DOCUMENT RESUME

ED 318 965 CG 022 512

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TITLE Predicting At-Risk-for-Failure Students Based on Information Processing Characteristics.
PUB DATE Mar 89
NOTE 17p.; Paper presented at the Annual Meeting of the National Association of School Psychologists (21st, Boston, MA, March 29-April 2, 1989).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Failure; Elementary School Students; Grade 2; *High Risk Students; *Identification; *Predictive Measurement; *Predictive Validity; Primary Education
IDENTIFIERS *Learning Efficiency Test

ABSTRACT

Each year large numbers of children experience academic failure during the first 3 years of their public school involvement. Many studies have been done using demographic and norm-referenced tests to try to identify at-risk-for-failure youngsters either at the preschool level or early during their school experience. Most attempts have been costly and of limited success. This study examined the concurrent and predictive validity of performance on a test measuring the information processing characteristics of students to identify youngsters with low achievement in school. Second-grade students (N=380) were individually administered the Learning Efficiency Test (LET) and regression and discriminant analyses were conducted. Variables examined included actual levels of performance in reading and mathematics, California Achievement Test total scores in reading and mathematics, and teacher rankings of overall student achievement levels. Results showed high levels of accuracy for the LET in predicting both achievement levels and in classifying students according to teacher rankings. The LET is easy to administer and reflects a cost-effective approach. Moreover, the predictive efficacy of the LET represents substantial improvements over past studies that used costly and elaborate diagnostic procedures which have failed to identify at-risk students beyond chance levels. (Author/ABL)

Predicting At-Risk-For-Failure Students Based on Information Processing Characteristics

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ABSTRACT

Many studies have been done using demographic and norm-referenced tests to try to identify at-risk-for-failure youngsters either at the preschool level or early during their school experience. Most attempts have been costly and of limited success. This study examines the concurrent and predictive validity of performance on a test measuring the information processing characteristics of students to identify youngsters with low achievement levels in school. Three hundred and eighty second-graders were individually administered the Learning Efficiency Test (LET) and regression and discriminant functions analyses conducted. Variables examined included actual levels of performance in reading and mathematics, California Achievement Test (CAT) total scores in reading and mathematics, and teacher rankings of overall student achievement levels. Results showed high levels of accuracy for the LET in predicting both achievement levels and in classifying students according to teacher rankings. The applied utility of an information processing assessment strategy to identify at-risk youngsters early in school is discussed.

Predicting At-Risk-For-Failure Students Based on Information Processing Characteristics

Each year large numbers of children experience academic failure during the first three years of their public school involvement. More severely and obviously disabled youngsters may receive special education after they have failed if they meet state department of education criteria. Children with less severe handicapping conditions that do not meet special eligibility criteria may be overlooked and receive no services after they have encountered continued academic failure (Lichtenstein, 1982; Algozzine & Ysseldyke, 1983).

Many programs have tried to identify non-handicapped children who are at-risk for school failure. Some programs have focused on the demographic characteristics of families to make these identifications (Bryant & Ramey, 1987), while others have assumed a more child-centered strategy (Colarusso, Gill, Plankenhorn, & Brooks, 1980; Kilgallen & Mueller, 1986; Vacc, Vacc & Fogelman, 1987). These latter studies emphasize the use of norm-referenced tests to identify at-risk youngsters either at the preschool level or early following formal enrollment in the schools.

Despite the encouraging narrative comments emanating from researchers, the empirical data compiled has generally been discouraging. For example, a 1982-83 statewide study in Minnesota, involving 45,457 preschoolers who were administered a variety of screening tests in nine different developmental areas, showed that a coin flip was more highly predictive of referral

rates for school failure than test performance (Ysseldyke & O'Sullivan, 1987). Similar findings were collected by Ramey, Stedman, Borders-Patterson and Mangel (1987) who showed that race and educational status of the mother were more significant predictors of school success and failure than the child's performance on psychoeducational and screening tests.

Information processing models of learning have emphasized and clarified the role of memory and memorial processes in school achievement (Anderson, 1987; Chall, 1983; Webster, 1981). Many studies have consistently shown the close relationship between information processing effectiveness and achievement in reading, language development, and mathematics (Perfetti, 1983; Torgeson, 1979; Webster, 1979). Webster (1981) highlighted the predictive utility of an older child's learning efficiency and memory capacity for later achievement levels in both reading and mathematics. Few studies exist which examine the usefulness of childrens' performance on information processing tasks to predict later school success or failure. This study examines the concurrent and predictive validities of performance on the Learning Efficiency Test (LET) an information processing test with actual classroom levels of performance, the California Achievement Test (CAT) achievement measures, teacher's ratings of academic standing, and referral for either special education placement or grade retention as the criterion variables.

Methods

Participants

During a four-week period all 389 second-graders in a rural

combined county/city school district in North Carolina were individually administered the LET (Webster, 1981) by teacher assistants trained specifically to administer the test. All students were between the ages of 7 years, 0 months and 10 years, 9 months, with mean age of the group being 8 years, 0 months (SD = 2.03 months). No students in the Trainable Mentally Handicapped range of function or lower, or with severe physical and/or sensory handicaps were participants.

One month later these students were given the California Achievement Test (CAT) and the scaled scores for each child in Total Reading and Total Mathematics compiled. At the end of the school year each classroom teacher was asked to specify the actual levels of performance at which students were working in reading and mathematics based on publisher standards defining grade level equivalents corresponding to the textbook used. Each teacher further classified students into one of three groups based on classroom achievement (above average, average, and below average).

Finally, students were placed into one of the following groups on the basis of their school performance either at the end of second grade or during third grade:

1. Students referred by teachers for special education evaluation because of academic performance difficulties and placed into special education classes or those already enrolled in special education classes;
2. Students who failed second grade and were repeating or students who failed third grade during the next

academic year and were repeating; and

3. the regular education group.

Statistical Analyses

Descriptive statistics were computed for each of the three individual groups formed on the basis of school performance. Individual simultaneous regression analyses using the 12 subtest scores from the LET as the independent variables were computed for each of these criterion variables: CAT Total Reading Score; CAT Total Mathematics Score; actual level of performance in Reading; and actual level of performance in Mathematics. Discriminant functions analyses were computed using teacher class rankings of students into three groups (above average, average, and below average) and for the student groups formed at the end of second grade and during third grade (special education placements, retained in grade, and regular education students).

Results and Discussion

Descriptive statistics on age, CAT subtests, and LET performance for each of the three groups formed on the basis of retention or special education placement are presented in Table 1. The special education group performed lowest on the CAT

Insert Table 1 about here

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variables and had the highest mean age. On the LET no such consistent pattern was evident. In terms of short-term memory (STM) capacity the average group showed the highest retention capacities for both visual (VOI) and auditory inputs, with

auditory STM capacity (AOI and AUI) their strongest learning modality.

Table 2 presents a summary describing the degree to which LET performance differentiated the three groups of students on the basis of school placement and advancement. Overall,

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Insert Table 2 about here

48.07% of student class placements were correctly predicted according to LET performance determined five to 15 months previously. Over 61% of the students referred and placed into special education were correctly classified by previous LET performance pattern. Lowest classification success was for the retained in grade group, although the 36.7% success rate was still slightly above chance levels. This may reflect the heterogeneity of learning characteristics within this group.

The discriminant functions analysis conducted using teacher class rankings of students into three groups indicated that, overall, 43.50% of students were correctly classified based on LET performance. Over 54% of students in the above-average and 48% in the below-average groups were correctly classified based on the LET. These data offer further substantiation for the LET as an effective screening instrument for predicting classroom performance and achievement.

Teacher class rankings may be the most important standard by which to evaulate predictive usefulness of the LET. In fact, current research has indicated that ratings by teachers offer

significant information about student performance levels (Sharpley & Edgar, 1986). Several authors have suggested that these ratings should be an integral part of the psychoeducational evaluation (Gresham, Reschly & Carey, 1987). Others are more adamant and have asserted that these ratings should be the major criterion to evaluate norm-referenced test validity (Gerber & Semmel, 1984).

Table 3 and 4 presents a summary for the regression of LET subtests with CAT Total Reading and Total Mathematics scaled scores. LET performance was consistently highly predictive of

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Insert Table 3 and 4 about here

CAT achievement levels in both subtests. The statistically non-significant levels indicated for the special education placements and retained in grade groups seems to reflect the small number of students in each. For the groups with substantially larger numbers, extremely high levels of statistical significance are evident and show that LET is highly predictive of achievement test performance. Findings from regression analyses of teacher estimates of achievement level in class indicated coefficients of .424 ($p < .01$) for actual reading and .346 ($p < .14$) for actual mathematics functional levels. Auditory immediate recall from the LET proved to be a consistently high predictor of performance in each of these variables.

These findings indicate that LET performance is a reliable

predictor of and discriminator between children who are successful in third grade and those who require special education placement either at the end of second grade or during third grade. The LET is easy to administer and reflects a cost-effective approach. Moreover, the predictive efficacy of the LET represents substantial improvements over past studies that used costly and elaborate diagnostic procedures which have failed to identify at-risk students beyond chance levels.

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Table 1

Means and Standard Deviations for Groups According to Variables

Variables	Special Education Placements		Retained in Grade		Regular Education	
	M	SD	M	SD	M	SD
Age: (Months)	101.30	8.00	97.23	8.45	94.99	7.56
CAT:Reading	542.40	70.46	561.24	66.00	638.01	61.05
CAT:Mathematics	619.80	49.19	633.42	56.53	674.24	59.03
Visual, Ordered						
Immediate (VOI)	2.64	.70	2.54	.70	2.75	.82
Short-term (VOS)	1.93	1.28	1.46	1.26	1.62	1.25
Long-term (VOL)	2.00	1.23	1.46	1.19	1.51	1.24
Visual, Unordered						
Immediate (VUI)	2.90	.74	2.88	.84	3.11	.99
Short-term (VUS)	2.32	1.35	2.16	1.26	2.16	1.43
Long-term (VUL)	2.33	1.30	2.06	1.34	2.01	1.51
Auditory, Ordered						
Immediate (AOI)	2.61	.88	2.62	1.14	3.08	1.16
Short-term (AOS)	1.03	.83	1.34	1.15	1.66	1.26
Long-term (AOL)	.83	.93	1.08	1.07	1.46	1.28
Auditory, Unordered						
Immediate (AUI)	2.90	.94	2.82	1.22	3.28	1.20
Short-term (AUS)	1.61	1.05	1.94	1.28	2.23	1.32
Long-term (AUL)	1.48	1.23	1.83	1.34	2.04	1.36

Table 2

Summary Table for the Discriminant Function Analysis Indicating Numbers and Percentages of Students for Predicted Group Membership

Group	Actual N		Predicted Group Membership 1	2	3
Special Education Placements	31	N	19	7	5
		%	61.3%	22.6%	16.1%
Retained in Grade	49	N	14	18	17
		%	28.6%	36.7%	34.7%
Regular Education	309	N	57	102	150
		%	18.4%	33.0%	48.5%

Percent of "Grouped" cases correctly classified: 48.07%

Table 3

Simultaneous Multiple Regression for LET Performance with CAT Reading

	Multiple R	% Variance Accounted	ANOVA
Special Education Placement	.7332	53.76	$F(12, 7) = 0.6781$, ns.
Retained in Grade	.5184	26.87	$F(12, 32) = 0.9799$, ns.
Regular Education	.2899	8.41	$F(12, 285) = 2.179$, $p<.012$
Total Group	.3120	9.74	$F(12, 350) = 3.246$, $p<.0003$

Table 4

Simultaneous Multiple Regression for LET Performance with CAT Mathematics

	Multiple R	% Variance Accounted	ANOVA
Special Education Placement	.9081	82.47	$F(12, 7) = 2.744$, ns.
Retained in Grade	.6456	41.68	$F(12, 32) = 1.906$, ns.
Regular Education	.3211	10.31	$F(12, 285) = 2.730$, $p<.001$
Total Group	.3225	10.40	$F(12, 350) = 3.385$, $p<.0001$