AN EXPERIMENTAL STUDY OF
MENTAL IMAGERY

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The research was concerned with providing information relevant to three aspects of imagery: its nature, function and phenomenology. The two current viewpoints in the debate on the nature of imagery were discussed, that is, the notion that imagery can be considered in pictorial terms, and the alternative idea that imagery is propositional and abstract in nature. The research examined the extent to which an image can be described in pictorial terms and resembles a percept. It was also concerned with the possibility of imagery as an epiphenomenon and with how much of the imagery experience is available to introspection.

The approach taken in the experiments was to determine whether qualitative differences in the reported image were related to differences in performance of an imaginal task. It was argued that qualitative differences, in contrast to quantitative differences, would allow statements to be made about the three aspects of imagery of interest. If qualitative differences, either in pictorial features of the image or in information stored about the image, influenced performance, then inferences could be made about the nature of imagery. If such differences were associated with differences in task performance, then it would be unlikely that the image is an epiphenomenon. It was expected that descriptions of these features would provide information on the extent to which the imaging process is accessible for reporting.
Six of the eight experiments in the series were based on a task requiring a painted cube to be cut mentally. Three of these six experiments had two stimuli: a standard wooden cube painted black and white, and a second cube, with one feature varied, to create the possibility for qualitative differences in imagery to occur. Quantitative differences in imagery were achieved by selecting subjects (all of whom were University students) from either extreme on imagery ability.

Experiment 1 was a factor analysis study of the most frequently used tests of imagery ability. Two independent factors emerged: the experience of imagery as self-reported; and the ability to manipulate imagery, as measured by objective tests. Because the task in the ensuing experiments involved manipulating imagery, subjects were selected on their performance on tests loading on Factor 1.

Experiment 2 was concerned with the qualitative difference of image size. The alternative stimulus was a smaller version of the standard cube. The performance of high imaging subjects was unaffected by stimulus size. Low imaging subjects, however, made more errors when presented with the smaller stimulus. A negative relationship was found to exist between reported image size and error rate.

In Experiment 3, the alternative stimulus was a cube with task irrelevant details painted on it. High imaging subjects made
fewer errors when presented with the complex stimulus than when presented with the standard stimulus, which had only task relevant information. The performance of low imaging subjects was equivalent with simple and complex stimuli.

Experiment 4 examined the effect of physical impossibility on the performance of an imaginal task by presenting a sugar cube as the alternative stimulus to be mentally dissected. Subjects of both high and low imagery levels made less errors and took longer to do the task when presented with the sugar cube as stimulus.

Experiment 5 was concerned with establishing that a visual image was being used for the task. Subjects who had taken part in one of the previous experiments were required to repeat the task during visual interference, auditory interference, or without interference. All subjects performed worse with visual interference than they had on a previous non-interference trial. Auditory interference appeared to disrupt the performance of low imaging subjects only, which suggested that auditory signals may have thwarted their attempts at using alternative strategies for the task. Despite the average interval of one year between first and second trials, subjects who repeated the task without interference performed better on the second trial.
Experiments 6 and 7 were concerned with various methods of improving performance on an imaginal task. The effects of practice on an easier task were compared with those of practice on a difficult task. Practice on an easier task was found to be as effective in improving performance as was practice on a difficult task, which suggested that subjects develop appropriate strategies for solving the task merely with practice. Practice on the same task was then compared with the effects of a combination of practice and training. Training consisted of recommending to subjects that they employ techniques which had emerged in the previous experiments as the most effective. These techniques consisted of using an image of an undissected cube, keeping the image still while counting, and working with two or more faces of the cube at a time. Practice combined with training was found to improve performance more than did practice alone.

The final experiment (Experiment 8) examined the relationship between a physical and an imaginal task. A task with single physical components was found to be solved more often when imagery-based techniques were used. The finding that more could be done with an image of the stimulus than with the stimulus itself suggested that an image and a percept differed with respect to the operations which could be applied to them. The experiment also tested the generality of findings from the previous experiments to a different type of imagery task, by varying stimulus size. The overall consistency between
results suggested that the findings from the previous experiments were applicable to a wider range of imagery tasks.

One consistent finding from all experiments was that, as well as the expected quantitative differences, there were qualitative differences between high and low imagers in the imaging process itself, which were reflected in performance. One such difference was in the type of errors made; high imagers were more likely to under-estimate the number of cubes. A further illustration was provided by an analysis of the time-error relationship: for high imagers, the relationship was negligible; for low imagers, there was a positive relationship between time and errors. The consistently different patterns in their performance suggest that the image and imaging process may be quite different in function and nature for high and low imaging subjects.

The results were generally consistent with the 'Imagery' position. The image could be described as pictorial to the extent that differences in pictorial qualities of an image were reflected in task performance. This finding would appear to have implications for the epiphenomenal viewpoint. Furthermore, it is suggested that an image is distinguishable from a concept in the processes which can be applied to it. Lastly, the finding that information in the image modality, but not reported as being in the image itself, affected performance, suggested that not all of the problem solving process is open to introspection.
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