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A Computer Program for the Block Figure Imagery Test: A Preliminary Report

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This paper describes a computer program for a block figure imagery test. While imaging a series of 20 block-shaped letters and numbers which are positioned between parallel lines, subjects categorize each corner of the figure as either touching or not touching one of the lines. The computer program provides the instructions for the task, presents the 20 figures, and records three types of error scores as well as duration of response. Information about the availability of the program is provided.

As the study of mental imagery has flourished in research and clinical settings, there have been widespread attempts to create quantifiable measures of individual differences in mental imagery ability. Although self-report scales (e.g., Marks, 1973; Sheehan, 1967) have proven to be useful, they fall prey to the hazards of response sets and other inaccuracies arising from the difficulty in comparing people's subjective reports of what is essentially an internal, unobservable experience. The advantage of quantifiable tests — which present behavioral tasks that presumably require the use of mental imagery — is that they can be scored objectively.

One such task was developed by Suler and Katkin (1988) and was a variation on a task originally developed by Brooks (1968). Subjects were shown a series of block letters positioned between two parallel lines (see Figure 1). After a letter was taken away, the subjects created an image of it. In their imagination, they started at one corner of the letter, as indicated by an arrow, and, proceeding clockwise around its edges, categorized each corner as either touching ("Yes") or not-touching ("No") one of the parallel lines. For example, the correct sequence of responses for the block letter "T" is YNNYYNNY.

This paper describes a computerized version of this imagery task which includes block figure numbers as well as letters. The advantages of a com-

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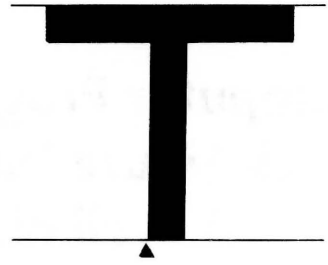

Figure 1. Sample of a block figure.

puterized version are its more reliable standardization of test procedures, reduction of scoring errors, and greater efficiency in administration. This version of the imagery task also includes several new scoring techniques.

Apparatus

The program is written in Apple Soft FP BASIC for an Apple IIe microcomputer (DOS 3.3) with 512 K RAM and dual disk drive (MS DOS version is also available). To prevent subjects from viewing letters and numbers while they perform the imagery task, all of the keyboard — except those keys to be used by the subjects — is covered with a piece of cardboard. Letters and numbers on the disk drive and monitor are covered with tape. Several alterations in keyboard control are built into the program to avoid subjects using keys with letters that might assist them in the imagery task. The "prime" key is reprogrammed to act as "return" and is relabelled as "R". The two game paddle keys are reprogrammed to enter an "O" and "#" into a response string and are relabelled on the keyboard accordingly. The space bar is reprogrammed to act as a delete key.

Description of the Computer Program

After presenting the instructions for the task and providing an example, the program presents graphics of 20 letters and numbers positioned between parallel lines. The figures are presented one at a time for two seconds each. Immediately after each figure disappears, a graphics "white-out" covers the area that was occupied by the figure. This white-out eliminates an afterimage glow on the screen that subjects might use, rather than imagery, to begin the task.

Once the figure disappears, subjects create their image. Beginning at the lower left hand corner of each imaged figure, they proceed clockwise around the figure and attempt to categorize its corners. "Touching" is coded by pressing the paddle key relabelled "#" and "not-touching" by pressing the paddle key relabelled "O". Responses in the string can be deleted and corrected by using the space bar. When the subject completes the task for that figure, the key relabelled "R" is pressed to proceed to the next figure.

The order of presentation of the figures ranges roughly from least to most difficult. Two criteria were used to determine difficulty: the total number of corners in the figure and the total number of corners not touching one of the parallel lines. Concerning the first criterion, it was assumed that more errors are likely on figures with more corners. Concerning the second criterion, past findings as well as those described in this paper (see Statistics section) indicate that more errors are made for corners not touching the parallel lines than for those that do touch the parallel lines.

For each of the 20 block figures the program calculates and records three scores and a duration of response score. The total error score is calculated by taking the absolute value of the difference between the total number of corners categorized by the subject (i.e., the total number of corners imaged) and the actual number of corners in the figure. Error scores for the "touching" and "not-touching" responses also are recorded by taking the absolute value of the differences between the number of "#" and "O" responses and the actual number of corners touching and not touching the parallel lines. Duration of response, measured in seconds, is calculated as the time interval starting when the block figure disappears from the screen and ending when the subjects has finished imaging and presses the "R" key to proceed to the next figure.

For each of the scores above — total error, touching error, not-touching error, and duration of response — the program calculates and records mean scores across all 20 trials.

Test Statistics

After developing and refining the computer program on several small groups of trial subjects, it was administered to a sample of 65 undergraduate students. The mean error scores and standard deviations for all subjects across all 20 trials were: total error, .84, 1.14; touching error, .59, 1.04; not-touching error, .82, 1.10; duration of response, 22.8 seconds, 16.9.

Split-half reliability using the odd/even method and Pearson-r correlations ($df = 63$) corrected by the Spearman-Brown formula was: total error, .96; touching error, .96; not-touching error, .96; duration of response, .69.

A retest was administered to 30 of the subjects between one and two weeks after the initial administration. Test-retest reliability determined by Pearson-r correlations ($df = 28$) was: total error, .75; touching error, .70; not-touching error, .88; duration of response, .65.

To identify any potential practice effects from the initial to second administration of the test, t tests for paired samples were conducted on the four scores for the test/retest group. Whereas no significant differences were found for the three error scores, the mean duration of response was lower for the second administration (18 sec) than for the first (22 sec), $t = 3.46$, $df = 30$, $p < .01$. These findings indicated that subjects performed

the test faster on the second administration but did not make a significantly different number of errors.

Using the data from the first administration, *t* tests were conducted on the mean error scores for the touching and not-touching responses. Significantly more errors were made on the not-touching responses (.82) than on the touching responses (.59), $t = 3.68$, $df = 64$, $p < .01$. As determined by *t* test, there are no significant differences between the mean number of corners across all the figures that *actually* touch the parallel lines and those that do not.

Discussion

As a result of repeated pilot-testing, modifications, and refinement, the computer program for the block figure imagery test described in this paper offers an easily administered version of a classic imagery task. Whereas other, more fine-grained and thorough measures of imagery ability do exist, the advantage of this test is its efficient and objective administration and scoring. Researchers may wish to include this test as part of a comprehensive imagery battery.

The most useful measure for assessing imagery ability on the block figure test may be the number of errors made in imaging the corners that are *not touching* one of the parallel lines. Test-retest reliability was highest for this error score. This finding may be attributed to the fact that imaging the not-touching corners was a more difficult task. More errors were made in imaging the not-touching corners than in imaging the touching corners, even though the numbers of not-touching and touching corners do not actually differ. It is possible that the parallel lines serve as a visual reference point or "anchor" that highlights the top and bottom of the letter, thereby enhancing the ability to image the corners at these positions. On the other hand, the not-touching corners, which are somewhere in the middle of the letter rather than anchored at the top or bottom, are more difficult to recall in the image. As such, this aspect of the test may be a more sensitive measure of individual differences in imagery ability.

Judging from the seemingly low error rates, one might suspect that the task is easy, thereby leading to ceiling effects. However, this was not the case. Almost no subjects completed the test without any errors at all and many subjects reported that they found the test difficult. Although the total mean and not-touching mean indicated approximately one error per letter, the subjects' performance on some of the simpler letters (e.g., "L") was often error free, while performance on the more complex letters involved a wide variability in errors.

Additional studies are necessary to further establish the value of this computerized task as a measure of mental imagery ability. It is possible, for instance, that the task taps spatial processing rather than visual processing per se. Future research must focus on validity data to determine

how this task compares to other criterion measures of mental imagery. An earlier study that we conducted on a smaller sample of subjects ($N = 30$) revealed no significant correlation between scores on the computerized task and the visual subscale of the Sheehan (1967) self-report questionnaire. That no significant correlation was found may be attributed to the differences between these two imagery tasks. Objective and subjective measures may not tap the same cognitive processes. For example, the block figure task requires a "literal" imagistic reproduction of a specific stimulus that has been presented to the subject, whereas imaging in response to the open-ended cue stimuli of the Sheehan scale (e.g., "imagine a storefront") involves complex subjective introspection and associative memory processes. The block figure task and many self-report scales may indeed tap very different aspects of mental imaging.

The use and interpretation of this test also should be examined in the context of Ahsen's (1985, 1987) research on vividness versus unvividness. Past studies typically have focused on the determination of vividness as one of the essential features of an individual's imagery ability without fully exploring the function of unvividness. However, Ahsen's work demonstrated that an individual's imagery can be highly variable and idiosyncratic in response to different test stimuli. The oscillation between vivid and unvivid images, as well as the juxtaposition of vivid and unvivid components within a single image, is an important dynamic of image structure and function. Because unvividness may reflect a variety of underlying processes and circumstances (emotional content, associative ideations, historical influences, etc.), it may actively contribute to the holistic construction and purpose of the imagery experience. Paradoxically, unvividness may be vividness in some functional way.

Availability of the Program

For information about the availability of the computer program, write to Joseph Rizziello, c/o Department of Psychology, Rider College, Lawrenceville, New Jersey 08648. PRODOS and MS DOS versions of the program are available.

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