists when reading without AI support. The AI tool classified this examination as low risk, with a maximum region score under 40. **(C)** Screening mammograms in a 50-year-old woman with an ill-defined mass in the upper outer quadrant of the left breast, diagnosed as invasive mixed ductal/lobular carcinoma. The AI tool classified this examination as intermediate risk, with a maximum region score between 40 and 59. **(D)** Screening mammograms in a 59-year-old woman without breast cancer. The AI tool classified this examination as medium-high risk, with a maximum region score between 60 and 79. The AI examination category and AI-marked regions with region scores are shown as in the reader study, with diamonds indicating calcifications and circles indicating soft tissue lesions.
High-res (TIF) version

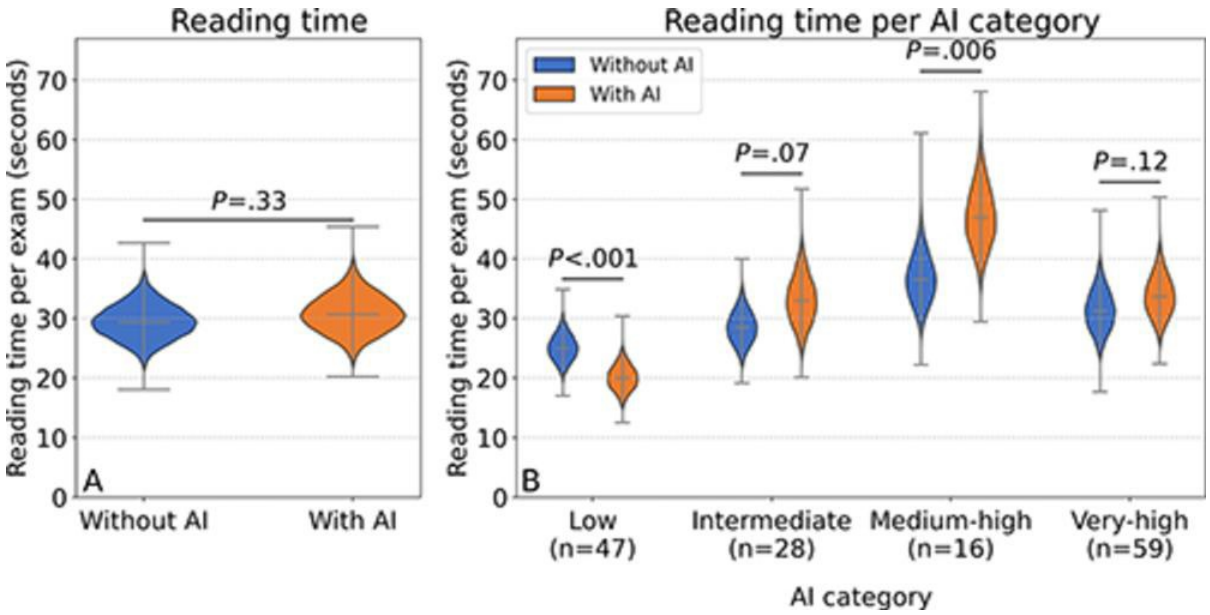

Figure 3. Violin plots show mean reading times per screening examination for radiologists reading without and with AI support **(A)** for all examinations and **(B)** per AI risk category.
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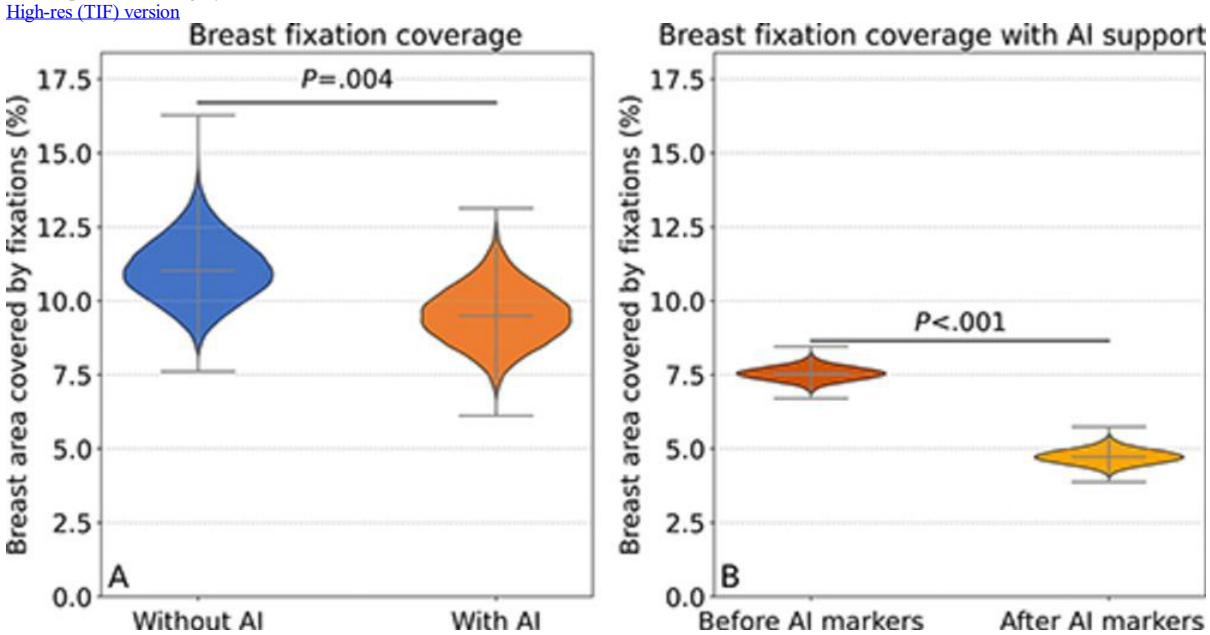

Figure 4. Violin plots show mean percentage of the breast area covered by fixations with the standard useful field of view **(A)** for radiologists reading without and with AI support and **(B)** for radiologists using AI support, before and after activating the AI markers.
High-res (TIF) version

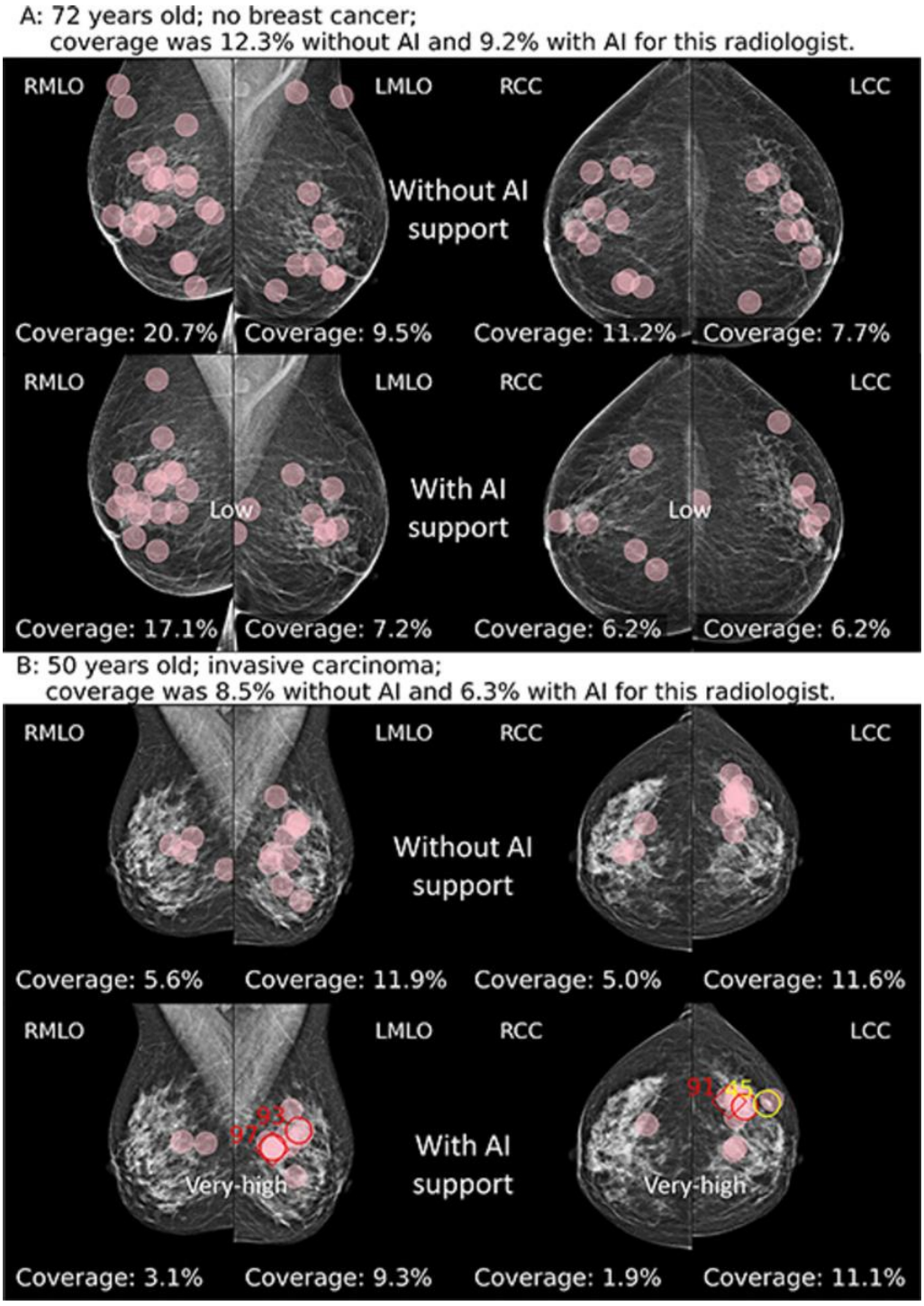

Figure 5. (A) Fixations (pink circles) of a radiologist while reading without and with AI support on a screening mammogram in a 72-year-old woman without breast cancer. The radiologists did not recall the woman in either reading condition. The AI tool classified this examination as low risk, with a maximum region score under 40. **(B)** Fixations of a radiologist while reading without and with AI support on a screening mammogram in a 50-year-old woman with invasive carcinoma. The radiologist recalled this woman in both reading conditions. The AI tool classified this examination as very high risk, with a maximum region score of 80 or higher (red numbers; yellow number represents intermediate risk). Diamonds indicate calcifications, and circles denote soft tissue lesions.
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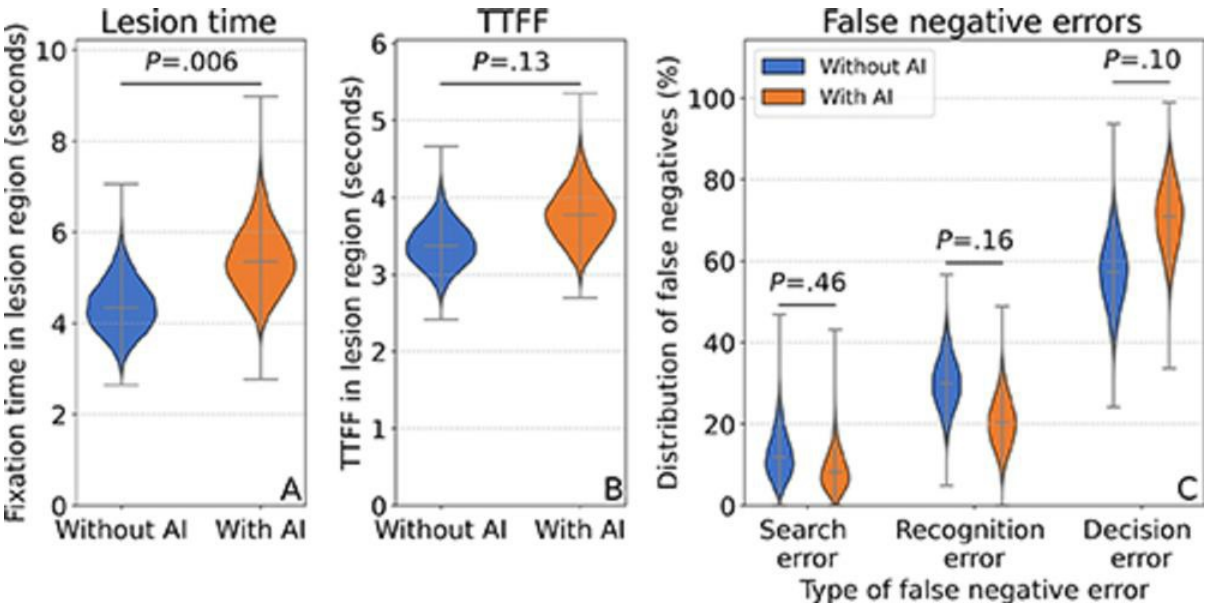

Figure 6. Violin plots show **(A)** mean fixation time within the lesion region for radiologists reading without and with artificial intelligence (AI) support; **(B)** mean time to first fixation (TTFF) within the lesion region compared for radiologists reading without and with AI support; and **(C)** mean search, recognition, and decision error rates among false-negative cases compared for radiologists reading without and with AI support.
High-res (TIF) version

Resources:

Editorial
Study abstract