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John T. Friar
University of Iowa

Harve E. Rawson
University of Iowa

Don Lewis
University of Iowa

Effects of Verbal Pretraining on Star Discrimeter Performance with Unique Random Shapes as Stimuli[1]

JOHN T. FRIAR, HARVE E. RAWSON, AND DON LEWIS

Abstract. With two unique sets of random shapes as stimuli, one set for relevant, the other for irrelevant verbal pretraining, and with specially scaled concrete nouns as verbal responses, an experiment was designed as a possible check on Gibson's hypothesis concerning generalization among stimuli in paired-associates learning. Performance on the Star Discrimeter followed verbal pretraining. The errors made on the Star by one of the experimental groups, compared with the errors made by its control, lent some support for the hypothesis; but additional experimentation is needed.

This paper reports a study concerned with the effects of verbal pretraining (VPT) on subsequent Star Discrimeter performance; or more exactly, the effects on a specific aspect of Star performance. Enhanced performance following VPT has been established beyond reasonable doubt, for the general case (Cator, 1955; Macek, 1957; Marshall, 1962; Marshall and Lewis, 1962; McAllister, 1953). The present aim was to check, if possible, on Gibson's (1940, 1942) hypothesis that during the first few trials of paired-associates learning, an increase in generalization among the several stimuli may be expected with an accompanying increase in errors and decrease in correct responses. A study by McCormack (1958) lent some support for the hypothesis provided that the data for only three of the six Star stimuli were taken into account but not if all of the data were left intact.

For those not familiar with the Star Discrimeter, it consists of a six-channeled response unit (as seen in Fig. 1) with a wobble stick which may be moved readily from a center position into any one of the channels. Originally and until recently, six colors of filtered light appeared randomly, one at a time, in the circular opal glass aperture on the stimulus unit. The subject's task was to associate each color with one of the six channels. The number of correct responses as well as the number of errors was recorded for each trial, typically 20 sec. in length.

The decision was made, a few years ago, that at least some of the ambiguities in the data obtained in transfer studies on the Star Discrimeter arose from the fact that the six stimuli, taken in pairs, were not equally discriminable. This point is illustrated in Fig. 2. Consider the three stimuli, A, B, and C. Suppose that they lie along a single continuum at equidistant

[1] The investigation was made in the Psychology Laboratory at the University of Iowa during the summer of 1965 under the general supervision of Professor Lewis. Mr. Friar was an NSF Undergraduate Research Participant while Dr. Rawson of Hanover College, Hanover, Indiana, was an NSF College Teacher Research Participant.

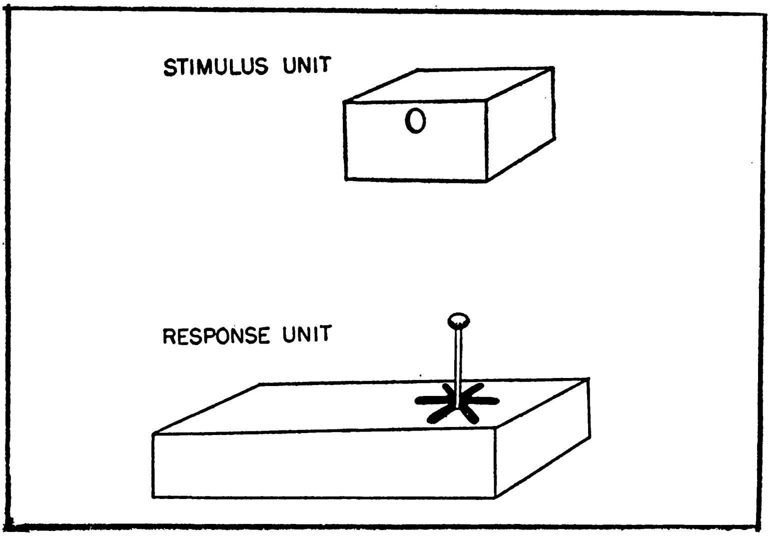


Fig. 1. Schematic representations of the stimulus and response units of the Star Discrimeter.

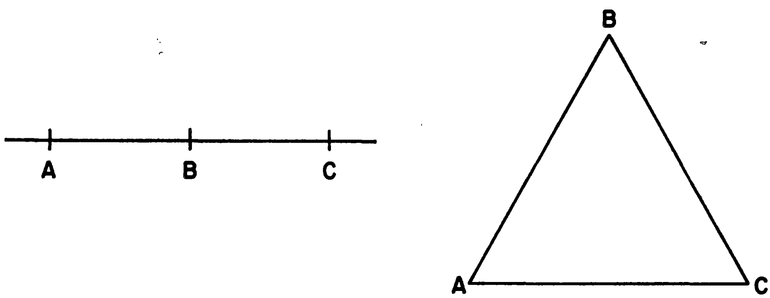


Fig. 2. Schematic representations of the location of three stimuli, A, B, and C, under two different conditions of relative discriminability.

points. Even though pairs AB and BC are equally discriminable, pair AC is clearly more discriminable than either of the other two. What seemed to be needed were three *mutually equally discriminable* (MED) stimuli which, conceptually at least, would lie at the three apexes of an equilateral triangle (as shown at the right). If four stimuli were to meet the MED requirement, they would lie equal distances apart within three-dimensional space. Six MED stimuli, needed for the Star Discrimeter, would lie equal distances apart in five-dimensional hyperspace.

To cut a long story short, random shapes, with 24 sides (points), were generated by Somnapan (1961, 1962) from a single prototype, in accordance with method 8 as described by Attneave and Arnoult (1956). A set of 13 such shapes is shown in Fig. 3. The

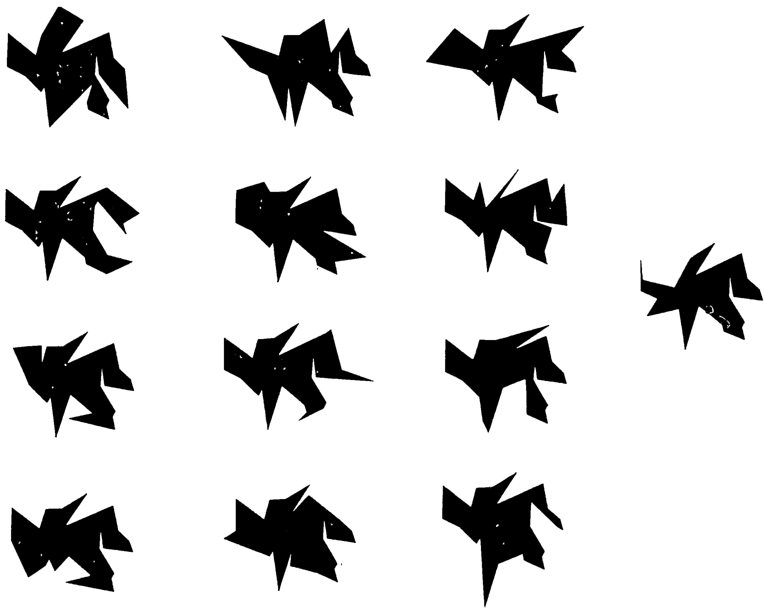


Fig. 3. Thirteen 24-pointed random shapes generated by Somnapan (1961) from a single prototype.

aim was to select the six from these which came closest to meeting the MED requirement. The procedure consisted of obtaining discriminability data for each of the possible pairs. The technique employed is illustrated in Fig. 4 where six shapes are seen, five of them the same and one different. This came to be called the odd-ball method. A subject saw the pattern briefly (for one sec. or less) and then moved a stylus to a position on a response unit to record his choice of the position of the odd-ball. The details of the experiment and of the computer program will be omitted. What the computer did was to select out the six shapes, from all of the possible combinations of six, for which the variance of the discriminability values among them was minimal. The ideal, of course, would be a variance of zero. The six shapes used for relevant VPT are seen in the left column in Fig. 5. The mean discriminability value for them was .623, the variance .00268.

After sets of six shapes which approached the MED ideal had been identified, the several numbers seemed at times to differ greatly in association value (or meaningfulness). Consequently, steps were taken to assess the meaningfulness of all of the shapes that had been generated. This led to the values shown in the second column in the figure labeled connotative strength (*cs*).

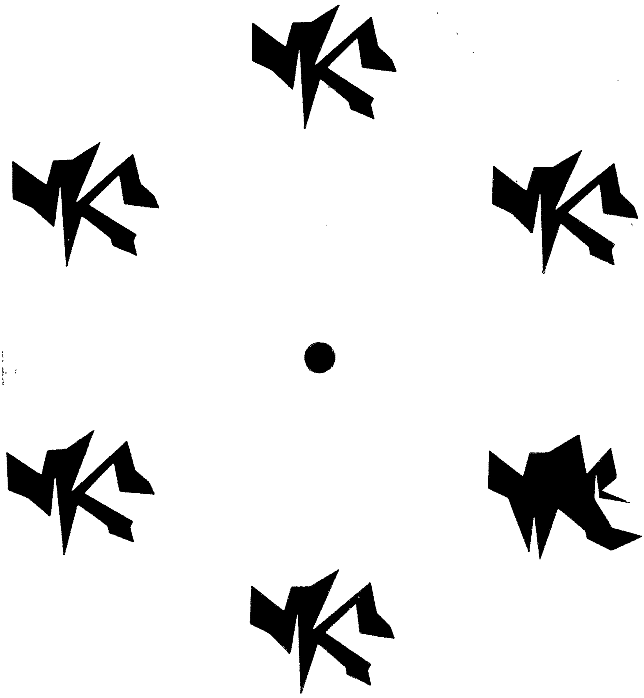


Fig. 4 An illustration of the patterning of a pair of random shapes in the discrimination task. In this case, the "odd-ball" is in position 3 (counting clockwise from the top). In a pairing with some other shape, it could have been in any one of the other five positions.

It also led to the possibility of choosing the two lists of nouns and their corresponding *da* value where *da* stands for descriptive appropriateness.

As a first step, a single shape would be shown to groups of undergraduate students for a period of 30 sec. At the end of this period, each observer wrote down a single concrete noun which seemed best to describe the shape. Such responses to the shapes were almost completely independent inasmuch as no person responded to more than two of the shapes. In this way, 33 concrete nouns were obtained for each of 39 shapes. An interval scaling procedure was next employed to obtain a *da* value for each noun in relation to its corresponding shape. The judgment was made in terms of five intervals or categories ranging from 1 (far-fetched or incongruous) to 5 (especially suitable or just the thing). The average of the 33 *da* values for each shape was taken as the *cs* of the shape. Further details are given by Lewis and Boehnert (1965).

The shapes seen in Fig. 5 were the ones used for relevant VPT and also for the later task on the Star Discrimeter. The

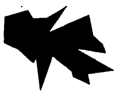
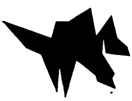
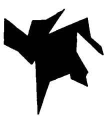
Shape	Connotative Strength	High da Word	da Value	Low da Word	da Value
	2.41	Eagle	2.94	Tree	1.41
	2.47	Painting	3.69	Fan	1.64
	2.51	Rocket	3.24	Dog	1.59
	2.44	Camel	3.37	Bear	1.50
	2.49	Dancer	3.55	Arrows	1.83
	2.53	Bat	3.00	Elephant	1.56

Fig. 5 The six shapes used for relevant pretraining together with their associated nouns of high and of low descriptive appropriateness.

values of *cs* are approximately the same. There were two groups which had relevant pretraining, one of them labeled Rel. High *da*, the other Rel. Low *do*. The two sets of six nouns are listed along with their individual *da* values. Note, for example, that the topmost shape with a *cs* value of 2.41 was paired with nouns eagle and tree, the *da* values for which were 2.94 and 1.41.

The stimuli and two sets of six nouns used for irrelevant VPT are shown in Fig. 6. The six shapes were selected by the computer from discriminability data on another set of 13 shapes generated from the same prototype by Somnapan. It will be seen that the shapes are oriented differently from those in Fig. 5. Their mean discriminability value was .693, their variance .00242. As indicated in Fig. 6, there were two irrelevant (control) groups: Irrel. High *da* and Irrel. Low *da*.

All groups were given five VPT trials, a trial being defined as the presentation of all of the six shape-noun pairs. The order

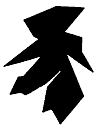
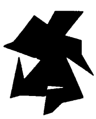
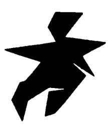
Shape	*Connotative Strength*	*High da Word*	*da Value*	*Low da Word*	*da Value*
	2.12	Mouth	3.15	Elephant	1.13
	2.34	Pattern	2.98	Space	1.32
	2.55	Puppet	3.11	Pyramid	1.25
	2.30	Warrior	3.22	Skyline	1.32
	2.55	Windmill	3.39	Octopus	1.50
	2.44	Man	3.22	Eagle	1.68

Fig. 6. The six shapes used for irrelevant pretraining together with their associated nouns of high and of low descriptive appropriateness .

of the pairs differed from trial to trial, to obviate serial learning. Response familiarization, that is, the memorization of the six response nouns, preceded the first trial. The number of trials was limited to five with the aim of maximizing the possibility of the occurrence of generalization among the six stimuli for the two relevant groups.

As already stated, there were two relevant VPT groups with corresponding irrelevant controls. The responses (nouns) for one of the groups had high *da* values; for the other low *da* values. Guesses could be made but no confident prediction as to whether the responses with low *da* values would lead to greater generalization than those with high *da* values.

Method

Subjects. The Ss were 56 University students. All of them were naive with respect to the purpose of the experiment and the procedural details. No S had previously participated in an experiment involving random shapes. There were five males and nine females in each of four groups.

Apparatus. A Dunning Animatic Projector was used for VPT. This projector, which utilizes 16 mm. filmstrips, is especially suitable for the anticipation method of paired-associates learning.

The external features of the Star Discrimeter have already been described. The only additional thing that needs to be said is that a 50-point stepping switch was energized to bring up a new shape whenever a correct response was made.

Procedure. The same VPT procedures were used for all four groups. The instructions explained that S was to learn to associate six different shapes with six different words. Response familiarization was achieved by giving S a card listing the six nouns to be used for his particular group. Memorization of these six nouns occurred before the first paired-associates trial. After the first trial (the inspection trial) S was instructed to speak the appropriate noun distinctly while the shape alone was on the screen. Correct responses and errors were tabulated.

Instructions for the motor task were the same for all groups except that the relevant VPT groups were told that the six shapes would be the same as those used before, whereas the irrelevant groups were told that they would be different. As already indicated, the trials were 20 sec. in length with inter-trial intervals of 10 sec. Number of correct responses and number of errors were recorded for each trial. S continued practice until reaching the criterion of zero errors and a minimum of six correct responses on a single trial. To retard rate of learning, Ss were told to use their non-preferred hand in manipulating the wobble stick.

Results

Trials to Criterion on the Star. Even though the main purpose of the experiment was not to determine whether relevant VPT facilitates subsequent performance on the Star Discrimeter, it will be of interest to see what actually happened. The pertinent information is given in the two parts of Table 1. At the top, the means of number of trials required by the four groups to reach the criterion are listed in the second column. Their order of magnitude is as expected, with the value for the Irrel. High *da* greater than that for the Rel. High *da* and Irrel. Low *da* greater than that for the Rel. Low *da*. The ranges for the individual S in the four groups are also listed in the upper part of the table.

Table 1. Trials to Criterion* on Star Discrimeter.

Group	Mean Number of Trials	Range
Rel. High *da*	32.57	13 – 56
Rel. Low *da*	38.64	12 – 57
Irrel. High *da*	43.50	18 – 68
Irrel. Low *da*	46.86	18 – 72

*Zero errors and at least 6 correct responses during a 20-sec. trial.

Significance of Differences between designated pairs of means.

Irrel. High *da* & Rel. High *da*	10.93	2.11	$<.05$
Irrel. Low *da* & Rel. Low *da*	8.22	1.55	$>.05$
Rel. Low *da* & Rel. High *da*	6.07	1.17	$>.05$
Irrel. Low *da* & Irrel. High *da*	3.36	.64	$>.05$

*$df = 26$

The significance of the differences between designated pairs of means is shown in the lower part of the table. The only difference that may be said to have statistical significance is the one between the two high *da* groups. However, the fact that the differences have magnitudes in the direction expected, the lack of significance of the second and third differences may be attributed, at least in part, to the very great ranges of the values for the 14 individuals in each of the groups.

Error Data on the Star. Because the Ss attained the performance criterion in widely differing numbers of trials, the error data were Vincentized (Hilgard, 1938) and were "justly weighted" in accordance with the procedure recommended by Hull (1939, p. 245). The justly weighted Vincent values are herein referred to as Hullian Error Quotients.

The mean quotients for the Rel. High *da* and Irrel. High *da* groups are plotted against tenths of trials (Vincent trials) in Fig. 7. Contrary to any prediction that might have been made on the basis of Gibson's hypothesis, the trend line for the Irrel. High *da* group lies consistently above that for the Rel. High *da* group.

The means of the error quotients for the two low *da* groups are plotted against tenths of trials in Fig. 8. In this case, the trend lines over the first three tenths fall as might have been predicted from Gibson's hypothesis. The difference during the 1st tenth of the practice trials is noticeably large (6.9 *vs.* 5.7). An application of the t test showed it to be significant around the .03 level ($t = 2.26$ with 26 df).

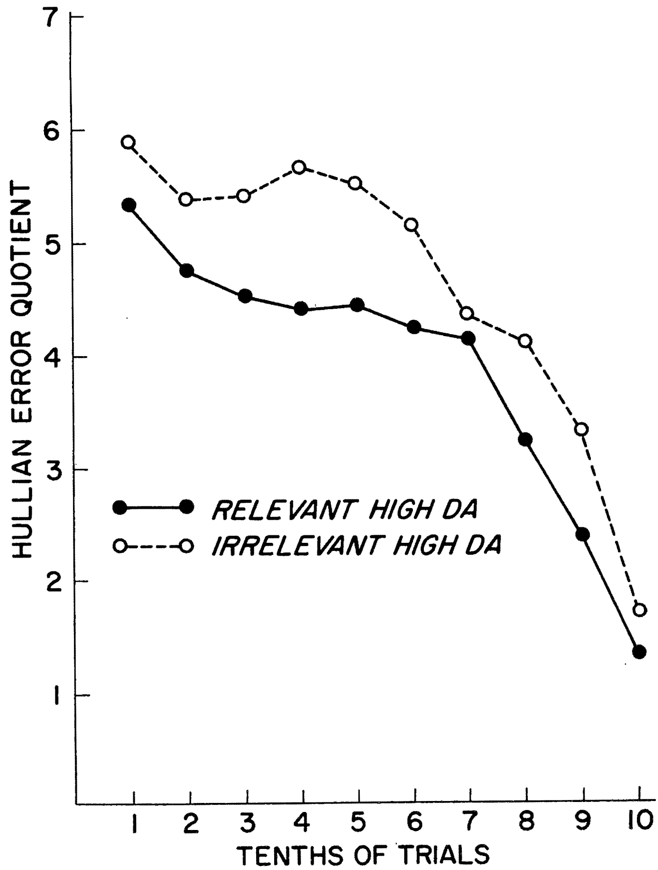


Fig. 7. Vincentized error curves for performance on the Star Discrimeter by the two high *da* groups.

CONCLUSIONS

The following conclusions seem warranted: 1) Relevant verbal pretraining is facilitative of subsequent performance on the Star Discrimeter even when as few as five pretraining trials are given. 2) The greater number of errors displayed in Fig. 8 for the Rel. Low *da* group may have arisen from an increase in generalization among the relevant stimuli during verbal pretraining, but further experimental substantiation is needed especially through the use of varying numbers of pretraining trials. 3) Gibson's hypothesis still lacks *unequivocal* empirical support but should not yet be abandoned in view of its theoretical plausibility.

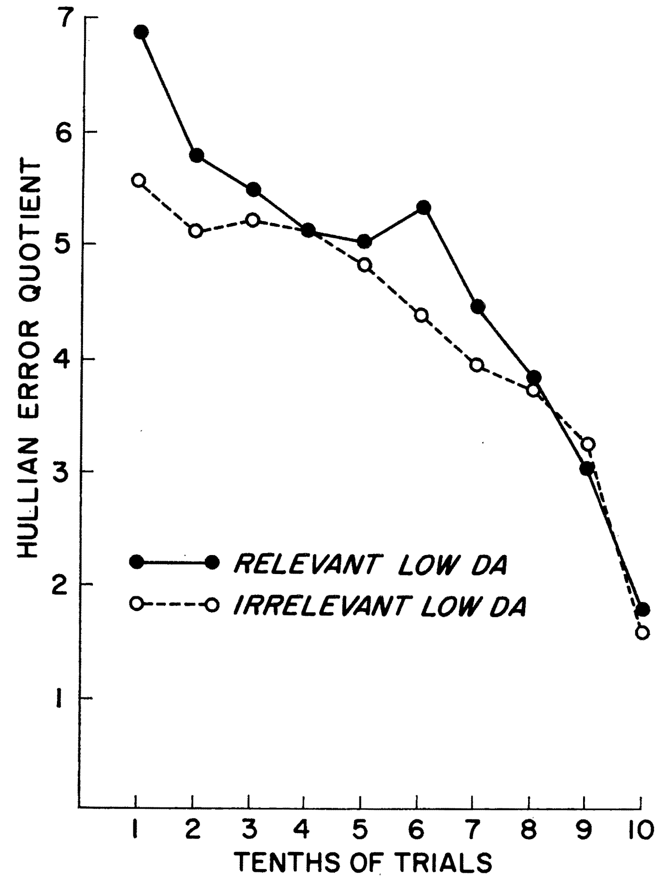


Fig. 8. Vincentized error curves for performance on the Star Discrimeter by the two low da groups.

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Selected Problems in Measuring Extrinsic Religious Values

JOHN R. TISDALE AND LARRY WALRATH

Abstract. This study deals with problems which have arisen in attempts to measure Allport's construct, extrinsically valued religion. Results here tend not to confirm the homogeneity reported for Wilson's Extrinsic Religious Values Scale, nor has a revised form correlated well enough with the original to be considered equivalent. It is concluded that if the construct is basically valid, then considerable work remains to be done on measurement and concurrent definitional revision.

The Extrinsic Religious Values Scale (ERV) was designed by Wilson (1960) to measure Allport's construct, extrinsically valued religion (Allport, 1960). To a person with an extrinsic orientation, religious devotion is not valuable in and of itself, but it rather serves such motives as security, social status, or the like. An intrinsically oriented individual, conversely, values religion for its own sake; his religious sentiment is not subservient to segmental needs or desires (Allport, 1960, 1966). The ERV consists of fifteen two-choice items; scores in the extrinsic direction result from responding to either of two types of alternatives:

> One subgroup reflects an allegiance to, and dependence upon the external or institutional structures of the church . . . The other subgroup reflects a utilitarian orientation toward religion, i.e., acceptance of religion as a means. (Wilson, 1960).