

Individual Differences in Problem Solving via Insight

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The purpose of the present work was to identify general problem solving skills that underlie the production of insight. One hundred and eighteen participants completed insight problems, analogies, series-completion problems and the Remote Associates Test. Scores on all measures were related to performance on the insight problems (Pearson r 's ranged from .31 to .47, $p < .008$). These findings are consistent with the notion that the abilities to apprehend relations and fluency of thought are involved in insightful problem solving.

An insightful solution is one that is both non-obvious and functional (Dominowski, 1995; Sternberg and Lubart, 1996). Insight occurs when a solver restructures a previously intractable problem such that a new understanding of what needs to be done appears in consciousness. Restructuring changes the problem situation "from an unclear, inadequate relation, to a clear, transparent, direct confrontation—straight from the heart of the thinker to the heart of his object, of his problem" (Wertheimer, 1959, p. 236). What are the cognitive processes that underlie the ability to perform such a reformulation? Early Gestalt psychologists (Kohler, 1947; Wertheimer, 1959) and modern cognitive psychologists (Dominowski, 1981, 1995; Metcalfe and Wiebe, 1987; Ohlsson, 1992; Schooler and Melcher, 1995; Smith and Blankenship, 1995; Weisberg and Alba, 1981) alike have been interested in defining the processes that give rise to insight. The purpose of the present work was to use an individual differences approach to help disentangle the cognitive processes that underlie the production of insight.

The individual differences approach has not been used often in the context of understanding insight. However, Jacobs and Dominowski (1981) found that performance across different object-use insight problems (e.g., the Candle-Box problem) was correlated. Further, Schooler and Melcher (1995) reported the findings from an unpublished study in which they identified perceptual restructuring and ability to break context as predictive of performance on insight problems and not on non-insight problems. Schooler and Melcher argued that because these two skills uniquely predicted insightful problem solving, they are representative of the distinct cognitive processing that is involved in producing insight. Whereas Schooler and Melcher focused on identifying what it is that distinguishes insightful problem solving from other types of problem solving, the present work focused on determining which general thinking skills underlie insightful problem solving.

Greeno (1978) provided the theoretical framework for the present study. He argued

that insight is “achieving a better understanding of the problem” (Greeno, 1978, p. 262). Understanding has two component skills: the ability to apprehend relations and the ability to generate an integrated representation of the problem (Greeno). Those who excel at apprehending relations readily notice patterns of relations among elements of a problem. The more readily one can apprehend relations, the more likely one is to find novel and meaningful connections, and thus, experience insight. However, discovering novel relationships among problem elements is not a sufficient condition for the production of insight. The solver must integrate the newly uncovered relationships such that she/he gains a new understanding of the problem that is then utility tested. This ability to create potential solutions demands fluency of thought. Fluency of thought not only requires that a person is capable of generating many different problem representations, but that the individual discards inappropriate representations—avoids fixation.

To test empirically Greeno’s (1978) view, the investigator administered to participants two measures to assess the skill of apprehending relations, one measure to assess fluency of thought and a set of verbal insight problems. Thus, the purpose of the present study was to identify general thinking skills that could account for performance on a set of relatively heterogeneous insight problems.

METHOD

Participants

The participants were 73 female and 45 male Introduction to Psychology students who volunteered their time in exchange for extra-credit points.

Materials

Performance on the Remote Associate Test (RAT) (Mednick, 1962) measured fluency of thought. Although originally intended to measure creativity, the RAT appears to be better suited to measure verbal fluency (Dewing and Battye, 1971). Items on this measure take the following form: “Find a fourth word that is related to the following three: cookies, sixteen, heart” (Answer: “sweet”). Ability to apprehend relations was measured by a test of 29 verbal analogies (e.g., MONTH is to YEAR as HOUR is to ___ Answer: “Day”) and the series-completion section of the Shipley-Hartford (SCSH) (Shipley Boyle, 1967) (e.g., Complete the following series: two w four r one o three ___ Answer: “r”). Insightful problem solving was measured by performance on 15 verbal insight problems: “John was washing windows on a high-rise office building when he slipped and fell off a sixty-foot ladder onto the concrete sidewalk below. Incredibly he did not injure himself in anyway, how was this possible?” (Answer: He was not very far up the ladder).

TABLE 1
Pearson Correlation Coefficients Between Problem Solving Tasks (N = 118)

Task	1	2	3	4
1. Insight Problems	—	.47*	.31*	.42*
2. Analogies		—	.41*	.39*
3. SCSH			—	.12
4. RAT				—

*Significant at the Bonferroni corrected alpha level of $p < .008$.

Procedure

Participants were run in groups that ranged in size from 6 to 15. The order in which the measures were presented was randomized across groups. Participants received 2 minutes to solve each insight problem, 15 minutes to complete the analogies, 20 minutes to complete the RAT, and 10 minutes for the SCSH.

RESULTS/DISCUSSION

Table 1 shows that there were positive relationships between performance on all of the tasks, with the exception of the SCSH and the RAT. The obtained pattern of results supports the construct validity of these measures. The positive correlation between the SCSH and analogy problems is consistent with the notion that they share an underlying skill, potentially that of apprehending relations. The finding that responses to the SCSH problems were unrelated to those on the RAT support the idea that these tasks tap different skills. Although scores on the RAT and the analogy problems covaried, given the lack of evidence for a relationship between performance on the RAT and on the SCSH, it is likely that this relationship is due to these tasks' emphasis on language.

As predicted, those participants who were capable of apprehending relations on non-insight problems generally were able to solve insight problems. Further, the ability to generate and test numerous possible solutions, as measured by performance on the RAT, was also positively related to success on the insight problems. The results of the present work lend empirical validity to Greeno's (1978) theoretical notions about insight and support the utility of an individual differences approach in this domain.

As the present work defines the general skills involved in insightful problem solving at the grossest level, future research should focus on delineating the component processes involved in apprehending relations and fluency of thought. In addition, this present data-set provides evidence regarding skills that are likely to be involved in the production of insight, it does not, however, define skills that are unique to insightful problem solving. Schooler and Melcher (1995) provided some of the groundwork for that task; still, much remains for future projects. Activity in these proposed programs of research will not only help to advance theoretical understanding insight, but might

prove fruitful in terms of developing interventions that promote better, more insightful thought.

NOTES

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Previous work by this author was published under her maiden name, Pamela I. Dallob.

These data were collected while the author was an assistant professor in the Department of Psychology and Counseling at Arkansas State University. I thank Melissa Mears for her help collecting and entering the data.

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