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ABSTRACT

This study investigated the moderating effects of previously conditioned, stable behavior characteristics on subsequent behavior resulting from a different set of reinforcement contingencies. The college students, who were the study subjects, were required to perform the task of solving anagrams under various modes of conditioning moderated by their previous conditioning related to internal-external expectancies. Due to the relatively short conditioning period, it was predicted that the existing expectancy set of subjects would assume major importance in performance, with feedback acting to confirm or disconfirm that expectancy set. Results supported the moderator status of subject locus of control and sex in performance situations that were dependent upon previously acquired skills and especially associated with past reinforcement. External locus of control subjects were seen as more conditionable but as valuing reinforcement to a lesser degree than internals. (Author/PC)

The Effects of Subject Locus of Control And Sex As Moderators of Conditioned Response

Steven J. Frey

INTRODUCTION

The effects of the nature and frequency of reinforcement on the acquisition of behaviors and on continued exhibition of those behaviors under extinction conditions, have been the subject of numerous investigations. Rotter (1966) indicates both the pervasiveness and limitations of reinforcement theory by stating that;

> "(T)he role of reinforcement... is universally recognized by students of human nature as a crucial one in the acquisition and (later) performance of skills and knowledge. However, an event regarded by some persons as a reward or reinforcement may be differently perceived and reacted to by others." (p.1)

Reinforcement theory per se is perceived as being less than adequate in interpreting experimental findings, especially those derived from human subjects whose performances on cognitive tasks are moderated by relatively stable behavioral characteristics, i.e. personality traits, resulting from past conditioning. Development of a theoretical framework from which to interpret existing experimental findings is of particular relevance to educational settings concerned with the prediction and the facilitation of students' responses under various conditioning and extinction situations.

The intent of this study was to investigate the moderating effects of previously conditioned, stable behavioral characteristics on subsequent behavior resulting from different reinforcement contingencies. Of particular interest were interaction effects of moderator variables on conditioning and on later persistence behaviors. Moderator variables were viewed in terms of generalized expectancy sets resulting from previous conditioning, and thus predictive of subjects' responses.

The expectancy set conceptualized as locus of control developed by Julian Rotter (1966), was of interest in the present study because of the possibility of its being a powerful moderator variable to various types of conditioning. In a skill situation, internal locus of control, an individual perceives that reinforcement is contingent on his own efforts, personal abilities and characteristics. Chance oriented situations, external locus of control, require individual action, however, reinforcement is contingent on luck, chance, fate, powerful others or simply is unpredictable because of the great complexity of the situation.

Based on additional research, (Feather & Simon, 1971, 1973), (Doctor, 1971), it was assumed in the present study that divergent expectancy sets exist as a function of past experience and reinforcement associated with word manipulation tasks encountered over the course of the academic careers of college students. Thus, the college students who were the subjects of this study were required to perform the task of solving anagrams under various modes of conditioning moderated by their previous conditioning related to internal-external expectancies. The solution of anagrams was viewed as a skill, which maximizes the reliance on past conditioning, therefore, permitting the prediction that subjects' performance would conform to research findings related to skill performance situations. (James & Rotter, 1958) (Rotter, Liverant & Crown, 1961) (Getter, 1966). Due to the relatively short conditioning period, it was predicted that the existing expectancy set of subjects would assume major importance in performance with feedback acting to confirm or disconfirm that expectancy set.

Hypotheses

Conditioning:

1) The interaction of locus of control and reinforcement contingencies results in performance differences. Specifically, (a) internal individuals perform at high levels when given constant success reinforcement since this conditioning strengthens their belief that they possess a particular skill; (b) external individuals perform at high levels when given aversive reinforcement since this reinforcement motivates them by raising anxiety levels and gives greatest impact to outside evaluation of their performance: and, (c) internal individuals receiving constant aversive reinforcement perform at low levels because this reinforcement implies that they do not possess the necessary skill to perform a task.

2) Sex is responsible for performance differences. Females have more experience with word manipulation tasks as a result of emphasis placed on such skills in previous school situations due to sex role differences.

Persistence:

3) The interaction of locus of control with treatment results in performance differences when reinforcement is withheld, but performance is required. Specifically, (a) internal individuals previously receiving success reinforcement perform at high solution rates since they continue to believe that they have the necessary skills: (b) external individuals previously receiving failure reinforcement perform at high solution rates to attempt to avoid continued failure, even though reinforcement is no longer provided: and, (c) internal individuals previously receiving failure reinforcement perform at low solution rates because they believe that they lack the necessary skills, and resist even though required to perform.

4) Internal and external individuals who previously received failure reinforcement perform at low response rates when given the choice as to whether to perform. Aversive reinforcement and anxiety can be reduced by avoiding the task situation.

Design

A 3x2x2 factorial design was used. Sixty six, Bucknell University students were stratified on the basis of Internality, a maximum I-E score of ten, Externality, a minimum I-E score of 12, and sex. Treatment groups were then randomly composed to include constant success feedback regardless of actual performance; constant failure feedback regardless of performance, and 50% success and 50% failure feedback, again regardless of actual performance. Feedback comments were attached to the subsequent day's anagram list to insure that each subject was aware of his preceding performance.

Procedure

Participation in the study entailed segments of 6 regular class meetings. Day 1 entailed an introduction to the experiment and the completion of the first series of anagram lists. Day 2 and Day 3 constituted the remaining 2 conditioning periods. Day 4 was designated as the time for the first extinction measure, since no feedback was supplied with regard to performance levels. Day 5 was designated as the second extinction measure, with no feedback provided with regard to performance, along with

the option for students to perform as many or as few anagram lists as they desired, or to perform none at all. Day 6 entailed the completion of a questionnaire related to the study and subsequent debriefing as to the actual intent of the investigation.

In order to reduce artificiality and mask the actual intent of the study, the following ruse was employed. Students were told that their class had been selected as one of a representative sample to participate in the development of local norms for a newly devised test. The intent of this device was that of assessing overall "verbal manipulation skills" through the use of anagrams.

To insure that subjects were exposed to all anagrams, a 2 minute time period was imposed upon each list of 10 anagrams under the training and forced performance condition. No time limit was imposed on the choice performance measure.

Both the total number of anagrams attempted, persistence of response, and the percentage of correct responses, persistence of attention, as suggested by Holmes and Moore (1970), were recorded and analyzed for both extinction conditions.

Results & Discussion

An analysis of variance was carried out using the number of correctly solved anagrams on the first day. No significant differences were found. Since this trial preceded feedback statements related to performance, Day 1 was subsequently used as a covariate in an analysis of covariance for the remaining two conditioning days. Homogeneity of within class regression was non significant for either day's analysis, ($F = 0.682$ and 0.859).

With regard to conditioning, Table 1 presents a summary of results of the analysis of covariance for the performance on Day 2. A significant ($p < .01$) source of variance was found for the interaction of locus of control and treatment. The Newman-Keuls test of means was utilized in this and subsequent appropriate instances to ascertain significant differences between cells. Specifically, it was predicted that with regard to this interaction, internal-100% success and external-100% failure subjects would respond at high, correct solution rates, while internal-100% failure subjects would respond at low solution rates. Both hypotheses were supported by the data.

Three assumptions were made in developing predictions of subjects' responses to reinforcement statements for this particular student population. First, it was assumed that subjects were success oriented as a result of previous success in school. Secondly, because of this past history of success, it was assumed that subjects would be motivated to perform in academically oriented tasks. Third, it was assumed that subjects would perceive the experimental task as skill oriented and dependent on previous learning skills.

Given these assumptions, the following rationale is offered as an explanation for group performance during conditioning: (a) Internal 100% success subjects perceived constant positive feedback confirming past successes with similar tasks and thus performed at high solution rates. Subjects' performance on the two conditioning measures supports this explanation: (b) Internal 100% failure subjects perceived the aversive evaluation of their performance as disconfirming past success experiences. Thus, doubt exists as to their ability to perform this task. Additionally, findings that internals assume personal responsibility for their performance (Rotter, 1966), that they value reinforcements for skill (Rotter and Mulry, 1965), that internals seek to repress failure (Efran, 1963), indicate that the constant failure feedback is particularly aversive to this group of subjects. Again, the data in Tables 2 and 5 supports

this interpretation as evidenced by the low performance. (c) External 100% failure subjects were predicted to perform at high solution rates. The dependence on cues from outside sources (Getter, 1966) likely creates considerable motivation to experience positive evaluation, particularly since, in general, past school associated performance has been evaluated positively. Additionally, as suggested by Moore (1974), application of effort most likely results in reduced anxiety and thus itself becomes reinforcing where performance cannot be avoided. Data for Day 2 (Table 2) supports the prediction of high solution rates, however, on Day 3 (Table 5) significance dropped from the $p < .05$ level of significance to the $p < .07$ level. This drop represents a mean decline of 0.21 words solved correctly, per subject. While perhaps purely statistical in nature, such a shift could be interpreted as initial possible evidence of lowered expectancy of task success, (Rotter, 1966) despite the motivating effect of the aversive feedback and forced performance situation.

The internal success-failure group was predicted to perform at an intermediate solution rate due to the varying nature of the feedback which neither confirmed nor denied subject expectation of success. This prediction did not entirely materialize. While the mean performance did not differ significantly from the mean of the external success-failure group, the average performance was significantly different from that of the internal 100% failure group on both conditioning measures, Tables 2 and 5. A possible explanation for this performance is that internal subjects operating within a skill oriented task, place value on outside reinforcement (Rotter and Mulry, 1965). Thus, positive feedback confirmed the existence of their skill, as 100% success-internals, while the aversive feedback indicated a need to put forth more effort to fully develop the skill. The overall effect is likely the enhancement of the positive feedback, via the motivating effect of negative reinforcement, which did not occur with sufficient intensity to totally disconfirm the presence of skill, as occurred for internal 100% failure subjects.

External 100% success and external 50% success-failure subjects, while responsive to reinforcement, place less value on skill reinforcement and are likely to be less motivated by failure since they do not take personal responsibility for their failure, and thus perform at intermediate levels.

No significant differences were predicted for the main effect of locus of control. The tenability of the null hypothesis with regard to locus of control was considered essential, particularly for initial performance since the existence of significant differences would indicate the independent nature of this variable and raise doubt as to its status as a moderator. The data support this status as a moderator since no differences are noted prior to performance feedback, and only significant interactions occur during the conditioning process.

Significant differences are reported for locus of control on the forced performance, persistence of attention measure. While not predicted, this result is not surprising since initial stratification, manipulation of reinforcement, and use of a skill task were intended to maximize the effect of differing locus of control orientation. As shown by Table 7, external subjects performed at higher solution rates than did internal subjects. The low solution rate of internal-100% failure subjects heightens the difference between internals and externals, however, the general conditionability of externals (Getter, 1966) and the absence of skill related reinforcement, which internals desire, in the extinction condition are suggested as major causes for this performance difference (Rotter and Mulry, 1965).

Two propositions were considered with regard to the effect sex would have on task performance. In the first, sex was viewed as a generalized moderator variable, dependent on differing past experience and reinforcements to produce differing expectancy sets, and thus varying responses. The second, more simplistic, position suggests that as the experimental task was restricted to specific word manipulation skills, differential responses might be more a function of task familiarity than due to differing expectancies associated with the sex of the subject, i.e., language majors should perform better on the anagram task than physical education majors. An analysis of subject areas of concentration indicated that a great percentage of female subjects were language and English majors. Thus stratification by sex was felt to be necessary primarily to control for possible skill differences in addition to possible expectancy differences.

Holmes (1970) found female subjects to be more adept at solving anagrams than males. It was predicted that this finding would be confirmed in the present study.

The predicted superior performance by females was not supported by the data. Significant differences for sex appear in the choice performance condition and indicate male response rates, both percent correct and number attempted, to be greater. The persistence of attention measure, Table 10, shows female solution rate to be 64.5% correct, while that of males exceeds 86%. With respect to total number of anagrams, female subjects attempted 23.03 anagrams, as opposed to 32.8 for males. It is of note that of the eleven subjects choosing not to perform, nine were females, and of those, six were from the success-failure group. It appears that the success-failure alternation is particularly aversive for females, and in general, when females are offered the opportunity not to perform in a situation likely to be considered as evaluative or competitive, they will avoid that situation.

Significant sex-treatment interactions noted on the third day performance and the persistence of attention measures for the choice performance situation provide additional insight as to the effect success-failure feedback has on females. In the training condition, forced performance, male success-failure subjects and female success-failure subjects performed at significantly different solution rates. Females correctly responded to 19.35 anagrams, while males responded to 14.54 anagrams. This result suggests that the alternating success-failure feedback was more motivating, likely more anxiety producing, for females in this forced response setting. All other groups performed at non significant, intermediate response levels. In the choice performance, persistence of attention measure, there is a complete reversal of performance rates. Success-failure males have apparently been conditioned to perform as they respond at 96.6% accuracy, which is significantly different from all other groups. Success-failure females perform at 29.5% correct which is again significant from all other groups. (Table 11)

These results confirm the aversive quality of success-failure reinforcements as indicated by the number of females opting not to perform as a result of experiencing success-failure feedback. When forced to perform success-failure females will do so, however, when given a choice of performing or not, female success-failure conditioned subjects in particular, and female subjects in general choose to avoid performance. It is suggested that the desire to generally avoid forced competition and to remove oneself from the uncertainty of the success-failure, is a generalized response, developed as a function of different experiences and reinforcement experienced by males and females with females being less responsive to feedback, and thus the preference to avoid such situations when possible.

With regard to persistence of attention, that is the percent of correct responses, in the forced choice condition, the following predictions were made for the interaction

of locus of control and treatment. As per the conditioning period, internal 100% success, and external 100% failure subjects would continue to perform at significantly different levels from internal 100% failure subjects. The data supports this prediction, and as evidenced by Table 8, the external 100% failure group performed at a 94.1% solution rate and the internal 100% success group performed at a 91.6% solution rate. The internal 100% failure group continued to perform at the lowest solution rate, 72.2%.

The external success-failure group also performed at a significantly different rate than did the internal 100% failure group. The solution rate for this group was 90.4% correct, suggesting that the random success-failure feedback conditioned this externally oriented group to maintain a high level of response accuracy.

Internal success-failure and external 100% success groups performed at intermediate levels. With regard to the internal success-failure group, which had performed at a significantly different level from the internal 100% failure group, it is likely that the withdrawal of reinforcement necessary to establish the existence of their skill was responsible for the intermediate level of response during the forced performance extinction condition. External 100% success subjects likely remained at an intermediate level as there had been no effort producing aversive feedback during conditioning. The success feedback was not as highly valued as by internal subjects and the extinction process was likely not of long enough duration to produce substantial decline in solution rates.

The absence of significant differences in relation to the number of anagrams attempted under the forced performance condition suggested that subjects perceived the task as skill rather than frequency oriented and thus relied on past experience and the concomitant expectancy sets associated with the development of those skills, which were evident on the persistence of attention measures.

The data did not support the hypothesis tendered with regard to locus of control and treatment interaction for the choice performance condition, as no significant differences were indicated. The significant differences noted for this performance condition have already been discussed with regard to the sex, sex and treatment interaction.

The presence of interaction effects for locus of control in a forced performance situation, and the existence of sex interactions in the choice performance condition suggests that the condition of performance itself may act as a secondary moderator variable, interacting in concert with locus of control or sex, to produce differing subject response. Forced performance brings locus of control interactions to the fore, while choice performance interacts with sex related traits. The explanation of this secondary interaction effect likely rests on the dependence of the forced performances' association with specific task performance and thus more specific expectancy sets, i.e., expectancy related to anagram solution in an academic setting. The choice performance likely allows for the assertion of a more generalized response-expectancy set, i.e., willingness to compete or respond to general reinforcement classes, which are more closely associated with the more generalized personality traits represented by the sex classification.

The analysis of the rating scale seems to support such a view, at least so far as subject appraisal of reinforcement influence on their performance: male internal subjects differ from male external subjects; male internal and male external subjects also differ significantly from their female counterparts; female internal and female external subjects do not differ significantly. Thus response commonality is

suggested due to gender (Table 15). This result appears to be contrary to Rotter's (1966) findings which indicates no difference exists between male and female subjects with regard to locus of control. However, this view is supported by the present study in that both males and females represent observed locus of control and treatment interactions. What is suggested here is that within the context of the task involved, and under particular performance stipulations, either sex or locus of control moderator variables are brought to prominence. Sex appears to be the more general variable in this case and is subject to alteration depending on the particular task and performance condition.

The extent of the analysis of subject rating of feedback influence on performance was undertaken to verify findings that indicate internals accept the consequence of their performance when performing skill tasks, while externals attribute performance outcome to external factors such as luck or task difficulty, (Rotter, 1966, 1971). Table 15 indicates that with regard to male subjects, internals were significantly more accurate in rating of feedback as having influence on their performance. This finding also agrees with Rotter and Mulry's (1965) statement that internals value reinforcement related to skilled tasks more than externals. Additionally, the rejection of feedback influence seems to indicate externals may have been more aware of manipulation attempts. (Doctor, 1971). Data in that study indicated that external aware subjects were most conditionable. The high solution rate of external success-failure males in the forced extinction measure is supportive of this finding, if we intuit rejection of feedback as indicative of awareness of manipulation.

The intermediate position occupied by female subjects is again interpreted as indicating a lesser ability on the part of females to respond to reinforcement, unless forced to do so.

Summary

The results of this study support the moderator status of subject locus of control and sex in performance situations that are dependent upon previously acquired skills and especially associated with past reinforcement.

External locus of control subjects are seen as more conditionable but as valuing reinforcement to a lessor degree than internals who place a high value on reinforcement particularly when such reinforcement is associated with a skill task.

The data also suggests that the condition of performance, that is choice or forced, may act as a secondary moderator variable. Forced performance brings locus of control to the fore, while choice performance emphasizes those characteristics associated with the sex variable. The explanation tendered is that forced performance emphasizes the specific reinforcements associated with the task, while choice of performance is more closely associated with general characteristics associated with subject's sex. The implication is not that future conditioning will not occur, but that in short term exposure situations, not unlike many encountered in the high school and college setting, students' responses may be more indicative of past reinforcements than academic skills.

TABLE 1

Summary of the Analysis of Covariance of the Number of Anagrams Solved on Day 2

Source	SS	df	MS	F
T (Treatment)	28.21	2	14.10	1.23
S (sex)	10.53	1	10.53	.92
I (I-E)	.54	1	.54	.05
TS	31.85	2	15.93	1.39
TI	157.71	2	78.85	6.88**
SI	9.41	1	9.41	.82
TSI	36.81	2	18.41	1.61
Covariate	297.25	1	297.25	25.95
error	538.34	47	11.45	

** $p < .01$
* $p < .05$

TABLE 2

Adjusted Means for the Number of Anagrams Solved on Day 2, Locus of Control X Treatment

	Success	Success-Failure	Failure
Internal	17.9	16.5	12.4
External	14.9	15.3	17.1

⟷ indicates significant differences between means, $p < .05$

TABLE 3

Summary of the Analysis of Covariance of the Number of Anagrams Solved on Day 3

Source	SS	df	MS	F
T (treatment)	45.43	2	22.72	1.63
S (sex)	26.03	1	26.06	1.86
I (-E)	1.53	1	1.53	.11
TS	91.99	2	46.00	3.30*
TI	172.68	2	86.34	6.19**
SI	.06	1	.06	.00
TSI	13.95	2	6.98	.50
Covariate	413.19	1	413.19	29.60
error	656.00	47	13.96	

** $p < .01$

* $p < .05$

TABLE 4

Adjusted Means for the Number of Anagrams Solved on Day 3

Sex X Treatment

	Success	Success-Failure	Failure
Male	16.0	14.5	14.9
Female	15.3	19.4	14.7

⟷ indicates significant difference between means, $p < .05$

TABLE 5

Adjusted Means for the Number of Anagrams Solved on Day 3

Locus of Control X Treatment

	Success	Success-Failure	Failure
Internal	17.8	17.4	12.7
External	13.6	16.5	16.9*

⟷ indicates significant difference between means, $p < .05$

* significant at the $p < .07$ level

TABLE 6

Summary of the Analysis of Variance

of the Percent of Anagrams Solved,

Forced Performance

Source	SS	df	MS	F
T (treatment)	355.23	2	177.62	1.16
S (sex)	464.82	1	464.82	3.03
I (I-E)	686.82	1	686.82	4.48*
TS	307.03	2	153.52	1.00
TI	2009.23	2	1004.62	6.55**
SI	2.82	1	2.82	.02
TSI	65.83	2	32.91	.22
error	7360.67	48	153.35	

** $p < .01$

* $p < .05$

TABLE 7

Mean Percent of Anagrams Solved,

Forced Performance

Locus of Control

Internal	External
83.2 ⟵	⟶ 89.9

⟷ indicates significant differences between means, $p < .05$

TABLE 8

Mean Percent of Anagrams Solved,

Forced Performance

Locus of Control X Treatment

	Success	Success-Failure	Failure
Internal	91.6 ⟵	85	72
External	85	90 ↖	↓ 94

⟷ indicates significant differences between means, $p < .05$

TABLE 9

Summary of the Analysis of Variance
of the Percent of Anagrams Solved,
Choice Performance

Source	SS	df	MS	F
T (treatment)	1735.60	2	867.80	.75
S (sex)	6976.82	1	6976.82	6.01*
I (I-E)	686.82	1	686.82	.59
TS	9690.52	2	4845.26	4.17*
TI	398.54	2	199.27	.17
SI	93.75	1	93.75	.08
TSI	6538.76	2	3269.38	2.82
error	55741.75	48	1161.29	

* $p < .05$

TABLE 10

Mean Percent of Anagrams Solved,

Choice Performance, Sex

Female	Male
64.5	86.1

⟷ indicates significant differences between means, $p < .05$

TABLE 11

Mean Percent of Anagrams Solved,

Choice Performance

Sex X Treatment

	Success	Success-Failure	Failure
Male	81.4	96.6	80.4
Female	72.9	39.5	81.3

⟷ indicates significant differences between means, $p < .05$

TABLE 12

Summary of the Analysis of Variance

of the Number of Anagrams Attempted,

Choice Performance

Source	SS	df	MS	F
T (treatment)	1086.03	2	534.02	2.32
S (Sex)	1440.60	1	1440.60	6.15*
I (I-E)	41.66	1	41.66	.18
TS	583.30	2	291.65	1.25
TI	297.03	2	148.52	.63
SI	2.40	1	2.40	.01
TSI	1205.09	2	602.55	2.57
error	11245.45	48	234.28	

* $p < .05$

TABLE 13

Mean Number of Anagrams Attempted

Choice Performance, Sex

Male	Female
32.8	23.0

⟷ indicates significant difference between means, $p < .05$

TABLE 14

Summary of the Analysis of Variance of Rating

of Effect of Feedback on Performance

Source	SS	df	MS	F
T (treatment)	3.23	2	1.62	1.36
S (Sex)	.15	1	.15	.13
I (I-E)	3.75	1	3.75	3.15
TS	3.10	2	1.55	1.30
TI	.70	2	.35	.29
SI	18.15	1	18.15	15.23**
TSI	2.70	2	1.35	1.13
error	57.20	48	1.19	

** $p < .01$

TABLE 15

Means of Feedback Rating,

Sex X Locus of Control

	Internal	External
Male	3.07	1.47
Female	2.06	2.67

⟷ indicates significant differences between means, $p < .05$

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