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MODE OF SYMBOLIC REPRESENTATION AND COGNITIVE STYLE

SCOTT G. ISAKSEN

K. BRIAN DORVAL

State University College at Buffalo

GEIR KAUFMANN
University of Bergen

ABSTRACT

The relationship between imagery and creativity was examined using a prediction from the theories of symbolic representation developed by Morris and Hampson [1, 2] and Kaufmann [3-6]. One-hundred and fifty-four college students completed the Kirton Adaption-Innovation Inventory on preferred styles of problem solving and Paivio's Individual Differences Questionnaire on preferred mode of symbolic representation. At a general level, results were in the expected direction for both theories by showing a significant relationship between innovative problem-solving preference and general level of use of conscious modes of symbolic representation. However, results also supported the more specific prediction from Kaufmann's theory that subjects with an innovative preference would have a relatively stronger preference for imaginal over verbal modes of representation.

Highly creative people often report a preference for using imagery in their creative endeavors [7-10]. In several theories of symbolic processing, the relevance of imagery is linked to the less programmed aspect of problem solving, where the task at hand is novel, unstructured or highly complex. Thus, Morris and Hampson have developed a model based on the thesis that the function of consciousness is to monitor and control processing that does not proceed automatically [1, 2]. Since imagery is a form of conscious representation, it should be particularly useful under novel task conditions. A potential limitation of their model is that it does not

distinguish between the role of imagery and other forms of conscious representation, like verbalization, in regard to task novelty.

The theory of symbolic representation in problem solving put forward by Kaufmann also employs the consciousness argument to link the symbolic strategies of verbalization and visualization to low programmed tasks [3-6]. However, this theory also prescribes a division of labor between linguistic and imagery representation *within* the task novelty dimension. It is argued that imagery is linked to the high-novelty end of the continuum through its capacity to access a set of simpler cognitive processes of a perceptual kind. Kaufmann has reviewed a number of experimental studies linking the efficiency of visual imagery to tasks that are high in novelty, complexity, and ambiguity [6]. Although a systematic link between imagery and creativity is implied here, empirical studies specifically targeted on the relationship between imagery and creativity have yielded mixed and inconclusive results [11-16]. One possible reason for the unclear research findings may be a failure to distinguish between variables that focus on level of processing and those which focus on style of processing. Recent research has demonstrated that a theoretical separation of level and style may be necessary to clarify ambiguous results found in creativity and imagery research [16-19]. For example, in several of the studies in the field, ideational fluency tasks are used as performance criteria for creativity. Such tasks seem clearly to contain both ability (level) and style (preference) aspects [cf. 20-24].

The concept of symbolic representation is a core concept within cognitive science [e.g., 25, 26] dealing with modes of information representation and processing. The concept of cognitive style is a parallel concept in the area of problem solving distinguishing the kinds of strategies people prefer to use in solving problems and making decisions [e.g., 27]. Thus, both symbolic representations and style of problem solving have been differentiated as focusing on *mode* rather than level of performance. Paivio [28], working from a dual coding theory of symbolic representations, has developed the Individual Differences Questionnaire (IDQ), a measure of individual differences in preference for imaginal and verbal modes of symbolic representation (see also [29, 30]). In line with the theory, the IDQ has been shown to yield two fairly reliable factors corresponding to the putative imaginal and verbal modes of processing. Kirton presented an Adaption-Innovation theory and method to explain and measure individual differences in problem-solving styles along a familiarity-novelty dimension [18]. According to the theory, adaptors prefer to do things better, within the established framework. Innovators prefer to do things differently and often move beyond established frames of reference in their problem-solving efforts. A number of studies consistently suggest that the Kirton Adaption-Innovation Inventory (KAI) contains a reasonable level of reliability and validity [18, 19, 31, 32].

The purpose of the present study was to examine the relationship between mode of symbolic representation, as measured by the IDQ, and preferred mode of problem solving, as measured by the KAI. Taking the anecdotal evidence and

theories of symbolic representation presented above into consideration, it is posited that a significant positive relationship exists between preference for conscious modes of symbolic processing and the kind of creativity involved in the innovative preference of problem solving.

According to the theoretical position of Morris and Hampson [1, 2], high-novelty tasks would require a higher level of processing and call for a more extensive use of conscious modes of processing, both verbalization and visual imagery. Innovators, as compared to adaptors, prefer to deal with high-novelty tasks. Thus, they would most likely report a higher level of use of *both* verbalization and visual imagery than adaptors. Kaufmann's theory makes the same general prediction, but also the more specific one that innovators would have an even stronger preference for *visual* imagery over verbalization.

METHOD

Subjects

One-hundred and fifty-four undergraduate students (43 males and 111 females), enrolled in an introductory course on creativity, participated in the study. Subjects were administered the two instruments as part of the course requirements.

Instruments

The IDQ was used to measure preference for mode of symbolic representation [30]. This is an 86-item true-false, self-report questionnaire. It asks subjects to report their preference for use of verbal and imaginal modes of representation during cognitive processing. Thirty-nine of the items formed the imaginal scale and forty-seven formed the verbal scale. The theoretical mean and range of the verbal scale are 23.5 and 0-47, respectively. The imaginal scale has a corresponding theoretical mean and range of 19.5 and 0-39.

The KAI is a 33-item self-report inventory that asks subjects to report stable preferences for mode of solving problems along a familiarity-novelty dimension [18]. The theoretical mean and range are 96 and 32-160, respectively.

Procedure

The data were collected in eight class sections of an introductory course on creativity (28 class sessions, 75 minutes each). The KAI was administered in the fourth class session and took approximately 10 minutes to complete. The IDQ took approximately 20 minutes to complete and was administered in the eighth class session. Due to the ease of administration, class instructors read the directions for both instruments aloud. After questions were answered, subjects completed the instruments overnight and returned them during the next class period.

RESULTS

Descriptive data on the total group are shown in Table 1. It is interesting that in a normal sample distribution of adaptors and innovators, there is a general preference for using conscious representation that is visual in nature. This finding may suggest that visual imagery is the most preferred mode of conscious representation. It may be important to consider this issue in future work with the IDQ to examine whether or not these findings differ in the population. In addition, it would be helpful to determine whether these differences are subjective comparisons or real differences caused by actual behavior. In the first set of analyses, subjects were divided into two groups based on KAI median (98.0). Subjects with scores below the median were placed in the adaptive group. Subjects with scores above the median were put in the innovative group. Results are given in Table 2. Significant differences in mean scores between the innovative and adaptive groups were found on both the imaginal and verbal scores. As predicted by both Hampson and Morris and the Kaufmann models, subjects with a preference for an innovative cognitive style reported stronger preferences for using conscious symbolic representation than subjects with an adaptive cognitive style. Sex was used as a covariate in the analyses of variance and did not affect the results.

Table 1. Descriptive Data for Total Sample (N = 154)

Measure	*M*	*SD*	Range	Skewness	Kurtosis
KAI	98.68	13.85	71-146	.529	.586
IDQ Verbal	24.97	7.78	7-41	−.031	−.727
IDQ Imaginal	32.72	4.15	19-39	−1.076	.793

Table 2. Mean Scores on the Verbal and Imaginal Scales of the IDQ for the Median Split on the KAI[a]

	Adaptive *M*	Innovative *M*	*F*	*p*
Verbal Scale (Median)	23.58 (n = 79)	26.43 (n = 75)	5.24	.023
Imaginal Scale (Median)	31.87 (n = 79)	33.61 (n = 75)	7.068	.009

[a]Means and mean differences in Tables 2 and 3 are not directly comparable due to the different number of items on the Verbal and Imaginal scales of the IDQ.

Table 3. Mean Scores on the Verbal and Imaginal Scales of the IDQ for the Quartile Split on the KAI

	Adaptive *M*	Innovative *M*	*F*	*p*
Verbal Scale (Quartile)	24.74 (n = 38)	28.67 (n = 40)	4.78	.032
Imaginal Scale (Quartile)	31.58 (n = 38)	33.95 (n = 40)	7.994	.006

The difference within the imaginal mode of processing should, according to Kaufmann's model, become even clearer with a sharper contrast between adaptors and innovators. As a test of this hypothesis, a second set of ANOVAs was performed. Results of the variance analyses on the KAI quartile groups for the verbal and imagery scales are also presented in Table 3. In spite of the lower N, results show an even stronger significant effect in the same direction when examining extreme preferences for adaptive and innovative cognitive style preferences and preference for use of conscious representation. No differential effect for sex was found.

These results are precisely in line with predictions from the Kaufmann model and raise a potential concern to the Morris and Hampson approach to consciousness. Their approach may have an important limitation due to not making a distinction between conscious representations that are verbal and imaginal in nature. Also, it appears that clearer relationships between imagery and creativity variables emerge when clear distinctions are made between variables which examine preference and those which examine ability. This suggests a functional difference between preference and ability, and research designs where these two types of variables are mixed may produce confounded results.

Several limitations to the present study should be pointed out. Subjects were all college students, suggesting the need for future research to replicate findings in different samples. Also, the instrumentation used to measure the variables were self-report questionnaires. A natural next step would be to examine this relationship in the context of performance. The nature of the present study is correlational. Replications based on stronger experimental designs are needed to examine the actual usefulness of imagery in creative problem-solving performance.

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Direct reprint requests to:

Scott Isaksen
Buffalo State College
Center for Studies in Creativity
Chase Hall Second Floor
1300 Elmwood Avenue
Buffalo, NY 14222-1095