Goal-Derived Categorization as Predictor of Problem-Solving Performance

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Problem Solving as Categorization

Insight problem solving is an instance in which the solver, being in a state of uncertainty regarding how to reach the effective solution (Murphy & Ross, 1994), is likely to form solution strategies based on *primary categorizations* of the problem's elements (e.g., in the *Candle Problem*, a *box of tacks* is perceived exclusively as a *container* for the tacks). However, reaching the correct solution to insight problems typically involves the construction of goal-derived, *secondary categories* (e.g., one effective way to solve the *Candle Problem* involves categorizing the box holding the tacks as *something to attach a candle on the wall*).

This study examined, by means of a categorization task, the effects of training participants to construct goal-derived categories (Barsalou, 1983, 1991) on subsequent insight problem-solving performance. It was expected that participants who received training in constructing secondary (i.e., goal-derived) categories of items, in addition to primary (i.e., taxonomic) categories of items, would perform better in insight problem solving.

Furthermore, participants' gender and general intellectual ability may contribute to their problem-solving performance in addition to the training manipulation employed in the present study. To determine the strength of the categorization training, relative to potential influences from gender and intellectual ability, as a reliable predictor of insight problem-solving, two multivariate analyses were conducted.

Method

One hundred and forty ($N = 140$) undergraduates (45 males; mean age = 19.06 yrs) were randomly assigned to one of four experimental conditions: (i) Alternative Categories Task (ACT, $n = 35$), (ii) Alternative Categories Task with critical items (ACT-C, $n = 35$), (iii) Embedded Figures Test-Control A (EFT, $n = 35$), and (iv) Word Association-Control B (WA, $n = 35$). The ACT condition received the Alternative Categories Task followed by seven insight problems; the ACT-C condition received the Alternative Categories with Critical Items Task and then received the insight problems; the EFT condition was administered the Group Embedded Figures Test and then received the insight problems; finally, the WA condition was presented with the Word Association test and then received the insight problems. The problems were *Charlie*, *Fake Coin*, *Prisoner*, *Pyramid*, *Candle*, *Two-String*, and *Ten Coin*. All participants were tested individually.

Results and Discussion

A contrast-based ANOVA on solution rates revealed that the ACT and ACT-C conditions notably outperformed the EFT and WA conditions. Nonetheless, results of a one-way ANOVA suggested that the variance observed in problem-solving performance may be accounted for by the differential contributions of participants' gender and general intellectual ability, in addition to the training manipulation. To investigate this possibility, a one-way ANCOVA was initially performed with insight problem-solving performance as the DV, training manipulation as the IV, and gender and SAT scores as covariates. After adjusting for covariates, problem-solving performance varied significantly with type of pre-problem-solving training ($F[1, 139] = 11.64$, $p < .001$). A Hierarchical Regression analysis was also conducted between problem-solving performance as the DV and gender, SAT scores, and training as the IVs. After pre problem-solving training was added to the prediction of problem solving performance by gender and SAT scores, R^2 increased reliably ($R^2 = .29$, F_{inc} (3, 133) = 11.64, $p < .001$), thus supporting the conclusion that the pre-problem-solving training is the best predictor relative to the other two independent variables. Further analyses introducing each type of training as a separate step in the regression suggested that, contrary to the control tasks (EFT, WA), the categorization tasks (ACT, ACT-C) reliably increased R^2. These results support the conclusion that pre-problem-solving training on goal-derived categorization significantly predicts success in insight problem solving. In fact, the prediction with this training is better than other variables that have been associated with problem-solving performance, such as gender and intellectual ability.

References

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