DOCUMENT RESUME

ED 108 039 CG 009 852

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TITLE	Underlying Constructs of Locus of Control of Reinforcement.
PUB DATE	Apr'75
NOTE	14p.; Presented at the Annual Meeting of the American Educational Research Association (Washington, D.C., March 30-April 3, 1975)
EDRS PRICE	MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS	Correlation; *Locus of Control; *Measurement Instruments; *Reinforcement; Research Problems; Speeches; *Test Construction; *Testing Problems

ABSTRACT

This study investigates the underlying constructs of two instruments which purport to measure the locus of control of reinforcement variable. Instruments used were the IAR and the Career Development Responsibility Scale (CDR). Principal components analyses were computed separately for each instrument from the intercorrelation matrix of the items of the respective instruments. Data were obtained from a cross-sectional student group of ninth graders. The study provides evidence that instruments designed to measure locus of control in domains other than academic achievement serve to increase the number of dimensions. Intercorrelations of the factor score derived from the IAR and CDR are sufficiently low as to question whether or not they are, in fact, measuring the same construct. Developers of locus of control instruments should be aware that the balance of situations and sources of control items will affect the scores obtained from the instrument, and thus the relationship with other similar instruments. (Author/PC)

UNDERLYING CONSTRUCTS OF LOCUS OF CONTROL OF REINFORCEMENT

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Locus of control of reinforcement was proposed by Rotter (1966) as a unidimensional construct describing a person's perceived source of power or influence in his life. The continuum of this construct ranges from internal (the belief that rewards follow from, or are contingent upon, one's own behavior) to external (the belief that rewards are controlled by forces outside oneself and thus may occur independently of one's own actions). This construct, conceptualized by Rotter as a generalized expectancy variable, has been found to be multidimensional (e.g., Stephens & Delys, 1973), and thus would probably be more appropriately defined as several loci of control for the underlying constructs rather than a single locus of control.

Evidence of the multidimensionality of the locus of control construct is provided by Mirels (1970), Collins et al. (1973), Gurin et al. (1969), and Hrycenko and Minton (1974). Mirels, using data from the Rotter I-E scale, obtained two factors from a principal components analysis. These factors were (1) hard work vs. luck, and (2) acceptance vs. rejection of the idea that a citizen can exert some control over political and world affairs. Items included in Factor I for both male and female samples were those that pair a statement which affirms the control over one's destiny with one which attributes such control to external forces. The second factor obtained by Mirels contained items that indicate acceptance or rejection of the idea that an individual can exert control over political or world affairs. Factors I and II respectively accounted for 10.9% and 8.6% of the variance

A paper presented at the annual meeting of the American Educational Research Association, Washington, April 1975.

for the male sample, while the respective percentages for the female sample were 12.1% and 6.7%. Hrycenko and Minton (1974), using similar population and analysis (i.e., students in an introductory psychology class and principal components analysis followed by Kaiser's (1958) varimax method) obtained similar factors which accounted for similar percentages of variance.

Using Rotter's (1966) items augmented with specific items concerning racial discrimination, Gurin et al. (1969) obtained two factors (type of factor analysis not reported) which could be attributed to the locus of control items included. Factor I included items that relate to success and failure in the culture at large, while Factor II included items describing the presence or absence of control of one's own life.

Stephens (1973) poses the additional question of the multidimensionality of instruments that purport to measure the I-E construct, noting that low correlations are frequently obtained among the various I-E instruments. Based on these findings, it was thought desirable to investigate the underlying constructs of the locus of control construct as measured in two instruments.

Objectives of the Inquiry

This study was designed to investigate the underlying constructs of two instruments which purport to measure the locus of control of reinforcement variable. More specifically, the objective was to determine whether there were significant canonical functions between factor scores derived from an instrument designed to measure locus of control in academic situations and the factor scores derived from an instrument designed to measure locus of control in career development situations.

Instrumentation

The instruments used in this study were the Intellectual Achievement

Responsibility Questionnaire (IAR; Crandall et al., 1965), and the Career Development Responsibility Scale (CDR; Thomas, 1974).

The IAR was developed to measure children's beliefs in their own control of reinforcement in intellectual-academic achievement situations. The response mode for the IAR is a forced choice between an internal and an external response. The thirty-four items are equally divided between acceptance of responsibility for success and failure.

The CDR scale was developed to measure the degree to which the respondents feel responsible for their own career development. The thirty items were written to reflect the dimensions of a 3 x 5 matrix formed by a modification of the connative areas of the attitude dimension and the cognitive dimension of a career development model (Crites, 1973). The response mode was identical to the IAR.

Method

Principal components analyses were computed separately for the IAR and CDR from the intercorrelation matrix of the items of the respective instruments. Factor scores were computed for each subject for the factors having eigenvalues equal to or greater than one. These scores were computed using the formula $F = SR^{-1}V$ where S is the standard score matrix, R^{-1} the inverse of the intercorrelation matrix, and V the matrix resulting from an orthogonal rotation of the principal components matrix. It was felt that this procedure would be the most parsimonious and would allow interpretation at the factor rather than at the item level.

Factor scores thus obtained were used as data for the canonical analysis. The resulting canonical functions were considered to be nontrivial if the correlation exceeded .40. The Bartlett chi square approximation (Cooley and Lohnes, 1971) procedure was employed to establish the probability level

of the canonical correlations.

Data Source

Data were obtained on the two instruments from students enrolled in the ninth grade of an Illinois junior high school, in which a cross-section of socioeconomic levels was represented. Students who were present on the day of data collection were included in the sample. Complete data were obtained for 188 students (17% black, 83% white; 54% males, 46% females).

Results

The component analyses yielded eleven components with eigenvalues equal to or greater than one for both the IAR and CDR when data for the respective instruments were analyzed separately. As shown in Table 1, the eleven components obtained from the CDR data accounted for 63.22% of the variance. Table 2 shows that the eleven IAR components accounted for 65.66% of the variance. A varimax rotation of the component analysis for the respective instruments, presented in Tables 3 and 4, was employed to compute factor scores for each subject. Descriptive titles for the resulting factors are included in Table 6. As indicated in Table 5, thirteen of a possible 100 intercorrelations of the CDR and IAR factor scores were significant at the .05 level, six of which were significant at the .01 level.

The canonical analysis of the two sets of factor scores produced two nontrivial canonical functions. The chi square approximation for the first canonical function was 217.81 ($P < .01$, $df = 121$) while the chi square approximation for the second canonical function was 123.29 ($P < .06$, $df = 100$). The canonical R for the first function was .644 while the second was .483, thus accounting for 41% and 23% of the variance of the canonical variates respectively. Table 6 presents the two sets of orthogonal standardized weights for both the IAR and CDR. The first canonical function, as defined

by the factors with the largest canonical weights, could best be described as a construct of control of one's own destiny in academic and career development situations in contrast to being controlled by outside forces, such as fate, luck, or chance. The second canonical function was defined by factors that describe acceptance of the responsibility for the control of one's own destiny versus powerful others being in control.

Discussion

Rotter's (1966) conceptualization of the locus of control of reinforcement construct as a unidimensional construct has been rejected by several researchers (e.g., Stephens and Delys, 1973). In the place of Rotter's original conceptualization, a multidimensional (Stephens, 1973) domain specific (Bradley and Gaa, 1973) construct has emerged. The present study provides evidence that instruments purporting to measure locus of control in domains other than those proposed by Rotter (e.g., academic achievement) serve to increase the number of dimensions. The intercorrelations of the factor scores derived from the IAR and CDR are sufficiently low as to question whether or not the two instruments are in fact measuring the same construct. The canonical analysis, however, provides evidence that the domain specific locus of control factors for the two instruments under study belong to two underlying constructs that are similar to those identified by the factor analysis of the Rotter I-E (e.g., Mirels, 1970). The canonical function accounting for the highest percentage of the variances of the canonical variates (control of one's own destiny in academic and career development situations in contrast to being controlled by outside forces, such as fate, luck, or chance) is similar to Factor I obtained by Mirels (1970), Hrycenko and Minton (1974), and Gurin, et al. (1969) from the Rotter I-E.

The second canonical function in the present study (acceptance of responsibility for the control of one's own destiny versus powerful others being in control) appears to be the more specific case of the second factor obtained by Mirels (1970) and Hrycenko and Minton (1974). Their second factor included statements concerning the individual citizen's ability to have an impact on political or world affairs. In both the general and specific case, items describe the individual's expectancies for control of versus being controlled by others.

Speculations regarding the larger number of factors and greater percentage of variance accounted for by the components obtained include the probability of greater variance in the socioeconomic background and academic achievement of the current subjects as compared to those in previous studies. In addition, the specificity of the IAR and CDR items may have also increased the variance of these instruments.

Conclusions

The concern expressed by Stephens (1973) regarding low or no correlation between the various locus of control instruments may be explained by multiplicity of situations that become apparent when the items of various instruments are closely scrutinized. If the way an individual responds to his/her own control of rewards in contrast to fate being in control depends on the situation, as the component analysis of the two instruments would indicate, then the situations predominant in an instrument alter his/her measured expectancies for control. That is, an individual might expect fate to be the determining factor in job acquisition situations, but feels that obtaining the preparation for the job he desires has nothing to do with fate. Thus, including a high percentage of items that pair own versus fate responsibility for job acquisition would increase the individuals's measured externality.

In addition, there appears to be variance in the expectancies for control by fate, luck, chance, as well as by others. The literature tends to lead one to assume that expectancies from these sources of control are invariant. The possible combinations of situations and external sources of control are enough to boggle the mind. The present study, however, indicates that the multiplicity of situation-control possibilities included on these instruments belongs to one or possibly two underlying constructs which are similar to those identified by the factor analysis of the Rotter I-E.

It appears from the present research that developers of locus of control instruments should be aware that the balance of situations and sources of control items will effect the scores obtained from the instrument and thus the relationship with other locus of control instruments. In addition, it appears that curriculum developers who wish to develop curricula that will enhance the prospective students' expectancies for control of reinforcements (become more internal) in a given domain would be well advised to provide experiences in the control of their own reinforcement in a variety of situations. If the findings of Bradley and Gaa (1973) can be replicated, the treatment effect of a curriculum in a specific area will not necessarily generalize to others, i.e., learning to depend on one's self to obtain career information will not necessarily generalize to depending on one's self to prepare for or acquire a job.

TABLE 1. Percentage of Variance by Component for the Career Development Responsibility Scale

Factor	Percent of Variance	Cumulative Variance
1	12.06	12.06
2	9.24	21.30
3	7.01	20.32
4	6.13	34.45
5	4.99	39.44
6	4.60	44.04
7	4.19	48.23
8	4.06	52.29
9	3.80	56.10
10	3.62	59.71
11	3.50	63.22

TABLE 2. Percentage of Variance by Component for the Intellectual Achievement Responsibility Scale

Factor	Percent of Variance	Cumulative Variance
1	18.63	18.63
2	9.31	27.94
3	6.98	34.92
4	5.21	40.12
5	4.58	44.70
6	3.93	48.63
7	3.93	52.56
8	5.58	56.14
9	3.34	59.48
10	3.18	62.66
11	3.00	65.66

TABLE 3: Principal Components Rotated (Varimax) Factor Loadings for the Intellectual Achievement Responsibility Scale.

Item	Factor[1]										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
1	15	12	07	83	07	01	02	21	03	03	-01
2	04	00	01	15	-07	13	70	-11	05	27	03
3	01	46	-25	30	15	-20	08	19	32	02	14
4	09	22	00	80	-03	-02	11	01	17	09	-01
5	-16	02	10	-02	05	13	44	11	44	25	11
6	-08	-05	10	35	03	04	08	-22	-04	60	27
7	03	03	02	18	03	08	-02	00	78	-01	-07
8	01	07	-00	-01	11	-10	18	22	08	76	-12
9	21	00	-05	20	-10	-09	-08	76	12	07	08
10	12	16	34	11	06	08	03	17	03	03	68
11	-15	11	16	-03	27	35	12	49	-08	22	-11
12	-06	17	72	-17	-04	21	16	-15	02	15	01
13	37	11	-01	24	03	49	-29	07	-05	05	-02
14	-09	-04	32	09	12	62	10	-24	09	-18	05
15	27	75	05	07	03	07	19	01	07	-04	-02
16	40	58	21	12	-08	27	-20	01	-20	08	-06
17	02	18	23	10	74	03	-05	-06	05	16	04
18	-07	13	04	-24	20	73	26	06	15	01	04
19	10	79	03	14	08	00	-09	-06	04	02	-01
20	10	35	22	-15	05	13	14	-44	23	24	05
21	29	35	-04	10	20	25	-29	11	-14	01	29
22	49	41	28	12	-05	26	-13	01	-10	12	00
23	26	07	19	12	38	08	49	-01	-38	-14	-11
24	10	16	30	13	12	04	00	14	01	01	-72
25	56	13	-13	07	16	18	-35	-15	09	15	05
26	26	-06	10	-07	76	27	-01	02	08	-01	-08
27	25	09	46	-02	20	02	08	-10	40	-02	10
28	72	23	16	02	-00	-05	-18	16	04	-04	13
29	08	-09	65	28	24	06	-13	-01	-02	15	-14
30	19	01	61	05	31	00	12	19	-01	-23	05
31	83	13	05	05	00	00	02	22	02	-02	-03
32	74	-05	03	09	08	06	20	-12	-07	-10	-02
33	79	29	-02	-01	02	-09	-01	05	12	00	-10
34	77	02	07	07	19	-09	08	-05	-06	-02	04

[1]decimals omitted

TABLE 4. Principal Components Rotated (Varimax) Factor Loadings for the Career Development Responsibility Scale

Item	Factor[1]										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
1	-11	08	33	-23	-12	07	29	-18	29	30	08
2	03	-01	-24	03	-08	08	-03	79	-06	-06	-02
3	-08	01	-06	03	08	04	83	-04	-02	-01	-01
4	00	16	73	-10	-08	03	-19	-14	-06	-11	-07
5	11	03	07	-15	79	04	09	-09	01	-04	02
6	04	-05	04	12	22	03	13	-05	77	-12	11
7	17	07	19	10	29	-04	27	00	-64	03	08
8	07	-27	-14	09	-04	10	11	-10	05	09	70
9	01	-09	-03	03	02	14	-02	-02	-14	84	03
10	07	13	07	63	-29	-09	07	07	22	36	10
11	05	02	-07	72	01	16	01	01	04	-04	06
12	21	23	-61	16	-02	-06	-10	23	04	-09	-02
13	-06	65	-02	18	-05	-27	-24	-01	04	-02	-05
14	00	67	05	11	-03	14	25	03	01	-19	01
15	04	73	-11	09	37	-02	-07	-01	-11	03	13
16	08	15	-24	48	-19	02	-22	-29	-10	-20	15
17	-08	20	22	21	20	40	-27	08	16	12	-15
18	15	12	-16	55	04	-02	06	18	-19	04	-37
19	08	77	10	-08	-08	18	03	02	-04	10	-21
20	43	18	40	14	48	-12	-08	16	14	18	-05
21	56	35	23	-23	18	00	05	16	-12	-17	17
22	63	-05	-40	-13	06	02	-10	-19	10	24	-07
23	69	-10	-31	-01	-20	13	-14	-04	-06	-08	-01
24	63	06	-04	22	04	02	01	19	03	-09	-01
25	10	25	14	-07	11	14	-16	32	01	-06	51
26	51	-09	04	09	12	22	-28	-16	-17	13	21
27	60	03	15	18	-33	-06	23	08	-09	05	08
28	36	21	-15	11	-07	-16	-07	40	-04	25	33
29	-05	18	21	06	-01	63	03	-22	-06	16	23
30	21	-10	-15	06	-02	77	07	24	08	00	04

[1]decimals omitted

Table 5. Intercorrelations of IAR and CDR Factor Scores

IAR Factors	CDR Factors[1] (N = 188)										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
I	-12	13	-20**	07	04	-05	11	-03	08	-07	-04
II	-09	10	-13	04	11	08	04	04	-09	-09	21**
III	-07	01	03	01	-20**	03	17*	05	12	-13	-11
IV	01	16*	-18	09	10	00	13	02	-10	-08	03
V	05	04	-16*	04	04	15*	-03	-15*	08	-09	02
VI	01	-10	03	-23**	-04	01	-03	-03	-07	-01	-12
VII	02	-10	01	-10	01	01	-09	-06	02	08	-10
VIII	08	-10	11	04	-04	-08	08	02	02	02	00
IX	07	-08	08	-26**	-04	06	04	03	-13	03	-03
X	-06	07	14*	-14*	24**	07	03	15*	-06	04	02
XI	01	05	07	05	01	10	12	-09	05	02	-04

* significant at .05 level
**significant at .01 level
[1]decimals omitted

Table 6. CANONICAL ANALYSIS OF FACTOR SCORES

FACTORS	Standardized Weights 1	2
CAREER DEVELOPMENT RESPONSIBILITY SCALE		
I. Own vs. Chance Responsibility for Planning	(-.233)	(-.036)
II. Own vs. Other Control for Career Development	.440	.187
III. Own vs. Luck Responsibility for Planning	(-.521)	(-.022)
IV. Own vs. Fate Responsibility for Job Acquisition	.536	-.232
V. Own vs. Other Responsibility for Acquisition of Occupational Information	.046	.691
VI. Own vs. Fate Responsibility for Self-Fulfillment	(.039)	(.247)
VII. Own vs. Luck Responsibility for Self-Determination	.212	-.057
VIII. Own vs. Luck Responsibility for Job Acquisition	(-.060)	(.167)
IX. Own vs. Other Responsibility for Information Acquisition	.134	-.444
X. Own vs. Fate Responsibility for Career Choice	(-.280)	(.059)
XI. Own vs. Other Responsibility for Job Performance	.210	.372
INTELLECTUAL ACHIEVEMENT RESPONSIBILITY SCALE		
I. Own vs. Fate Responsibility for Achievement	.423	-.190
II. Own vs. Other Responsibility for Failure	.322	.481
III. Own vs. Other Responsibility for Learning	(.162)	(-.499)
IV. Own vs. Chance Responsibility for Success	.402	.270
V. Own vs. Chance Responsibility for Achievement	(.266)	(.058)
VI. Own vs. Chance Responsibility for Rewards	(-.358)	(.004)
VII. Own vs. Fate Responsibility for Rewards	(-.269)	(-.027)
VIII. Own vs. Other Responsibility for Success	-.174	-.151
IX. Own vs. Fate Responsibility for Failure	-.448	.207
X. Control of Others vs. Other Control	(-.160)	(.578)
XI. Own vs. Other Responsibility for Other's Feelings	(.033)	(.084)

( ) - sign of weight should be changed due to scaling

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