

A COGNITIVE APPROACH TO MENTAL ROTATION TESTING ON PILOT SELECTION

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Many studies had demonstrated that it is necessary to include spatial ability tests in pilot selection test battery, but the process underlying traditional mental rotation tests used for distinguishing appropriate pilot trainees may not easily be obtained, because scores of traditional tests designed by the factor analysis paradigm combined with many processes other than that we are concerned, thus faded the measurement. To overcome this problem in pilot selection, instead of the factor analysis approach, an experimental procedure was called for to extract the crucial process that could discriminate suitable pilot trainees. The present study adopted a method similar to "componential analysis" by Sternberg (1985), an information processing paradigm, to design a mental rotation task to use in pilot selection of trainees at the Chinese Air Force Academy. Subjects were told to make a judgment whether two blocks showed on the computer screen were the same when rotated. Three within-subject variables and one between-subjects variable were manipulated. The only between-subjects variable was the kind of pilot trainees (pass or fail), three within-subject variables were rotation angles (60, 120, 180, 240, or 300 degree), the way stimulus being displayed (2 blocks presented at the same time or one after the other), and the number of block reflections (two or three). Four model parameters were estimated in the present componential analysis, labeled "display", "reflection", "rotation", and "constant" respectively. Among these

parameters, "display" which represents the difference of processing time between two ways of stimulus display was related to the capability of encoding spatial stimulus, "reflection" which represents various processing time between two and three reflections was related to the processing efficiency in complex stimulus, "rotation" which represents the processing time increased when added rotation angles was related to the processing efficiency in rotating stimulus, and "constant" was related to all other processing not included in any of the other parameters. The results showed that the task adopted has a good internal validity. Compared to those trainees having passed the basic flying training, the data showed that those who did not pass obtained significant estimations on the parameter regarding "reflection" which indicates complexity of stimulus. In case of including parameters estimated by componential analysis into the parameter pool of a quantitative stepwise selection model established by the Chinese Air Force Academy, 'reflection' was the third variable chosen for the selection model. As the data showed in this research, cognitive approach test of mental rotation could be a useful tool among others on pilot selection, with the processing efficiency in rotating complex stimulus as a discriminative index on pilot selection.

Keywords: Componential analysis, Mental rotation, Pilot selection, Test design