

# Metacognitive Models and Situation Assessment

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Schema-driven decision making emphasizes the indispensability of (1) situation assessment in naturalistic settings, and (2) knowledge base, past experience, event sequence, and similarity recognition as cognitive components of situation assessment (Federico, 1995). A theoretically interesting research question is whether subjects' metacognitive models (Metcalfe & Shimamura, 1994) involving these salient elements of an abstract schema-driven decision-making process, are related to their performance on concrete experimental tasks requiring situation assessment. That is, within the metacognitive context of "cognition about cognition," but not on-going monitoring and control, are subjects' higher order cognitions about these crucial cognitive components at an abstract level correlated with their performance on experimental tasks necessitating situation assessment at a concrete level? If subjects are asked to indicate in their metacognitive models the perceived degree of importance of these cognitive components to situation assessment, then is the assigned saliency of each of these elements correlated with their performance on tasks where situation assessment is a prerequisite?

First, assuming subjects were asked to classify tactical situations into two or more discrete clusters, it was hypothesized that the more weight attributed to these metacognitive links by subjects, the more categories they would create, the more time they would use to categorize tactical situations, and the less the number of tactical situations per category derived for them. It was speculated that the more saliency ascribed by subjects to these four metacognitive links, the more they implicitly believe in, and automatically adhere to, the schema-driven decision-making process, where correct classifications or similarity judgments are crucial to proficient performance. Consequently, the more likely these individuals would tacitly discriminate among the tactical situations creating more categories and fewer tactical situations per category, and cognitively process these tactical situations at deeper levels of analysis thus necessitating more time for their classification.

Second, assuming subjects were asked to perform pairwise similarity ratings of tactical situations, it was hypothesized that the attributed metacognitive link weights would be positively related to the derived subjects' weights along each dimension of a multidimensional scaling solution. It was thought that the more importance subjects assigned to these metacognitive link weights, the more they tacitly accept, and unconsciously use, the schema-driven decision-making process. Consequently, the more likely these individuals would weigh indirectly the derived dimensions underlying their perceptions of pairwise similarity among the tactical situations. The perception of similar situations is an important component of schema-driven decision making which is recognition-primed, because schema-driven solutions are invoked by recognizing particular problem types or specific similar situations.

The primary purposes of this research were to experimentally test the above hypotheses, and attempt to shed some light on the raised theoretical issues.

Consequently, seventy-six, volunteer, male, naval officers were asked to (1) represent as graphic weighted networks their metacognitive models of schema-driven tactical decision making, where situation assessment is crucial, and (2) perform experimental tasks requiring categorizing and pairwise similarity ratings of tactical situations. Canonical, regression, and correlation analyses and multidimensional scaling established that two of four metacognitive link weights were significantly associated with (1) three of six measures of sorting performance, and (2) one of two dimensions derived for the scaling solution of pairwise similarity ratings. These results supported what was hypothesized regarding subjects' metacognitive models and sorting and pairwise performance.

## References

- Federico, P-A. (1995). Expert and novice recognition of similar situations. *Human Factors*, 37, 105-122.
- Metcalfe, J., & Shimamura, A. (Eds.). (1994). *Metacognition: Knowing about knowing*. Cambridge, MA: The MIT Press.