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Introduction

The present study was concerned with the role of stimulus generalization in the explanation of responses to stimuli of projective tests, specifically of responses to stimuli of the Rorschach. The general rationale for the study is exemplified by Auld's statement that, "Behavior theory comprises our best set of facts and principles about human behavior and the principle of stimulus generalization from an 'origin situation' is basic to the explanation of the occurrence of responses to both projective test and criterion situations" (Auld, 1954, p. 421). A more specific rationale is provided by Goss and Brownell who hypothesize that:

> Once a complex stimulus or some detail thereof is attended to, previously reinforced responses to that particular stimulus or similar test or extra test stimuli can be expected to occur. Psychodrama arrangements, various features of thematic apperception pictures, doll play materials, and inkblots can be conceived to be of varying degrees of similarity along one or more physical dimensions to extratest stimuli to which Ss have previously responded. Therefore, previously learned responses should be elicited with strengths which are direct functions of such similarity and of strengths of associations between responses and extratest stimuli (Goss and Brownell, 1957, p. 511).

The generalization of responses to visual, auditory, and tactile stimuli, which have been varied along single and multiple dimensions, has been demonstrated in a variety of learning situations with many different responses of rats, dogs, humans of different ages and other organisms (Hull, 1950; Mednick and Freedman, 1960; Moylan, 1957). Such

generalization has also been demonstrated with different types of visual forms of varying degrees of complexity (Hull, 1950; Mednick and Freedman, 1960; Moylan, 1957). However, only Moylan has demonstrated the generalization of a response from training stimuli to a stimulus similar to one of the Rorschach inkblots. He first conditioned a nonsense-syllable response to silhouettes of a bat or of a bird to low or to high levels of association strength after which test stimuli were introduced, one of which was a solid black version of Card V of the Rorschach. On the first test trial, frequencies and speeds of the nonsense-syllable response declined from training to test stimuli only slightly and not significantly; thus there was almost complete generalization of the nonsense syllable response from the training stimuli to the modified Rorschach stimulus. Falling gradients of response speeds appeared on the second and third trials with the gradient for high association strength lying significantly above the gradient for low association strength. These gradients, however, were attributed to the immediate effects of decreasing similarity of stimuli produced by postural and other responses. In turn, the changes in these responses were presumed to be greater with decreasing similarity of training and test stimuli and for low than for high association strengths.

Moylan's flat gradient for the first test trial was interpreted as indicating that when both external and response-produced stimuli of the training and first test trial were the same, responses generalized from training stimuli to the solid black Card V without significant decrements in strength. The stimulus generalization which Goss and Brownell

have postulated, however, is from training situations in which not only the training stimuli but also the external and response-produced stimuli are different from those of the test situations in which responses to Rorschach stimuli occur. Thus, while responses may generalize from training to test stimuli when the external and response-produced stimuli of the training and test situations are the same, conceivably such generalizations would not occur when the external and response-produced stimuli of the test situations also differ from those of the training situations. The objective of this study was, therefore, to determine whether a response would generalize from a training stimulus to both Card V of the Rorschach and to Moylan's solid black version of that card when the external and response-produced stimuli of the test situation also differ from those of the training situation. Should such generalization occur, Goss and Brownell's stimulus generalization hypothesis of the origin of many responses to Rorschach stimuli would receive even stronger support than that offered by Moylan's findings.

Method

Experimental design. As shown in Table 1, the training phase for the experimental groups involved strengthening of speeds of responses of "bat" or "vec" to the occurrence of a silhouette of a bat. Generalization of the two responses was tested by presenting the training stimulus itself, Moylan's Card V, and Card V of the Rorschach under conditions similar to those of the conventional administration of the Rorschach test.

The "bat" response was used to obtain information on the generalization of a familiar response which, because of Ss' previous experience in labeling similar stimuli as a "bat," was expected to have some initial association with the silhouette. The "vec" response was less familiar and had no previous association with the silhouette or similar stimuli. This response was included to obtain information on the generalization of a response which had no initial association with the silhouette and which, in both training and test phases, presumably had to compete with "bat," "bird," and other responses which might have generalized from social stimuli to both the training stimulus and test stimuli.

The test situation differed from the training situation with respect to the features of the room in which generalization was tested, the appearance of the Rorschach cards preceding the generalization stimuli, and the stimuli produced by responses to the four Rorschach cards as opposed to those produced by the "bat" or "vec" training responses.

Table 1

Summary of Experimental Design

Training		Stimuli for Test of Generalization		
Stimulus	Response	Bat Silhouette	Moylan's Solid Black Card V	Card V of the Rorschach
Bat Silhouette	"Bat"	20*	20	20
Bat Silhouette	"Vec"	20	20	20
White Circle	"Bat"	10	10	10
White Circle	"Vec"	10	10	10

* Number of Ss in each group of the test for generalization

For the conditions in which the training and test stimuli were the same, only the situational and response-produced stimuli of the training and test phases presumably differed. For the conditions with Moylan's Card V or Card V of the Rorschach, the test stimuli as well as the situational and response-produced stimuli presumably differed from those of the training phase.

The control group, in which there was no experimental exposure to the bat silhouette, served as a baseline for any occurrences of "bat" responses to test stimuli due to generalizations based on pre-experimentally established associations between various social stimuli and that response.

The Ss of this group were divided into two subgroups. The training phase for these groups involved the strengthening of "bat" or "vec" responses to a white circle. By means of this control, all factors in the training phase, except the association of "bat" or "vec" to the silhouette, would be the same for both experimental and control groups.

Stimuli and responses. For the experimental groups, the stimulus of the training phase was a black silhouette of a bat with outspread wings on a white background. This figure was approximately the size of the inkblot on Card V of the Rorschach. The white circle stimulus for the control subgroups was 2 in. in diameter; the background was black.

For both experimental and control groups the stimuli for the test of generalization were the bat silhouette, the inkblot of Card V, and Moylan's solid black version of that inkblot. Ratings of Moylan's

judges established that the latter stimulus was on a continuum of decreasing similarity to the bat silhouette. Because Card V of the Rorschach was shaded, this stimulus was considered no more similar and perhaps less similar to the training stimulus than the solid black version. The first four cards of the Rorschach were also used. "Bat" and "vec," as noted above, were the responses.

Apparatus and rooms. During the training phase, the bat silhouette was presented by means of a tachistoscope into which Ss looked continuously. The intervals between presentations of the stimulus and the beginning of S's response of "bat" or "vec" were timed by an electronic timer (Hunter Klockounter) and a Wichita voice key. Activation of the voice key by the beginning of Ss' responses stopped the timer and turned off the light in the tachistoscope.

The intervals between successive presentations of the stimulus involved repititions of the randomly determined sequence of 10, 20, 15, 20, 15, and 10 sec. These intervals and the presentation of the stimulus were controlled mechanically by a series of cams and a micro-switch. The cams were cut at three different distances along the edge of a circular metal disc. The disc was rotated by a one r.p.m. electric motor so that the cams activated a micro-switch at intervals of 10, 15, or 20 sec. In turn, the micro-switch turned on the light which presented the stimulus.

The room in which the tachistoscope was placed was lit by a small lamp in the corner which threw enough light so that Ss could get to the

tachistoscope and seat themselves without trouble. An electric fan, which ran continuously, masked noises from the micro-switch and the voice key in the adjacent room.

The test phase was carried out in an adjacent room where E and S were seated on opposite sides of a desk positioned in about the middle of the room. In order to assure uniform presentation of the four Rorschach cards, and of the test stimuli which succeeded them, each was placed from above onto a small wooden stand. The cards rested on the upper surface of the stand which was approximately 45° from the vertical. A micro-switch protruded from an opening in the middle of the upper surface so that when the card came to rest on the surface the micro-switch was activated. Activation of the micro-switch started the timer which was stopped when S's response activated the voice key.

Procedure for training. With the same E present in both the training and test phases or even associated with those phases it seemed possible that Ss might have "hunches" that the same responses ("bat" or "vec") were to be given in both situations. In order to reduce the likelihood of such response-mediated generalization, the Ss did not see E until they had left the room in which the training phase was administered and were leaving what they had been told was a finished experiment.

This was accomplished by guiding Ss to the room of the training phase by means of a series of signs and a light and, following their entry into the room for the training phase, by directing and instructing

Ss by means of tape-recorded directions. Specifically, as Ss approached the area of the training phase room, they encountered signs which gave the identifying label (WS-1) of the experiment and led them in the proper direction. Upon reaching and turning the corner into the hallway along which the room was located, Ss encountered a set of instructions which told them that, upon seeing a red light over the door of the room go on, they were to enter, seat themselves, and await further instructions. Once Ss were seated in front of the tachistoscope, further instructions were piped into the room by a loudspeaker. Appropriate instructions for each condition (see Appendix) had been recorded in a woman's voice. They were played from a tape recorder in the test room. These instructions were turned on when E, looking through a one-way vision screen, saw that an S was seated in front of the tachistoscope.

Following the instructions Ss learned either "bat" or "vec" as a response to either the bat silhouette or white circle to asymptotic response latencies. Asymptotic latencies were defined as five successive responses all within a range of 0.50 sec. and with a difference between the first and the last of those latencies of no more than 0.25 sec. When Ss had reached asymptotic latencies, the experiment was terminated by the sounding of a loud buzzer which, they had been instructed, would be the signal that they had completed the experiment and could leave. During this phase, E sat in the adjacent test room where he recorded response latencies and manually reset the timer and voice key after each trial.

Procedure for testing. After Ss had left the training room and had walked out to the end of the hallway, they were approached by E and asked if they could spare five minutes more to serve on an experiment he was conducting in the test room and for which Ss were needed. They were then taken to the adjacent room and seated. While E was preparing the apparatus for the test phase, he explained that the experiment in which S had just served was being run by another student who had arranged things automatically so that she could be away from the department and run Ss at the same time. The Ss were given essentially standard instructions for the Rorschach (see Appendix). They were then shown the first four inkblots of the Rorschach in their regular order. All four inkblots were achromatic, the red parts of Cards II and III having been photographically reproduced in black. For one-third of the Ss, the fifth stimulus was the bat training stimulus, for another one-third it was Moylan's Card V, and for the remaining one-third it was Card V of the Rorschach. In order to insure greater uniformity of the conditions and duration of presentation, and of the up-down, left-right position of each inkblot, E placed each card on the wooden stand from the top and removed it immediately after the first response. Removal of the card immediately after the first response controlled for differences in numbers of responses to blots preceding the test stimuli.

The response measures for these groups trained with "vec" were frequencies of "vec," "bat," and other responses, and latencies of those responses. The measures for the groups trained with "bat" and for the

three groups without prior training to the bat silhouette were frequencies of "bat" and other responses and latencies of those responses.

Results

Strengthening of "Bat" and "Vec" Responses to Training Stimuli.

The asymptotic strength of the association between the "bat" or "vec" response and the bat silhouette or white circle stimuli during the training phase was determined individually for each S of each of the 12 groups. Shown in the first two columns of Table 2 are means and standard deviations of numbers of trials required by Ss in each group to reach the defined asymptote of five successive latencies all within a range of 0.50 sec., with a difference between the first and last of those latencies of no more than 0.25 sec.

Table 3 summarizes the analysis of variance for differences among means of trials to asymptotic levels. None of the Fs reached the .05 level of significance; therefore, the 12 groups were considered homogeneous with respect to trials to asymptotic levels.

Table 2 also shows means and standard deviations of response speeds (reciprocals of the latencies) for each group for each of the five asymptotic trials separately and averaged over these trials. Table 4 shows the analysis of variance for differences among means of response speeds during the five asymptotic trials. The only significant F indicated that the mean speed of 2.69 for the "bat" response was greater than the mean speed of 2.54 for the "vec" response.

Test for Generalization of the "Vec" and "Bat" Response.

Frequency of "bat" responses. Generalization of the "bat" or "vec" response to the test stimuli was measured by frequency of the

Table 2

Means and Standard Deviations of Trials to Asymptotic Levels and of Speeds of Responses to Training Stimuli on each of Five Asymptotic Trials and Averaged over the Five Asymptotic Trials

Training Group	Trials to Asymptote		Speeds (1/sec.) on Asymptotic Trials										Average for Trials 1-5	
			1		2		3		4		5			
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Ba-Ba-T*	17.15	10.89	2.65	.22	2.71	.26	2.69	.30	2.67	.26	2.68	.28	2.68	.26
Ba-Ba-MV	16.10	8.67	2.74	.30	2.72	.33	2.72	.32	2.73	.28	2.77	.26	2.74	.30
Ba-Ba-V	18.80	9.96	2.73	.30	2.68	.30	2.69	.33	2.66	.35	2.73	.33	2.70	.32
Ba-Ve-T	17.70	8.58	2.60	.36	2.60	.36	2.65	.39	2.68	.40	2.67	.37	2.64	.36
Ba-Ve-MV	20.65	10.95	2.42	.22	2.41	.24	2.39	.22	2.47	.26	2.43	.24	2.42	.24
Ba-Ve-V	23.70	12.29	2.52	.30	2.55	.33	2.46	.28	2.49	.32	2.52	.30	2.51	.31
O-Ba-T	17.70	9.61	2.56	.30	2.58	.28	2.58	.33	2.59	.30	2.53	.30	2.56	.30
O-Ba-MV	16.60	8.47	2.89	.49	2.72	.30	2.77	.37	2.80	.35	2.80	.41	2.79	.38
O-Ba-V	17.40	5.14	2.62	.30	2.65	.28	2.60	.33	2.66	.28	2.66	.32	2.64	.30
O-Ve-T	19.50	13.75	2.58	.28	2.59	.20	2.63	.28	2.58	.24	2.56	.24	2.59	.25
O-Ve-MV	18.10	7.75	2.61	.35	2.62	.46	2.63	.39	2.58	.39	2.57	.36	2.60	.39
O-Ve-V	16.60	5.79	2.56	.28	2.58	.28	2.52	.26	2.57	.32	2.58	.32	2.56	.28

* The order is in terms of training stimuli (Bat Silhouette or White Circle, indicated O), training responses ("Bat" or "Vec"), and generalization stimuli (T indicates Bat Silhouette, MV indicates Moylan's card V, and V indicates card V of the Rorschach).

Table 3

Analysis of Variance of the Number of Trials to Asymptote in the Training Phase

Source	Trials to Asymptote			
	df	SS	MS	F
(A) Training Stim.	1	74.66	74.66	.76
(B) Training Resp.	1	186.05	186.05	1.89
(C) Test Stim.	2	136.74	68.37	.70
AxB	1	152.15	152.15	1.55
AxC	2	216.72	108.36	1.10
BxC	2	59.34	29.67	.30
AxBxC	2	75.47	37.74	.38
Error	168	16485.20	98.13	
Total	179	17386.33		

Table 4

Analysis of Variance of Speeds of Response over the Asymptotic Trials in the Training Phase

Source	Response Speeds over Asymptotic Trials			
	df	SS	MS	F
Between Ss	179	81.58		
(A) Training Stim.	1	.02	.02	.004
(B) Training Resp.	1	5.01	5.01	11.65**
(C) Test Stim.	2	.13	.07	.016
AxB	1	.49	.49	1.14
AxC	2	1.36	.68	1.58
BxC	2	2.39	1.20	2.79
AxBxC	2	.01	.005	.011
Error (between)	168	72.17	.43	
Within Ss	720	9.91		
(D) Asymptotic Tr.	4	.03	.007	.50
AxD	4	.04	.01	.71
BxD	4	.04	.01	.71
CxD	8	.22	.027	1.93
AxBxD	4	.07	.018	1.28
AxCxD	8	.12	.015	1.07
BxCxD	8	.11	.015	1.07
AxBxCxD	8	.09	.01	.71
Error (within)	672	9.19	.014	
Total	899	91.49		

** Significant at the .01 level

occurrences of these responses to the test stimuli and by speed of these and other overt responses to the test stimuli. However, no S who had learned "vec" as a response, either to the bat silhouette or to the white circle, responded to any of the three test stimuli with "vec." Table 5 shows both frequencies of responses of "bat" and all responses other than "bat" but not including "vec," for each of the 12 combinations of training stimuli, training responses, and generalization stimuli. Illustrative of the responses other than "bat" which occurred are responses of "bird," "butterfly," and "moth" (see Appendix). Differences among these frequencies were tested by the Sutcliffe--X^2 procedure and are shown in Table 6.

Of the 120 Ss trained with the bat silhouette, 60 responded to the test stimuli by saying "bat" and 60 made some other response. Of the 60 trained with the white circle, 43 responded with "bat" and 17 made some other response. The X^2 for Training Stimuli was significant at the .01 level, thus indicating that Ss trained with the bat silhouette were less likely to respond to the test stimuli with "bat" than Ss trained with the white circle. Whether the bat silhouette or the white circle was the training stimulus, essentially the same proportion of responses of "bat" occurred with the bat silhouette as the generalization stimulus. Training with the bat silhouette led to proportionately fewer "bat" responses to Moylan's Card V and to Card V of the Rorschach than did training with the white circle. Thus, this difference in proportion was the basis for the significant X^2 for Training Stimulus. However, the interaction of Training Stimuli and Generalization Stimuli was not significant.

Table 5

Type and Frequency of Occurrence of Responses to the Generalization Stimulus for All Subjects in Each Training Group

Training Conditions		Response to	Generalization Stimulus			
Stimulus	Response	Test Stimulus	Bat Silhouette	Moylan's V	Rorschach V	Total
Bat	Bat	Bat	18	4	8	30
		Not Bat	2	16	12	30
Bat	Vee	Bat	18	7	5	30
		Not Bat	2	13	15	30
White Circle	Bat	Bat	9	6	5	20
		Not Bat	1	4	5	10
White Circle	Vee	Bat	10	5	8	23
		Not Bat	0	5	2	7
	Total	Bat	55	22	26	103
		Not Bat	5	38	34	77

Table 6

Summary of Sutcliffe--X^2 for Frequency of "Bat" Responses in the Test for Generalization

Source	X^2	df
(A) Training Stim.	7.67**	1
(B) Training Resp.	.20	1
(C) Generalization Stim.	44.17**	2
AxB	.42	1
AxC	2.35	2
BxC	.15	2
AxBxC	3.24	2

** Significant at the .01 level

The significant $\underline{X}^2$ for Generalization Stimuli indicated that proportionately more responses of "bat" were made to the bat silhouette than to Moylan's Card $\underline{V}$ or to Card $\underline{V}$ of the Rorschach. None of the remaining $\underline{X}^2$s was significant, thus indicating that neither training responses nor the interactions of the three variables had significant effects on frequencies of occurrence of "bat" or other responses.

Response speed. Whether $\underline{S}$s responded to generalization stimuli with "bat" or some other name, the latency of the response which occurred on each stimulus presentation was recorded and converted to response speed. Means and standard deviations of response speeds to each of the three generalization stimuli for each of the four combinations of training stimuli and training responses are presented in Table 7.

Differences among these means were tested by the analysis of variance summarized in Table 8. Only two $\underline{F}$s were significant. The $\underline{F}$ for Generalization Stimuli indicated that the mean speed of 2.04 for responses to the bat silhouette was greater than the mean speeds of 0.72 and 0.97 for responses to Moylan's Card $\underline{V}$ and Card $\underline{V}$ of the Rorschach, respectively.

The significant $\underline{F}$ for the interaction of Training Stimuli, Training Response, and Generalization Stimuli reflected two features of the relationships among the 12 means. The first feature was variations among the four combinations of training stimuli and training responses in differences between decrements in speeds of responses to the bat silhouette and to Moylan's Card $\underline{V}$. Diminishing differences occurred

Table 7

Means and Standard Deviations of Speeds of Responses to the First Four Stimuli Used in the Test Phase, to the Generalization Stimuli, and Averaged over the Five Test Stimuli

Training Group	First Four Stimuli (Rorschach Cards)								Generalization Stimuli		Average for Stimuli 1-5	
	1		2		3		4		5			
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Ba-Ba-T	.52	.32	1.02	1.39	.66	.82	.46	.52	2.29	2.34	.99	1.07
Ba-Ba-MV	.48	.48	1.06	1.91	.39	.30	.37	.28	.59	.57	.57	.70
Ba-Ba-V	.43	.33	.51	.41	.38	.34	.37	.36	.58	.77	.45	.44
Ba-Ve-T	.35	.34	.43	.68	.29	.24	.30	.22	1.39	1.35	.55	.56
Ba-Ve-MV	.98	1.54	.82	1.30	.56	.54	.48	.33	.55	.46	.67	.83
Ba-Ve-V	.72	.73	.77	.77	.61	.75	.38	.28	1.27	2.19	.75	.94
O-Ba-T	.62	.88	.48	.62	.36	.45	.26	.70	1.62	1.88	.66	.90
O-Ba-MV	1.37	1.62	.87	.88	.59	.52	.77	.95	1.61	2.63	1.04	1.32
O-Ba-V	.78	.77	.50	.60	.35	.26	.40	.23	.79	.92	.56	.56
O-Ve-T	.67	1.20	1.46	2.46	.72	.90	.45	.35	3.33	3.28	1.32	1.63
O-Ve-MV	.90	.84	.55	.35	.35	.22	.44	.24	.48	.36	.55	.40
O-Ve-V	.81	1.49	.48	.36	.75	1.13	1.09	1.92	1.34	2.24	.89	1.42

Table 8

Analysis of Variance of Speeds of Response
to Generalization Stimuli Alone

Source	Speeds of Response to Generalization Stimuli Alone			
	df	SS	MS	F
(A) Training Stim.	1	7.01	7.01	3.40
(B) Training Resp.	1	.22	.22	.11
(C) Generalization Stim.	2	59.30	29.65	14.39**
AxB	1	2.10	2.10	1.01
AxC	2	1.73	.87	.42
BxC	2	8.74	4.37	2.12
AxBxC	2	24.21	12.11	5.87**
Error	163	336.37	2.06	
Total	174	439.68		

** Significant at the .01 level

for the training with "vec" as a response to the white circle, for training with "bat" as a response to the bat silhouette, for training with "bat" as a response to the white circle, and for training with "vec" as a response to the bat silhouette. The second feature was that speed of response to Card V of the Rorschach was greater than speed of response to Moylan's Card V for two of these four conditions, less for a third condition, and the same for a fourth condition.

Table 7 also shows speeds of responses to each of the four Rorschach stimuli which, for each of the 12 combinations of conditions, preceded the generalization stimuli. These mean speeds reflect latencies from approximately .40 sec. to 4 sec. Such latencies are lower than those normally reported from Rorschach protocols, and probably reflect several conditions in this experiment which differed from conventional Rorschach administration. These included instructions to respond rapidly, experience in responding rapidly to the prior Rorschach stimuli, and the greater precision and reliability of the latency measures used here.

The first four stimuli and the three generalization stimuli combined was included as a variable in the analysis of variance summarized in Table 9. The significant F for this variable indicated that the mean speeds of responses to the four prior stimuli of .67, .75, .50, and .45, respectively, were significantly less than the mean speed of 1.25 for the three generalization stimuli combined. The increase in response speeds to the bat silhouette as a generalization stimulus relative to speeds of responses to the first four stimuli was greater

Table 9

Analysis of Variance of Speeds of Response over all Five Stimuli Presented in the Test Phase

Source	Speeds of Response to all Five Stimuli Presented in the Test Phase			
	df	SS	MS	F
Between Ss	174	412.02		
(A) Training Stim.	1	5.95	5.95	2.65
(B) Training Resp.	1	.47	.47	.21
(C) Generalization Stim.	2	6.92	3.46	1.54
AxB	1	1.63	1.63	.72
AxC	2	.35	.18	.08
BxC	2	7.79	3.90	1.74
AxBxC	2	24.36	12.18	5.43**
Error (between)	163	364.55	2.24	
Within Ss	647	784.28		
(D) Test Phase Stim.	4	72.79	18.20	17.66**
AxD	4	5.44	1.36	1.32
BxD	4	.77	.19	.18
CxD	8	59.35	7.41	7.19**
AxBxD	4	3.80	.95	.92
AxCxD	8	4.66	.58	.56
BxCxD	8	4.96	.62	.60
AxBxCxD	8	13.61	1.70	1.65
Error (within)	599	618.90	1.03	
Total	821	1196.30		

** Significant at the .01 level

than for Moylan's Card V or for Card V of the Rorschach relative to the first four stimuli. This difference in increments occasioned the significant interaction of response speeds to the first four stimuli and generalization stimuli.

The interaction of Training Stimuli, Training Responses, and Generalization Stimuli was due, in part, to the same relationships among means which gave rise to the interaction among these three variables for just the presentation of the generalization stimuli. Because the speeds of responses to the first four stimuli were included in these means, some further apparent differences in the relationships among the means occurred which seemed random in nature.

Discussion

The present study was concerned with the role of context or contextual stimuli in the generalization of responses from training stimuli to projective test stimuli, specifically, stimuli from or like those of the Rorschach series. Responses of "bat" or "vec" to a bat silhouette were strengthened to asymptotic levels in one context and that stimulus and two similar stimuli were presented in another context to test for generalization of those responses. The different contexts involved differences in appearances of the rooms, in instructions, in the nature of the stimulation immediately prior to presentation of the stimuli to test for generalization, and in characteristics of the apparent Es.

The asymptotic speed with the "bat" response was slightly but significantly higher than that for the "vec" response. Whether these responses were to the bat silhouette or to the white circle, however, made no difference in asymptotic response speeds nor were there any differences in asymptotic speeds among groups subsequently tested with the bat silhouette or with the two similar stimuli, Moylan's Card V or Card V of the Rorschach.

Moylan kept the context of training and the context of the test for generalization as similar as possible. With equivalent contexts, there was essentially complete generalization of the "jex" response from training to test stimuli as measured by frequency and speed of the response.

With the highly dissimilar contexts of the present study there was no generalization of the "vec" response from training to test stimuli. In the new test context, the "vec" response failed to occur, even to the "bat" silhouette, which had been the training stimulus. Moreover, response speeds provided no evidence of generalization as indicated either by faster or by slower speeds than the speeds for white circle controls with either "bat" or "vec" training responses.

There was also no evidence of generalization when frequencies of "bat" response and response speeds of groups trained to respond to the bat silhouette with the "bat" response were compared with frequencies and speeds for groups trained to respond to the white circle with the "bat" response. Thus, with the change of contexts, even further strengthening of the strongest initial response to the bat silhouette was not sufficient to produce generalization either with the training stimulus as a generalization stimulus or with two stimuli similar to the training stimulus as generalization stimuli.

The failure to obtain generalization to test stimuli of either the "vec" or the "bat" response provides indirect support of Hull's hypothesis of generalization based on context or, as he preferred, on incidental or static stimuli. This failure to obtain generalization also provides indirect support of Moylan's suggestion that the falling gradients he obtained on the second and third test trials were due, most immediately, to changes in contextual stimuli which, in turn, were functions of the similarity of training and test stimuli and of the strength of associations between the "jex" response and the training stimuli.

The only indication of any transfer from training to test situations was an apparent reduction in the frequency of "bat" responses to Moylan's Card V and Card V of the Rorschach occasioned by prior training with the bat silhouette. The basis for this possible effect is not known.

More generally, the findings of this study, in conjunction with those of Moylan, suggest that the flat gradients of generalization obtained on the first test trials of many studies of primary stimulus generalization (Hull, 1950; Mednick and Freedman, 1960; Moylan, 1957) are largely independent of variations in the similarity of training and test stimuli. Instead, these gradients are flat because the major stimulus components to which the responses are conditioned, the contextual stimuli, are essentially the same in both training and test situations.

A further implication, when dealing with changes of contextual stimuli, is that gradients of generalization based largely or entirely on similarities between training and test stimuli may not be obtained by training and test procedures which, heretofore, have been conventional for studies of primary stimulus generalization. The apparent requirement is strengthening of a training response to a training stimulus in varied contexts so that the training stimulus is the only common element through all successive acquisition trials for that stimulus-response relationship. Both external and internal components of contextual stimuli should be varied. Generalization of the training

response to the training stimulus and to increasingly dissimilar generalization stimuli should then be tested both in repetitions of the various training contexts and in new contexts.

The present findings, like those of Moylan's, cannot be regarded as positive demonstrations of the hypothesized role of stimulus generalization in projective test behavior, either in general or with Rorschach stimuli. Nor can they be regarded as inconsistent with the Goss and Brownell hypothesis. Any critical test of that hypothesis, it would seem, should involve training in which responses to the bat silhouette or other training stimuli are strengthened in varied contexts. Such training is, of course, more similar to extra-laboratory experiences in which Ss typically learn a common label for all members of particular classes of stimuli, such as silhouettes of bats, regardless of the context in which those stimuli occur.

Summary

This experiment was concerned with the role of context or contextual stimuli in the generalization of responses from training stimuli to projective test stimuli, specifically, Rorschach and Rorschach-like stimuli. There were two phases to the experiment, a training phase and a test phase, and the switch from one phase to the other involved gross changes in internal and external contextual stimuli. Whether or not responses learned in the training phase would generalize to the training stimulus and to similar stimuli in the test phase under such conditions was investigated in an attempt to throw further light on Moylan's previous study, in which generalization from training to test stimuli, without contextual change, was found to be almost perfect.

The Ss were 180 undergraduates primarily from the introductory psychology course at the University of Massachusetts. The training stimuli were a bat silhouette for experimental Ss, and a white circle for control Ss. The generalization stimuli were the bat silhouette, Moylan's solid black version of Card V, and Card V of the Rorschach. The latter two stimuli were on a previously established continuum of decreasing similarity to the bat silhouette. The training phase stimuli were presented tachistoscopically until each S reached asymptotic response latency. In the test phase the four prior stimuli and then one of the three generalization stimuli were presented one at a time in a modification of the standard Rorschach procedure. Both the

particular responses made to these stimuli and response latencies were recorded. These latencies were then transformed to response speeds.

There was no evidence of generalization of the responses learned in training. "Vec" did not occur as a response to any of the three generalization stimuli and there was no evidence of generalization of the "bat" response. Although mean speeds of responses given to Moylan's Card V and to Card V of the Rorschach were below those to the bat silhouette, they were not significantly different from mean speeds of response to the four prior stimuli of the test phase. Also, the mean response speed of Ss trained with the bat silhouette did not differ significantly from that of the controls.

These findings in conjunction with Moylan's suggest that generalization of learned responses is heavily dependent upon contextual stimuli and that the flat gradients often obtained on the first test trials of many studies of primary stimulus generalization are largely independent of similarity of training and test stimuli. Instead, the gradients are due to essential similarities of the contextual stimuli of training and test situations. Moreover since no generalization is likely with gross contextual changes, the strengthening of responses to training stimuli should apparently be carried out in varied contexts so that only the training stimulus itself is common over successive acquisition trials. Generalization should then be tested both in repetitions of training contexts and in new contexts.

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Although the present findings did not demonstrate the role of stimulus generalization in projective test behavior, they are not necessarily inconsistent with the Goss and Brownell hypothesis. A critical test of this hypothesis should involve training in varied contexts which, in turn, would be more similar to most extra-laboratory learning experiences.

Appendix A

Instructions to Ss

Training Phase--Experimental Ss

Hello, please walk over to the chair in front of the black box and sit down. (five second pause) This is a study in verbal reaction time. Please press your face as closely as possible to the hole in the black box and stay alert. When the experiment begins, a light will flash on inside of the box illuminating the figure of a bat with outspread wings. As soon as you see the bat I would like you to say "Bat" ("Vee") in a normal voice as rapidly as you can. When you respond the light will go off and that will be one trial. The light will flash on at different intervals so remain alert but don't try to guess when the light will come on. We will repeat the process for a number of trials and then the experiment will be over.

The experiment is about to begin; please pay attention and remember to say "Bat" ("Vee") as rapidly as you can each time you see the bat. When you hear the buzzer the experiment will be over and you may leave. Thank you.

Training Phase--Control Ss

Hello, please walk over to the chair in front of the black box and sit down. (five second pause) This is a study in verbal reaction time. Please press your face as closely as possible to the hole in

the black box and stay alert. When the experiment begins, a light will flash on inside of the box illuminating a white circle. As soon as you see the circle I would like you to say "Bat" ("Vec") in a normal voice as rapidly as you can. When you respond, the light will go off and that will be one trial. The light will flash on at different intervals, so remain alert but don't try to guess when the light will come on. We will repeat the process for a number of trials and then the experiment will be over.

The experiment is about to begin; please pay attention and remember to say "Bat" ("Vec") as rapidly as you can each time you see the white circle. When you hear the buzzer the experiment will be over and you may leave. Thank you.

Test Phase--All Ss

Please sit down and make yourself comfortable. (pause) I'm doing some research on some inkblots that are similar to the Rorschach inkblots but not identical to them. The Rorschach Test is used widely by clinical psychologists for purposes of personality assessment. It consists of a series of inkblots which remind people of different things when they look at them. I'm interested in some of the responses that college students might give to the blots I have here.

I have five cards which I will present to you one at a time by laying them on the stand in front of you. I would like you to merely say the first thing that the blot reminds you of as soon as it comes into

your head. Please give me just one response per card. After you have responded I will replace the card with another. Any questions?

Appendix B

Response Speeds on Asymptotic Training Trials

Bat - "Bat" - Bat Silhouette*

S	1	2	3	4	5
1	3.05	3.22	3.33	2.99	2.98
2	2.79	2.73	2.72	2.58	2.75
3	2.62	2.82	2.70	2.52	2.64
4	2.78	2.78	2.65	2.63	2.59
5	3.13	3.10	3.16	3.08	3.34
6	2.48	2.56	2.61	2.55	2.47
7	2.64	2.69	2.78	2.75	2.76
8	2.65	3.02	2.72	2.72	2.71
9	2.31	2.24	2.07	2.08	2.19
10	2.54	2.54	2.63	2.71	2.45
11	2.65	2.70	2.94	2.70	2.74
12	2.61	2.87	2.72	2.85	2.73
13	2.54	2.52	2.52	2.50	2.50
14	2.26	2.25	2.15	2.27	2.18
15	2.23	2.23	2.32	2.47	2.31
16	2.75	2.87	2.65	2.56	2.89
17	2.83	2.96	2.73	2.72	3.01
18	2.86	2.86	2.82	3.10	2.99
19	2.58	2.64	2.75	2.99	2.62
20	2.67	2.69	2.92	2.56	2.76

Response Speeds to Generalization Stimulus and Qualitative Response

1	
.92	bat
.94	bat
1.01	bat
1.26	bat
.52	bat
6.99	bat
1.51	bat
8.13	bat
2.07	bat
.14	bat
2.29	bat
4.65	bat
4.74	bat
1.03	bat
.26	butterfly
4.76	bat
.68	bat
2.88	bat
.86	bat
.10	head

Bat - "Bat" - Moylan's Card V

S	1	2	3	4	5
1	2.18	2.27	2.28	2.99	2.99
2	2.56	2.77	2.69	2.47	2.66
3	2.60	2.54	2.75	2.57	2.67
4	3.08	3.30	3.12	2.96	3.23
5	2.77	2.61	2.71	2.47	2.64
6	3.06	3.28	2.99	3.03	2.84
7	2.87	2.82	2.92	3.04	2.79
8	2.85	2.71	2.95	2.75	3.00
9	2.44	2.46	2.71	2.55	2.51
10	2.65	2.67	2.49	2.42	2.74
11	3.14	3.12	3.01	3.27	2.99
12	2.55	2.29	2.54	2.35	2.53
13	2.60	2.61	2.66	2.65	2.77
14	2.23	2.27	2.07	2.31	2.27
15	2.96	2.85	3.00	3.23	3.03
16	2.40	2.24	2.14	2.38	2.33
17	3.34	2.81	3.15	2.86	3.07
18	2.65	2.91	2.79	2.69	2.52
19	2.89	2.65	2.54	2.82	3.01
20	2.90	3.21	2.98	2.72	2.87

1	
.78	butterfly
.22	butterfly
.48	moth
.59	butterfly
.09	butterfly
.59	bat
1.64	bird
1.02	bat
.23	butterfly
.07	butterfly
.28	bird
.10	bird
1.19	bat
.49	insect
.30	moth
.86	butterfly
2.26	bat
.17	moth
.14	insect
.23	bird

* Groups are identified in terms of Training Stimulus, Training Response, and Generalization Stimulus.

Response Speeds on Asymptotic Training Trials

Response Speeds to Generalization Stimulus and Qualitative Response

Bat - "Bat" - Card V of Rorschach

S	1	2	3	4	5	1	
1	2.62	2.50	2.69	2.55	2.52	.35	butterfly
2	2.44	2.28	2.25	2.38	2.34	.50	butterfly
3	2.92	2.87	2.82	2.86	2.95	.32	lion
4	2.65	2.54	2.56	2.81	2.56	.68	bird
5	2.60	2.62	2.62	2.84	2.65	.23	bat
6	2.29	2.33	2.43	2.30	2.31	.12	donkey
7	3.05	3.14	3.16	3.13	3.16	.84	bat
8	2.48	2.56	2.61	2.38	2.43	.13	bat
9	2.99	2.82	2.75	2.71	2.73	.59	butterfly
10	2.81	3.02	2.77	2.73	2.97	.26	butterfly
11	2.96	2.91	2.94	2.64	3.10	2.57	bat
12	2.75	2.59	2.60	2.76	2.80	.58	bat
13	3.18	2.86	2.90	2.86	3.05	.34	bat
14	2.17	2.08	2.15	1.99	2.18	.07	butterfly
15	2.92	2.75	2.74	2.91	2.94	.32	butterfly
16	3.21	3.12	3.56	3.40	3.32	.14	moth
17	2.91	3.00	3.03	3.02	3.13	.48	butterfly
18	2.74	2.73	2.54	2.42	2.59	.08	butterfly
19	2.46	2.36	2.33	2.23	2.44	.03	bat
20	2.42	2.45	2.40	2.26	2.49	2.93	bat

Bat - "Vec" - Bat Silhouette

S	1	2	3	4	5	1	
1	2.48	2.71	2.49	2.55	2.56	.62	bat
2	2.61	2.80	2.80	3.00	2.77	3.44	bat
3	2.71	2.61	2.74	2.73	2.85	.46	bat
4	2.96	2.68	2.92	2.68	2.98	.54	bat
5	2.33	2.27	2.23	2.34	2.36	1.64	bat
6	3.09	2.97	2.93	3.22	3.17	1.16	bat
7	2.30	2.43	2.24	2.27	2.38	.48	bat
8	1.95	1.96	1.96	1.95	1.98	.72	bat
9	3.16	3.12	3.23	3.15	3.30	1.20	bat
10	2.96	2.79	3.09	3.21	3.00	3.28	bat
11	2.20	2.19	2.21	2.36	2.24	1.60	bat
12	2.48	2.48	2.54	2.57	2.48	.47	bat
13	2.16	2.36	2.26	2.35	2.14	.40	bat
14	3.19	3.12	3.60	3.62	3.39	.17	cat
15	2.48	2.67	2.66	2.65	2.64	1.07	bat
16	2.76	2.67	2.70	2.70	2.82	.69	airplane
17	2.38	2.48	2.67	2.40	2.39	.31	bat
18	2.54	2.61	2.54	2.77	2.72	1.39	bat
19	2.96	2.79	2.60	2.62	2.76	2.65	bat
20	2.26	2.30	2.52	2.40	2.44	5.43	bat

Response Speeds on Asymptotic Training Trials

Response Speeds to Generalization Stimulus and Qualitative Response

Bat - "Vee" - Moylan's Card V

S	1	2	3	4	5	1	
1	2.23	2.23	2.10	2.28	2.28	.55	island
2	2.40	2.69	2.43	2.57	2.51	.22	bird
3	2.82	2.86	2.70	2.90	2.66	.30	bat
4	2.23	2.28	2.11	2.16	2.13	.21	mirror image
5	2.53	2.56	2.67	2.46	2.49	.62	bat
6	2.29	2.36	2.41	2.54	2.30	.55	bat
7	2.21	2.04	2.20	2.30	2.23	.13	--- nothing
8	2.25	2.38	2.42	2.20	2.24	.22	butterfly
9	2.08	2.11	2.07	2.11	2.16	2.11	moth
10	2.54	2.53	2.33	2.38	2.51	1.09	butterfly
11	2.35	2.27	2.42	2.30	2.23	.54	bird
12	2.33	2.17	2.25	2.43	2.35	.17	butterfly
13	2.26	2.35	2.27	2.35	2.17	.34	bat
14	2.30	2.28	2.28	2.51	2.31	.18	plier
15	2.38	2.35	2.38	2.59	2.35	.23	bird
16	2.95	2.81	2.73	3.13	3.07	.70	bat
17	2.54	2.33	2.40	2.28	2.54	.99	bat
18	2.81	2.93	2.91	2.93	2.77	.72	insect
19	2.32	2.17	2.22	2.43	2.42	.70	bat
20	2.62	2.48	2.53	2.52	2.79	.48	butterfly

Bat - "Vee" - Card V of Rorschach

S	1	2	3	4	5	1	
1	2.86	2.87	2.76	2.62	2.78	.10	butterfly
2	2.26	2.12	2.20	2.17	2.16	.65	butterfly
3	2.53	2.43	2.30	2.47	2.45	1.26	--- nothing
4	2.71	2.75	2.78	2.84	2.82	.36	butterfly
5	2.75	3.00	2.64	2.82	2.92	.19	bat
6	2.30	2.35	2.20	2.26	2.23	.58	butterfly
7	2.64	2.71	2.62	2.65	2.59	.43	butterfly
8	1.80	1.80	1.68	1.72	1.76	3.24	bat
9	2.84	2.99	2.68	2.70	2.69	.16	bug
10	2.72	2.65	2.49	2.55	2.64	.21	lamb
11	2.68	2.89	2.71	2.56	2.53	.65	butterfly
12	2.84	2.93	2.68	2.82	2.72	.63	butterfly
13	2.70	2.59	2.67	2.95	2.65	.02	--- nothing
14	2.39	2.26	2.39	2.17	2.24	.39	bat
15	2.64	2.70	2.39	2.56	2.57	1.49	bat
16	2.62	2.48	2.43	2.58	2.62	2.21	butterfly
17	2.06	2.18	2.11	2.01	2.11	.21	bug
18	2.25	2.20	2.06	2.25	2.36	9.90	bat
19	2.46	2.44	2.49	2.38	2.53	1.50	butterfly
20	2.85	2.67	2.81	2.72	3.00	1.12	butterfly

	Response Speeds on Asymptotic Training Trials					Response Speeds to Generalization Stimulus and Qualitative Response	
White Circle - "Bat" - Bat Silhouette							
S	1	2	3	4	5	1	
1	2.99	2.83	3.13	3.13	2.94	1.45	bat
2	2.88	3.12	2.96	2.72	2.99	6.58	bat
3	2.43	2.24	2.41	2.23	2.35	.38	owl
4	2.74	2.72	2.70	2.73	2.81	.52	bat
5	2.04	2.23	2.04	2.15	2.11	.39	bat
6	2.36	2.36	2.34	2.49	2.38	1.19	bat
7	2.84	2.67	2.67	2.89	2.66	1.05	bat
8	2.65	2.65	2.74	2.65	2.51	1.78	bat
9	2.27	2.36	2.20	2.44	2.23	2.54	bat
10	2.39	2.54	2.65	2.43	2.36	.35	bat
White Circle - "Vee" - Bat Silhouette							
S	1	2	3	4	5	1	
1	2.38	2.48	2.64	2.53	2.43	.84	bat
2	2.63	2.46	2.49	2.36	2.58	.57	bat
3	2.02	2.24	2.10	2.42	2.04	.58	bat
4	2.61	2.58	2.90	2.71	2.65	.76	bat
5	2.64	2.58	2.75	2.49	2.55	6.94	bat
6	2.35	2.46	2.39	2.23	2.36	1.71	bat
7	2.50	2.64	2.54	2.80	2.61	9.17	bat
8	2.92	2.98	3.13	3.14	2.85	6.62	bat
9	2.85	2.65	2.75	2.65	2.78	1.03	bat
10	2.93	2.79	2.62	2.65	2.76	5.03	bat
White Circle - "Bat" - Moylan's Card V							
S	1	2	3	4	5	1	
1	2.50	2.50	2.53	2.71	2.51	.44	butterfly
2	2.46	2.36	2.31	2.41	2.40	.12	bat
3	2.94	2.89	2.78	2.64	2.94	.94	bat
4	2.35	2.46	2.35	2.58	2.58	.09	fly
5	2.48	2.53	2.51	2.54	2.40	.38	bat
6	3.28	2.83	3.22	2.82	3.25	1.01	bat
7	3.29	2.90	2.92	2.87	2.68	1.48	bat
8	3.47	3.07	3.36	3.38	3.27	1.88	butterfly
9	3.64	3.25	3.16	3.44	3.51	8.93	bat
10	2.48	2.44	2.56	2.61	2.42	.85	butterfly

White Circle - "Vec" - Moylan's Card V

S	1	2	3	4	5	1	
1	2.58	2.65	2.59	2.64	2.54	.18	people
2	3.21	3.30	3.19	3.09	3.09	.70	bat
3	2.42	2.54	2.54	2.60	2.41	.27	bat
4	2.20	2.06	2.17	1.98	2.09	.94	butterfly
5	2.35	2.67	2.36	2.58	2.48	.25	bat
6	2.63	2.43	2.67	2.43	2.68	.05	duck
7	2.53	2.52	2.62	2.53	2.42	.51	bat
8	2.27	2.05	2.06	2.07	2.16	.80	butterfly
9	2.77	2.46	2.80	2.62	2.61	1.05	bat
10	3.18	3.50	3.25	3.23	3.19	.09	object

White Circle - "Bat" - Card V of Rorschach

S	1	2	3	4	5	1	
1	2.88	2.68	2.87	2.61	2.80	.40	wings
2	2.51	2.49	2.33	2.57	2.63	2.91	bat
3	2.75	2.95	2.59	2.94	2.80	1.61	butterfly
4	2.58	2.64	2.92	2.94	2.65	.39	butterfly
5	3.08	2.91	2.92	2.80	3.14	.03	animal
6	2.36	2.24	2.23	2.48	2.39	1.45	bat
7	2.56	2.82	2.55	2.67	2.59	.16	wing
8	2.67	2.69	2.55	2.76	2.72	.32	bat
9	2.00	2.16	2.02	1.99	1.98	.32	bat
10	2.83	2.90	2.99	2.81	2.92	.28	bat

White Circle - "Vec" - Card V of Rorschach

S	1	2	3	4	5	1	
I	2.15	2.11	2.04	2.05	2.13	.52	bat
2	2.60	2.57	2.82	2.69	2.61	.68	bat
3	2.39	2.48	2.39	2.31	2.42	.54	bat
4	3.06	2.81	2.68	2.83	2.99	7.63	bat
5	2.50	2.56	2.54	2.78	2.49	.44	bat
6	2.68	2.73	2.80	2.75	2.80	.10	bird
7	2.34	2.38	2.22	2.20	2.31	.85	bat
8	2.29	2.40	2.35	2.33	2.36	.84	bat
9	2.81	2.62	2.55	2.80	2.79	1.46	bat
10	2.77	3.12	2.81	2.92	2.92	.34	butterfly

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