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CUE UTILIZATION IN A VISUALLY DEMANDING TASK

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Modern technologies make it possible to provide operators who perform visually demanding tasks with devices that help them in the performance of these tasks. Relatively little is known about the adaptive changes that occur in operators' reliance on such devices as a function of their validity. In our study, participants performed a task with high visual demands in which aid was offered in the form of cues that could potentially ease the workload drastically. The experimental conditions differed in the validity of the cues. Participants either received invalid, moderately valid, or highly valid cues, or no cues in the control condition. We were mainly interested in the adaptive changes over time in the reliance on the cues.

The experimental task required participants to determine whether a number, which was presented for less than 100ms and was followed by a masking stimulus, was above or below a specified value. High values indicated a malfunction in an industrial machine. The payoffs were heavily skewed to penalize missed signals (i.e. declaring a malfunctioning system safe). The cues were color-coded green (safe) or red (unsafe) fields that were displayed at the beginning of each trial. Participants were informed that the cues were not completely reliable but were not told the actual correlation of the cues to the true condition.

The results were analyzed in terms of signal detection theory, and in particular the setting of the response criterion. In all groups participants adopted a more cautious decision criterion over time. Participants improved in the performance of the task, as indicated by an increase in the percentage of "hits" compared to "false alarms." Reliance on the cues was assessed through the difference in the response criteria setting when cues were green and red. By the second block of trials, observers receiving invalid and moderately valid cues used similar settings for both colors, i.e., they did not rely on the cues. Only the group with highly valid cues continued to utilize the cues.

The fact that there was no direct indication of people's reliance on cues when they were not valid does not mean that the cues had no effect. The overall analysis of the detection performance showed that all groups, except the group that received highly valid cues, performed less well than the control group. This indicates that the mere existence of a cue affected performance, even when there was no direct evidence of participants' reliance on the cues. The implications of these results for the design of decision aids to assist in the performance of tasks with high perceptual or attentional demands are discussed.