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Imagery and Verbal Processes in Creativity

Various theories in psychology have suggested that mental imagery can enhance creativity (Arieti, 1976; Durio, 1975; Koestler, 1964; McKellar, 1957; Singer, 1966). The basic assumption is that the processing of sensory-perceptual experiences in imagery taps a highly subjective, idiosyncratic, and fluid style of cognition that facilitates the transcendence of conventional, reality-restricted thinking. Psychoanalytic theory, for example, states that imagery derives creative potential from its close association with primary process, which is a cognitive style governed by "mobile cathexes" that yield highly flexible and proliferous associations (Suler, 1980). These theories support the hypothesis that there is a special relationship between imagery and what Guilford (1959) called "divergent thinking."

Numerous anecdotes in art and science attest to the powerful impact of mental images on creative insights. Empirical research evidence is less impressive. Some research indicates that instructions to image can increase scores on the Alternate Uses divergent thinking test (Davis & Manske, 1966), and that hypnotically induced imagery can enhance performance on the Torrance Test of Creativity (Gur & Reyher, 1976). However, other evidence has been unclear or sketchy. Schmeidler (1965) and Forisha (1978) found low or inconsistent correlations between questionnaires of visual imagery ability and creativity. Durndell and Wetherick (1976) reported that controllability of imagery was related to creativity, but imagery vividness was not.

Methodological and conceptual flaws have contributed to these inconsistent results. Most research studies have relied

on self-reported assessments of imagery ability rather than objective measures. The validity of self-report questionnaires may be questioned. More importantly, widely accepted theories in cognitive psychology, most notably Paivio's (1971) dual coding theory, state that verbal and imagery processes constitute two primary, distinct systems of mental functioning. This is supported by research on cerebral lateralization which has located verbal processes in the left hemisphere and imagery processes in the right (Galen, 1974). Although imagery may facilitate the innovative manipulation of ideas derived from sensory-perceptual experiences, this effect may be independent of creative thinking in verbal areas. In her classic studies of scientific creativity, Roe (1952) found that original thinkers in some disciplines, such as physicists and biologists, relied on imagistic ideation, while researchers in other areas, such as psychology and anthropology, favored verbal operations. Therefore, instructing subjects to use imagery may have little effect on creativity tasks which require verbal processes, and may interfere with performance on these tasks.

The purpose of this study was to determine how scores on visual and verbal divergent thinking tests would be affected by instructions to use visual imagery, and by individual differences in visual imagery ability as defined by both self-report and objective measures. It was hypothesized that: (1) individuals with greater visual imagery ability would score higher only on a visual creativity test, and; (2) instructions to use visual imagery would enhance performance on a visual test, but would interfere with performance on a verbal test.

METHOD

Subjects

Forty-two undergraduate students (20 males, 22 females, mean age = 19.5) participated in the study. All were students in an introductory psychology course and volunteered for the experiment.

Procedure

All subjects responded to two tests of mental imagery administered by a microcomputer. The sequence was determined randomly for each subject. One test, which consisted of the items from the visual subscale of Betts' mental imagery questionnaire (Sheehan, 1967), required subjects to image specific objects and situations, and to rate the vividness of those images using a 5-point scale (1 = very vivid, 5 = no image at all). The other test was an objective measure of imagery ability derived from a task developed by Brooks (1968). It required subjects to visualize ten block letters and, in their imagery, to count the number of corners in each letter. The

error score for each letter was calculated by the microcomputer as the absolute value of the number of corners counted by the subject minus the actual number of corners. Mean error scores on the self-report questionnaire and the block-letter task were later used to separate subjects into high and low imagery ability groups.

All subjects responded to three tests of creative divergent thinking. For each subject the order of the tests was determined randomly. These tests were: (a) Associational Fluency (Guilford & Guilford, 1980), which asks subjects to list synonyms for cue words, and therefore, taps verbal cognitive processes; (b) Sketches (Gardener, Gershon, Merrifield, & Guilford, 1967), which asks subjects to draw recognizable objects from incomplete patterns, and, therefore, taps visual processes; (c) Alternate Uses (Guilford, Christensen, Merrifield, & Wilson, 1978), which asks subjects to list unusual uses for common objects.

Before taking the creativity tests the subjects were randomly assigned to an imagery or standard condition. In the imagery condition, the instructions accompanying the test booklets emphasized using visual imagery as a way to produce answers to the three tests. Subjects were told to "relax and allow pictures to form in your imagination". In the standard condition the instructions suggested that relaxing might help them while responding to the tests; imagery was not mentioned.

After completing the creativity tests the subjects used three bipolar scales to rate: (a) how often they experienced visual images while responding to the tests; (b) how vivid were the images they experienced, and; (c) how helpful were those images for producing answers to the tests.

RESULTS

Using the scores from the self-report questionnaire and the block-letter task, a composite mental imagery ability score was derived for each subject. A median split of these composite scores divided the subjects into high and low imagery ability groups. Using imagery ability and instructional set (imagery versus standard condition) as the independent factors, 2x2 ANOVAs were conducted for the scores on the three divergent thinking tests. The analysis for associational fluency revealed a significant main effect for instructional set such that subjects in the standard condition scored significantly higher, $M = 12.01$, than subjects in the imagery condition, $M = 9.50$, $F(1, 38) = 5.88$, $p < .01$. The analysis for alternate uses revealed a trend toward a significant main effect such that subjects in the standard condition scored higher, $M = 18.23$, than subjects in the imagery condition, $M = 15.99$, $F(1, 38)$

= 3.49, $p < .06$. There were no significant results about instructional set for sketches. Using a composite creativity score, the comparison of the imagery and standard conditions showed that subjects in the standard condition scored significantly higher, M = 15.62, than subjects in the imagery condition, M = 13.57, $t = 2.57$, $p < .05$.

The analysis of variance revealed no significant results concerning imagery ability for any of the three creativity tests. To probe further for the effects of imagery ability, subjects were divided into high and low imagery ability groups based only on the self-report questionnaire scores, and then based only on the scores for the block-letter task. Using imagery ability and instructional set as the independent factors, all 2x2 ANOVAs on the scores for the creativity tests were non-significant for the effect of imagery ability. A Pearson-r correlation between the self-report questionnaire scores and the block-letter task scores was non-significant.

Using the composite imagery ability scores, 2x2 ANOVAs of responses to the post-experimental rating scales revealed no significant differences between high and low imagers and between the imagery and standard conditions concerning the subjects' reports of the frequency of imagery experiences while responding to the creativity tests, the vividness of those images, and their usefulness. When imagery ability was defined according to the scores on the self-report questionnaire, high imagers reported a significantly greater vividness of images while responding to the creativity tests, M = 3.34, than the low imagers, M = 4.00, $F(1, 38) = 4.96$, $p < .05$. When imagery ability was defined according to scores on the block-letter task, this result was non-significant.

DISCUSSION

The results indicated that instructions to use visual imagery may not facilitate performance on creativity tests, as some theories suggest, and actually may interfere with performance on creativity tests requiring verbal cognitive operations. This was supported by the finding that subjects who were instructed to use visual imagery to respond to a verbal divergent thinking test scored lower than subjects who were not given these instructions. Because verbal processes form a fundamental cognitive system distinct from the imagery system (Paivio, 1971), creative thinking in the verbal realm may be disrupted by attempts to induce imagistic ideation. That subjects instructed to use imagery did not score significantly higher on a visual creativity test may indicate that a more powerful instructional set or more thorough training in the use of imagery is

necessary to enhance creative performance. Despite the manipulation of instructional set, all subjects may have used imagery to respond to this visual test. Finally, subjects who were told to use imagery showed a trend toward lower scores on a task requiring them to derive alternate uses for common objects. Although, intuitively, one might expect that visual imagery would facilitate responses to this task, the trend toward the opposite effect suggests that the cognitive operations required by this task may be verbal, or perhaps imagistic in areas other than visual (ex. kinesthetic). Future studies of the relationship between creativity and imagery must take into consideration the verbal operations and subtypes of imagery processes involved in the creative task.

Individual differences in imagery ability as defined by a self-report questionnaire, an objective block-letter task, and a composite measure did not influence performance on the creativity tests. It is possible that the median split of imagery scores did not create high and low imagery groups sufficiently different in imagery ability to affect creativity scores; and that the variance of imagery scores was not great enough to produce a significant correlation with the creativity scores. Suler (1985) showed that high and low imagers selected from a large sample differ in their cognitive associational processes.

Evidence from this study suggests that objective and self-report tests are not equivalent measures of imagery ability. As compared to low imagers, high imagers reported a greater vividness of imagery while responding to the creativity tests when imagery ability was defined by the self-report questionnaire, but not when it was defined by the objective block-letter task. The correlation between these measures also was non-significant. Self-report measures of imagery may correlate more highly with each other than with objective indices. The practical application and controllability of imagery, which is required by objective tasks, has been recognized as an aspect of imagery distinct from subjective reports of image vividness (Gordon, 1949; Richardson, 1969). Also, objective measures such as the block-letter task require subjects to imagistically reproduce as accurately as possible a specific cue stimulus, while self-report scales require them to generate idiosyncratic, subjectively derived images synthesized from a variety of past percepts. Using Richardson's (1969) terms, objective tests may measure "literal" imagery, while self-report scales assess "associational" imagery. Therefore, future research into the relationship between imagery and creativity must consider controllability and vividness, objective and self-report methods,

and literal and associational processes as important issues concerning the assessment of imagery ability.

REFERENCES

ARIETI, S. *Creativity: the magic synthesis.* NYC: Basic Books, 1976.

BROOKS, L. R. Spatial and verbal components of the act of recall. *Canadian Journal of Psychology,* 1968, *22,* 349-368.

DAVIS, G. A. & MANSKE, M. E. An instructional method of increasing originality. *Psychonomic Science,* 1966, *6,* 73-74.

DURIO, H. F. Mental imagery and creativity. *Journal of Creative Behavior,* 1975, *9,* 233-244.

DURNDELL, A. J. & WETHERICK, N. E. *British Journal of Psychology,* 1976, *67,* 501-506.

FORISHA, B. L. Creativity and imagery in men and women. *Perceptual and Motor Skills,* 1978, *47,* 1255-1264.

GALEN, D. Implications for psychiatry of left and right cerebral specialization. *Archives of General Psychiatry,* 1974, *31,* 572-583.

GARDNER, S., GERSHON, A., MERRIFIELD, P. R., & GUILFORD, J. P. *Sketches: manual of instructions and interpretations.* Orange, CA: Sheridan Psychological Services, 1967.

GORDON, R. An investigation into some of the factors that favour the formation of stereotyped images. *British Journal of Psychology,* 1949, *39,* 156-167.

GUILFORD, J. P. *Personality.* NYC: McGraw-Hill, 1959.

GUILFORD, J. P. & GUILFORD, J. S. *Christensen-Guilford fluency tests: manual of instructions and interpretations.* Orange, CA: Sheridan Psychological Services, 1980.

GUILFORD, J. P., CHRISTENSEN, P. R., MERRIFIELD, P. R. & WILSON, R. C. *Alternate Uses: manual of instructions and interpretations.* Orange, CA: Sheridan Psychological Services, 1978.

GUR, R. C. & REYHER, J. Enhancement of creativity via free imagery and hypnosis. *American Journal of Clinical Hypnosis,* 1976, *18,* 237-249.

KOESTLER, A. *The act of creation.* NYC: Macmillan, 1964.

McKELLAR, P. *Imagination and thinking: a psychological analysis.* NYC: Basic Books, 1957.

PAIVIO, A. *Imagery and verbal processes.* NYC: Holt, 1971.

RICHARDSON, A. *Mental imagery.* NYC: Springer, 1969.

ROE, A. *The making of a scientist.* NYC: Dodd & Mead, 1952.

SCHMEIDLER, G. R. Visual imagery correlated to a measure of creativity. *Journal of Consulting Psychology,* 1965, *29,* 78-80.

SHEEHAN, P. W. A shortened form of Bett's questionnaire upon mental imagery. *Journal of Clinical Psychology,* 1967, *23,* 386-389.

SINGER, J. L. *Daydreaming.* NYC: Random House, 1966.

SULER, J. R. Primary process thinking and creativity. *Psychological Bulletin,* 1980, *88,* 144-165.

SULER, J. R. Imagery ability and the access of affect by free associative imagery. *Journal of Mental Imagery,* 1985, *9,* 101-110.

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