

The eyes have it: Visual inspection experience essential for airport security screening

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QUT researchers have used eye-tracking to study airport security screeners' performance during different visual inspection phases of a screening task. The study is [published](#) in the journal *Applied Ergonomics*.

Dr. Levi Swann, a Senior Lecturer in Industrial Design within the QUT School of Design, Emeritus/Adjunct Professor Vesna Popovic from the QUT School of Electrical Engineering & Robotics and former QUT researcher Dr. Dedy Wiredja teamed up to investigate how airport security screeners employ problem solving techniques during X-ray screening, and how strategies change with experience.

The study involved four groups of screeners with varying levels of experience: beginner, inexperienced, experienced, and expert.

Dr. Swann said the research was unique among most airport security screening research because it was conducted under normal task conditions.

"The typical practice is to conduct research in controlled environments," Dr. Swann said.

"Thirty-nine professional security screeners were observed on the job performing X-ray screening at an Australian international airport.

"Video and eye-tracking data was collected and analyzed to explore activity phases and problem-solving strategies."

"The whole complexity of the task can be captured by conducting research in the field like this, and it has enabled us to identify problem-solving as essential to a security screener's job.

"They use interface functions that, for example, change the visual appearance of images, and they also interact with other staff to help them make decisions, such as whether an object is a threat or not.

Dr. Swann said that because research conducted in controlled environments did not include the environmental context, it focused on

the visual scanning of images and the actual decision.

"We found that the extent of problem solving performed during security screening differs for screeners based on their experience," Dr. Swann said.

"Less experienced screeners apply more problem solving to make decisions.

"More experienced screeners can make decisions without problem solving more often."

"We also found that the problem strategies employed by screeners change with experience.

"Less-experienced screeners rely on strategies that defer decision-making to another staff member or depend on a search-based strategy, which is a slow and weak approach to problem-solving that causes extraneous cognitive load."

Professor Popovic said their results suggested that it took beginner screeners approximately six months of on-the-job experience to perform problem-solving at a similar level to experienced screeners.

"This is a considerable time for a critical safety task," Professor Popovic said.

"Our results also suggest that problem-solving skills take longer to develop than other aspects of task performance, such as search, which involves the visual scanning of images."

Dr. Swann said effective training in that task was essential due to its critical nature for safety.

"Efficient training that enables fast skill development is also essential because the occupation has been associated with early staff attrition," Dr. Swann said.

Professor Popovic said the research findings were transferrable to other visual inspection tasks.

"Visual inspection is standard in medicine, manufacturing, security, maintenance, and transportation," Professor Popovic said.

"Problem solving should be explored in these areas to understand how improvements can be made to visual inspection."

"Given the significant variance observed in the screener's performance according to the experience level and type, there is a strong case for defining specific screening criteria instead of depending on the generalist experience criteria."

Dr. Swann said the study provided a basis for future research exploring how other factors, such as emotions and stress, can further affect screener performance.

"This research highlights the importance of tailoring personnel management techniques according to experience levels, followed by specific selection and [training programs](#)," Dr. Swann said.

Professor Popovic said that with the implementation of experience tailoring, the study concluded that airport [security](#) screenings could be more consistent and efficient and provide higher safety and passenger satisfaction.

"The research is transferable to other visual inspection training domains requiring expertise, such as port control, [traffic control](#), surgical training,

or X-ray examination," Professor Popovic said.

More information: Levi Swann et al, Visual inspection problem-solving strategies at different experience levels, *Applied Ergonomics* (2024). [DOI: 10.1016/j.apergo.2024.104273](https://doi.org/10.1016/j.apergo.2024.104273)

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