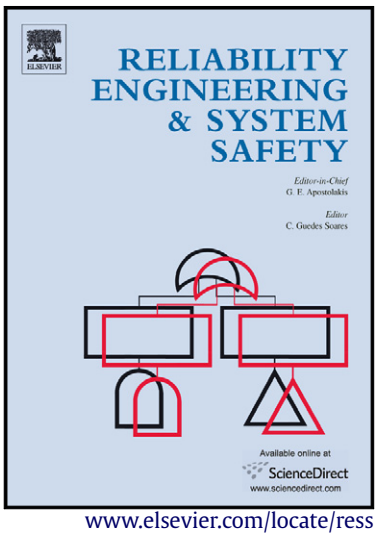

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Comparison of task complexity measures for emergency operating procedures: Convergent validity and predictive validity

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ABSTRACT

Human performance while executing operating procedures is critically important for the safety of complex industrial systems. To predict and model human performance, several complexity measures have been developed. This study aims to compare the convergent validity and predictive validity of three existing complexity measures, step complexity (SC), task size, and task complexity (TC), using operator performance data collected from an emergency operating procedure (EOP) experiment. This comparative study shows that these measures have a high convergent validity with each other, most likely because all of them involve the size dimension of complexity. These measures and their sub-measures also have a high predictive validity for operation time and a moderate-to-high predictive validity for error rate, except the step logic complexity (SLC) measure, a component of the SC measure. SLC appears not to contribute to the predictive validity in the experimental EOPs. The use of visual, auditory, cognitive, and psychomotor (VACP) rating scales in the TC measure seems to be significantly beneficial for explaining the human error rate; however, these rating scales appear not to adequately reflect the complexity differences among the meta-operations in EOPs.

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