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Supporting Information Processing and One Instant Teaming of Humans and Cyber-Technical Systems by Conceptual Chunking

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Abstract

Human skills and expert knowledge are valuable in increasingly complex human-machine systems. Efficient one instant teaming between operators and cyber-technical systems requires deeper understanding of human cognition. Conceptual chunking is one strategy to optimize memory performance by integrating small information units and their interactions to a larger one. Graphical visualizations (e.g., in industrial control panels) can support teaming and understanding of complex interactions by highlighting these relationships. The present study investigates whether graphical design elements are able to enhance conceptual chunking. In an experiment (N = 40), graphical design elements were used to induce or inhibit conceptual chunking. Response accuracies, response times, gaze data, and strategies were assessed. Results reveal that participants rely more often on graphical design elements presenting relations between variables. Hence, they show a deeper understanding, faster and more accurate responses when using the presentations for the first time. This indicates high potential for one instant teaming.