Biased Decision Making in Realistic Extra-Procedural Nuclear Control Room Scenarios

In normal operations and emergency situations, operators of nuclear control rooms rely on procedures to guide their decision making. However, in emergency situations, where several interacting problems can cause unpredictable adverse effects, these procedures may be insufficient in guiding operators to safe shutdown of the power plant. Little is known about the decision making strategies that operators employ in these extra-procedural situations. To address this, a realistic simulation study was conducted with five crews of active, licensed nuclear operators to see the behavioural patterns that occur when procedures are not sufficient. This paper, a re-analysis of a dataset collected for a different study, investigates how the design and existence of procedures influence, and possibly bias, decision making strategies. We found evidence that operators were affected by confirmation bias, and that, in some cases, the mismatch between their home power plant and the simulated power plant made them commit errors due to misapplied expertise. We further found that this effect was amplified by the existence and design of the procedures used. Based on these findings, we suggest that designers may improve safety by creating procedures that bear the risks of these biases in mind, or by specifically aiming to debias the users. Avenues for debiasing through design are discussed.

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