DISCRIMINANT ANALYSIS FOR SUCCESSFUL PAROLE PREDICTION
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BACKGROUND

Predictive techniques designed to determine the risk factor in the parole decision have applied many multivariate statistical methods. Only recently has the discriminant-analysis function been tested to compare it with multiple-regression and factor-analysis methods (Alumbaugh, 1978). The discriminant function showed no problem of shrinkage as did the regression analysis, and no problem with homogeneity of variance as with factor analysis.

A major problem in developing consistent post-prison predictor scales has been the inconsistent use of independent variables for classification and analysis. Pritchard (1979) has demonstrated the reliability of using variables such as age at first arrest, type of offense, prior convictions, and length of prison term. Education and marital status are two other variables which have been deemed to add to over-all predictive reliability (Sampson, 1974). The Task Force Report on Corrections (1967) identifies several variables which appear to be valid predictors of successful parole performance. The report claims that violation rates are associated closely with age, offense, education, work history, and prior record. The scales developed to determine post-release success are most commonly used in conjunction with the parole boards' personal considerations about institutional behavior and progress of the inmate toward the rehabilitation goal.

The National Advisory Commission on Criminal Justice Standards and Goals (1968) states that: "the basic purpose of parole is to reduce recidivism." Two of the more essential goals of parole are seen as 1) helping the offender during community reintegration, and 2) protection of society (Parker, 1966). Stanley (1976) states that "parole hearings are of very little use in finding out whether inmates are likely to succeed on parole." Hawkins (1968) also sees the prison performance of inmates as the first consideration used by parole boards to make a parole decision. Prison performance and parole-board intuition are a part of the parole-decision process, but accurate testing instruments are clearly needed for initial guidance.

The discriminant-analysis function can be used to improve parole prediction. It is used to distinguish between 1) successful and 2) unsuccessful parolees. To distinguish these two groups, the researcher selects a collection of discriminating variables that measure characteristics on which the two groups are expected to differ. The discriminant-analysis function can then be used to assign individuals to success or failure groups on the basis of their scores on the collection of measures. Kerlinger (1964) says that if measures are used which have in the past predicted delinquency, they can be combined into a discriminant function, and future cases can be classified with them. Press (1972) sees discriminant analysis as a method of summarizing the number of correct and incorrect classifications, here shown in Table 1. Mathematically, the objective of the discriminant-analysis function is to weigh and linearly combine discriminating variables so that the groups are forced to be as statistically distinct as possible (Klecka 1973).

In a more technical framework, the discriminant function as a classification criterion is determined by a measure of generalized squared distance. This can be based on the individual within-group covariance matrices or on the pooled covariance matrix. The model takes into account the prior probabilities of the groups, and tests for the homogeneity of the within-group covariance matrices. This allows the researcher to follow the two objectives of the technique: 1) analysis, and 2) classification.

METHOD

The sample for this study was selected from two groups of persons under the Oklahoma Department of Corrections. Fifty were selected in the failure category for post-release conviction and incarceration two or more times for felony offenses. The criteria for the inclusion of 28 persons in the success category was just one felony conviction, and 18 months or more under successful parole

TABLE 1: POSTERIOR CLASSIFICATION BY DISCRIMINANT ANALYSIS

Parolee	Category: Corrected	Calculated	Type 1 Error	Parolee	Category: Corrected	Calculated	Type 1 Error
1	2	1	.83	40	2	2	.04
2	2	2	.05	41	2	1	.54
3	2	2	.30	42	2	2	.17
4	2	2	.01	43	2	2	.01
5	2	2	.01	44	2	2	.01
6 .	2	2	.01	45	2	2	.01
7	2	2	.01	46	2	2	.01
8	2	2	.02	47	2	2	.02
9	2	2	.01	48	2	2	.01
10	2	2	.14	49	2	2	.02
11	2	2	.32	50	2	2	.07
12	2	2	.01	51	1	1	.01
13	2	2	.01	52	1	1	.03
14	2	2	.01	53	1	1	.03
15	2	2	.02	54	1	1	.03
16	2	2	.04	55	1	1	.01
17	2	2	.47	56	1	1	.01
18	2	2	.04	57	1	1	.01
19	2	2	.01	58	1	1	.01
20	2	2	.34	59	1	1	.01
21	2	2	.01	60	1	1	.01
22	2	1	.54	61	1	1	.16
23	2	2	.01	62	1	1	.01
24	2	1	.51	63	1	1	.30
25	2	2	.01	64	1	1	.01
26	2	2	.02	65	1	2	.73
27	2	2	.03	66	1	1	.01
28	2	2	.15	67	1	1	.01
29	2	2	.01	68	1	1	.01
30	2	2	.01	69	1	1	.06
31	2	2	.04	70	1	2	.58
32	2	2	.04	71	1	1	.08
33	2	2	.20	72	1	2	.94
35	2	2	.01	73	1	2	.94
36	2	2	.19	75	1	1	.01
36	2	2	.19	75	1	1	.11
37	2	2	.13	76	1	1	.25
38	2	2	.01	77	1	1	.01
39	2	2	.05	78	1	2	.84

TABLE 2: CONTINGENCY OF KNOWN AND CALCULATED PAROLEE OUTCOMES

A: Age Included				B: Age Excluded			
Known	Calculated		Total N	Known	Calculated		Total N
	Sucesss%	Failure%			Success%	Failure%	
Success	82	18	28	Success	82	18	28
Failure	8	92	50	Failure	2	98	50
Total	35	65	78	Total	31	69	78

supervision without further convictions. Both groups were given questionnaires dealing with demographics, criminal history, and attitudes concerning prison-treatment programs. Both groups were also given the Socialization Scale and the Responsibility Scale of the California Psychological Inventory (Gough, 1958).

The study design was made to use the post-incarceration success or failure on parole as a dependent variable. Of course, success or failure was already known to the researcher. The independent variables and psychological scores were put into a discriminant analysis function to determine how well these variables might discriminate between successful and unsuccessful parolees. The use of discriminant analysis in certain ways verifies the weight and significance of the independent variables. Here it is used retrospectively to determine whether the variables can be used with reasonable accuracy.

FINDINGS

The main independent variables used to discriminate successful from unsuccessful parolees were 1) age, 2) years of education, 3) age at first arrest, 4) length of sentence, 5) time served, 6) Socialization score, 7) Responsibility score, and 8) type of offense. Table 1 shows the posterior probability of membership in the successful category with these 8 variables used as a set of discriminators. The success probability is the probability score for the person being placed in the success category for each of the 78 parolees.

The misclassified cases are those persons who have actually failed or succeeded on parole, but who would have been wrongly classed by discriminant analysis depending on their responses. There were 9 misclassifications, and 92 percent were correctly classed in the failure category (2); and 82 percent were correctly classed in the success category (1). (See Table 2) Overall, the successful classification by discriminany analysis is 87 percent.

Using the t-test, it was found that age had little to do with finding the correct classification in either group. When discriminant analysis is performed without the age variable, we see a marked increase in reliability.

Table 2 (b) shows a gain in statistical power which was lost by including the age variable. Excluding the age variable, prediction with discriminant analysis becomes more predictive.

The percent of correct classifications increases from 92 percent to 98 percent when age is excluded.

As a statistical base for discriminant analysis, each observation is compared with the total of all observations, and constantly altered until all observations have been considered. The analysis then determines a constant for each category which is calculated with the scores on the independent variables.

CONCLUSIONS

The combining of several independent variables to classify post-prison success and failure has distinct possibilities. On the practical level, this data could be made available and could be used by paroling authorities as demarcation points in their decision on parole for each inmate. If total populations of incarcerated and paroled offenders were to be used as a statistical base, the discriminant analysis function would adjust constantly to consider every new observation. It would be possible to select other dependent variables to be used to classify offenders, such as the violent and non-violent variable.

The discriminant function offers the researcher a tool to distinguish between groups using many independent variables with each variable weighted in a linear function. In this operation each independent variable is weighed according to its overall effect in the discriminant analysis in accord with the other independent variables in the set. The discriminant function could also be used as a first step towards more complex analysis of data to identify influential variables.

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