Well-designed visual aids improve risk understanding

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A University of Oklahoma professor, Edward T. Cokely, shows that informed decision making depends on the ability to accurately evaluate and understand information about risk in a newly published study in the scientific journal *Human Factors*. A state-of-the-science review of the literature concludes that visual aids are beneficial for diverse people with different levels of numeracy and graph literacy. Cokely identifies five categories of practical, evidence-based guidelines for the evaluation and design of visual aids.

"It is striking to see how effective visual aids can be for diverse people facing complex, life-changing decisions, including physicians, patients and their families," Cokely said.

Cokely, Presidential Research Professor and associate professor of psychology, in the OU Department of Psychology and National Institute of Risk and Resilience, collaborated with Rocio Garcia-Retamero, University of Granada in Spain, on the review of "how to" build visual aids that promote understanding and good decision making. Data for the study covered research from January 1995 to April 2016, and 36 publications provided data on 27,885 diverse participants from 60 different countries, concluding that well-designed visual aids tend to be highly effective tools for improving informed decision making among diverse decision makers.

Cokely and Garcia-Retamero reviewed literature concentrated in health and medical decision making that included findings on the link between

skills and quality outcomes. Next, the researchers presented findings on the psychological, social and technological factors which shape the influence of numeracy on risk literacy, decision making and health outcomes. Lastly, they presented a review of research investigating the influence of skills on the benefits of visual aids.

Visual aids are graphical representations of numerical expressions of probability and include icon arrays, bar and line charts and others and have been used to communicate risk information. However, not all visual aids are equally effective. Visual aids provide an efficient means of risk communication when they are transparent—that is, when they promote unbiased risk understanding and evaluation. This means the visual aid is well defined and accurately and clearly represents the essential risk information. Researchers then focused on individual differences in two relevant skills: numeracy and graph literacy. Numeracy, the ability to use mathematical skills to solve everyday problems, including statistical numeracy, has been found to be one of the strongest single predictors of general decision-making skill and risk literacy. Graph literacy is the ability to evaluate and extract data and meaning from graphical representations of numerical information—another essential component of risk literacy.

A review of static visual aids to improve risk literacy and promote healthy behavior focused on studies involving people with different levels of numeracy that included a control condition, which compared visual aids with numerical information in written text. Eighty-eight percent of the studies showed static visual aids tend to be beneficial. Static visual aids were helpful for people with low numeracy as long as they had moderate-to-high graph literacy.

One theme that emerged across some studies is that, on average, "less is more." Very simple icon arrays including clear explanations to convey the meaning of information can improve understanding. People with

different levels of numeracy and graph literacy like, trust and prefer simple icon arrays. These icon arrays offer an efficient means of reaching individuals with different levels of numeracy and graphic literacy. A simple training in the use of icon arrays maximizes potential benefits and reaches vulnerable groups of people with limited graph literacy.

Visual aids improve accuracy of risk understanding in part because they increase the likelihood that people deliberate more about the relevant risks and trade-offs. Because visual aids cause relatively robust changes in risk understanding by shaping and fine-tuning knowledge representation in long-term memory, visual aids also tend to give rise to more enduring changes in attitudes and behavioral intentions, which can directly affect decision making and healthy behavior. Based on all relevant, available scientific data from the last 20 years, findings indicate that icon arrays tend to be the best "all purpose" type of visual aids.

Provided by University of Oklahoma

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