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Keywords: inductive/analogical reasoning, problem-solving, information processing models, intelligence.

Proposal for poster session

ANALOGICAL REASONING: "Infer-Infer-Compare" vs "Infer-Apply-Test" information processing models.

Geometric analogy solution was studied as a function of systematic variations in the tasks variables used in the generation and manipulation of item difficulty. Also, the assumptions on which the task design for componential analysis are based were tested. The different componential trials varied in the amount of information presented so as to include redundant or non redundat terms in solution trials.

The experimental analogies were systematically generated in terms of the number of transformations, types of dimensional changes, true-false counterparts and zero-two precueing trials/four terms (redundant)-two terms (non redundant) solution trials. Analogies with two and three transformations presented solution times that were closer to the dimensional change which showed the highest difficulty level in problems with one transformation. This complexity graduation did not always correpond to former predictions formulated in function of the number of transformations. Attribute salience may probably influence the ease with which certain dimensions are encoded and later processed. These results emphasize the importance of taking in consideration the information which has to be executed by the different operations included in processing models of geometric analogies. Analysis of solution trials with redundant and non redundant terms suggest that additional processing mechanisms should be considered if all analogical terms are included in the design of these second trials. The results found in the non redundant condition corroborated Evans' predictions on the processing durations of the operations executed on the second pair of analogical terms.

Future research should futher explore the circumstances under which information reprsentation might improve processing ability in addition to the dimensional salience effects of tasks variables.

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Despite the extensive use of analogy items on intelligence testing and the recent research done on the nature of the processing involved in analogical performance, the principle theoretical and empircal analysis of the information processes necessary for solving these type of problems converge on two main models. These processing models have been described as "infer-infer-compare" and "infer-apply-test" and were postulated by Evans (1968) and Sternberg (1977), respectively. Both models relate process execution and overall performance to the amount of information that must be processed, but the operations included in the procedure for the second part of the problem are substantially different.

Bethell-Fox, Lohman and Snow (1984) suggested that these models could represent different processing strategies: constructive matching for the infer-apply-test model and response elimination for the infer- infer-compare model. Although it seems plausible that these strategies might be used in the solution processing of analogical problems, the identification of Evans 'model with a response elimination strategy is rather questionable. The response elimination notion is Evans'artificial intelligence program is executed when the response alternatives present notorious differences in relation to the problem stem terms, and after the inferential relations have been processed.

The objectives outlined in the present study seek to futher explore the different predictions formulated on the time consuming durations associated with the two alternative processes. In order to analyze the processing durations employed in the executions of each pair of analogical terms, the experimental task was designed following Sternberg's componential method. This method divides the analogical problem in two presentations, each requiring successively less processing demands. Test trials are divided in two parts, with precueing in the first presentation and solution in the second. Precueing conditions may include zero, one, two or three terms and their solution counterparts present the previous information plus the remaining terms necessary

for solution. It is assumed that precueing information will be used during this trial and will not be reexecuted during solution trials. Solution tests trials varied the amount of information presented in order to test the former assumption.

Also item information structure research on analogical problems indicate that only two mayor variables -number of elements and transformations- are enough in the prediction of performance data. Recent research on the effects of tasks variables used in the manipulation of item difficulty showed that the different types of transformations should also be considered as an additional source of problem complexity (Whitely Schneider, 1981; Bethell-Fox, Lohman Snow, 1984). Therefore the effects on solution times and error rates of three common types of dimensional changes (rotation, size and color) and their combination in problems with two and three transformations were analyzed.

The analogical problems were generated from seven types of transformations in a true-false presentation format and the geometric figures that constitued the terms were counterbalanced in each type of analogy. Each problema was divided in two test trials: precuening presentations included zero or two terms and solution trials contained all four terms or the last pair . Presentation rate and solution time for each problem was controlled by the subjects on a three field tachistoscope. The sample was constituted by 60 psychology students from the Complutense University of Madrid.

The analysis of solution trials with redundant information (four terms) showed significant longer solution times than the precueing trials. These results could suggest an additional reinspection operation of the previous presented information and its duration would be confounded with the inference/or application processing times. But when solution trials were analyzed in the non redundant condition (second pair of terms) a non significant difference was found between test trials. These results favor Evans'predictions and indicate a significant effect in relation to the type of componential design used in solution trials. This effect should be considered in future interpretations of component durations under the assumption of the differential processing demands required in solution trials.

When the data was analyzed taking in consideration only the number of transformations, it was found that increasing the values of this variable systematically increased time solution and error rates. However, if solution time and errors were analyzed in terms of the different types of

transformations the pattern of effects were quite different. Problems with one transformation presented rotation as the highest difficulty dimensional change, followed by changes in size and color. When problems combined two or three transformations the solutime times were closer to the dimensional change that independently presented the highest difficulty level. This finding suggests that averaging solution times in function of the number of transformations is probably canceling the significant effects of the dimensional properties of the terms. This could also imply that the variable number of transformations might be considered as a criterion to facilitate item difficulty manipulation provided that all types of dimensional changes are counterbalanced. However, it is not admissible to infer that the significant differences found in solution times and errors may be explained by the number of times each process has to be executed. The salience of the attributes may probably influence the ease with which certain dimensions are encoded and later processed. Future research in this area should explore the circumstances under which information representation might improve processing ability.