

LEARNING POTENTIAL MEASUREMENT WITH SPANISH-SPEAKING YOUTH AS AN ALTERNATIVE TO IQ TESTS: A FIRST REPORT*

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ABSTRACT. The learning potential (LP) procedure represents an alternative method of measuring the general ability of Spanish-speaking students who tend to score low on traditional IQ tests. The relative predictive power of LP and IQ measures on achievement scores was compared for Spanish-speaking students. Subjects were administered the Raven and Series LP procedures, the WISC Performance Scale in Spanish, the WISC vocabulary subtest, Picture Motivator Scale, and an achievement test in Spanish and English. Numeric and nonverbal achievement in both Spanish and English were significantly related to posttraining Series LP scores, WISC performance IQ, and age. WISC vocabulary scores were related only to verbal achievement in the same language. The LP procedure resulted in increased levels of performance on a reasoning task and predicted achievement better than verbal IQ for these students.

RESUMEN. El procedimiento "potencial de aprender" (LP) representa una alternativa al método para medir la habilidad general de los estudiantes de habla española, los cuales tienden a producir un porcentaje bajo en los tradicionales IQ tests. Se comparó con estudiantes de habla española el relativo poder predictivo, en relación al rendimiento, de los métodos LP y IQ. Se les administró a los estudiantes el Raven y procedimientos de las Series LP, la escala de ejecución del WISC en español, subtests de vocabulario del WISC, la Escala Motivadora de Grabados y un examen de rendimiento en español e inglés. Los resultados en rendimiento cuantitativo y no-verbal en español e inglés estuvieron significativamente relacionados a las calificaciones de post-entrenamiento en las Series LP, a la escala de ejecución del WISC, IQ y edad. Los resultados del WISC de vocabulario estaban relacionados solamente al resultado verbal en la misma lengua. El método LP dio como resultado ejecución elevada en una tarea de razonamiento y predijo rendimiento mejor que el IQ verbal para estos estudiantes.

Children from poor and/or nonwhite homes tend to score at below average levels, often in the mentally retarded ranges, on IQ tests which purport to measure intelligence. For the child who speaks a language other than English, this practice has resulted in a high incidence of children misclassified as mentally retarded and placed in special classes. Poor Spanish-speaking Americans of Puerto Rican, Mexican, or other Latin American origin have been over-represented in special classes for the mentally retarded, and are inappropriately educated as if they were mentally retarded. What casts greatest doubt on the validity of the low IQ score as a measure of these children's *intelligence*, more broadly defined, is that their behavior

at home and in their community is generally perceived as adequate (Mercer, 1973). The President's Committee on Mental Retardation recently called attention to these children as "six hour retarded" children, i.e., retarded during the school day but not in their functioning in their home or community (President's Committee on Mental Retardation, 1969).

The designation of these children as mentally retarded by an IQ score is clearly inappropriate because they are culturally and linguistically different from the white, middle class, English-speaking students for whom the expectations of school programs are congruent with their prior and continuing home experience. The poor and/or non-English-speaking child does not have the school-appropriate matrix of prior and continuing experience. The prediction of their intelligence as reflected in the IQ score is based on items inappropriate for these children. But the IQ score does correctly predict their failure in school, unless the program of the school is adjusted to their learning strengths.

Zirkel (1972) and DeAvila and Havassy (1972) have reviewed the relevant literature and demonstrated the inadequacy of existing procedures for testing Spanish-speaking children. The authors indicated several possible reasons for the low IQ scores of Spanish-speaking children. They may lack competence in the vocabulary and the idiom of the English language. The Spanish-speaking children of concern come from a low income environment which provides "minimal opportunity for the learning of the skills which are subsumed under the term intelligence . . . [rather it] is one in which he [the lower class youth] has maximum opportunity to learn 'self-defeating' techniques - e.g., loosely defined expectancies of failure, absolute as opposed to relative thinking, concrete as opposed to abstract thinking, belief in his essential worthlessness, etc." (McCandless, 1952). The culture fair tests developed by Cattell (1940) and Davis and Eells (1952) failed to eliminate social class differences in attainments because middle class children are good spontaneous solvers of abstract problems regardless of the test contents.

Translating existing IQ tests for Spanish-speaking children into Spanish can be criticized because regional dialects abound and direct translations may result in questions and vocabulary irrelevant to the Spanish-speaking child's experience (DeAvila & Havassy, 1972). The same word may have a different meaning for children from Mexican and Puerto Rican backgrounds.

Tests which consider cultural background should take account of the fact that the Spanish-speaking child is reluctant to guess when he doesn't know the answer to a question (Brussel, 1968; Hertzog, Birch, Thomas, & Mendez, 1968); that the Indian child is taught in the spirit of cooperation rather than competition and is reluctant to compete with his peers; that

test items with time limits may run counter to the concept of time appropriate within a particular culture; and that there are a significant number of children from all of these groups who view the schools (and testing) as threatening, hostile, and alien.

Budoff (1969) has set forth the rationale for an alternate method to the IQ test for measuring intelligence, where this construct is defined as the ability to learn and profit from appropriate experience. Learning potential assessment utilizes a three-stage procedure which includes a pretest, a training session, and a posttest. The tasks employed to date have been nonverbal reasoning problems. The strategy is based on the premise that low income and/or minority group children differ in familiarity and experience with particular tasks, have a negative expectancy of success in test-taking, and are less effective in spontaneously developing strategies appropriate to solving the often strange problems on a test. Training helps these children develop a sense of competence on the task by providing them with problem-relevant strategies in a context of positive support. Two scores are derived from the learning potential assessment paradigm. Pre-training scores reflect the present functioning ability of the child on the task. The posttest scores reflect what the children can do following the training experience which seeks to equalize the test-taking disadvantages of the poor, and/or nonwhite, and/or non-English-speaking child.

Considerable work has been completed with this measurement approach with children and adolescents IQ-defined as educable mentally retarded and placed in special classes for the retarded. Up to two-thirds of these low income, low IQ, white and black children scored in dull and average ranges on the nonverbal reasoning tasks following training. These children have severe educational problems which are predictable from their low academic aptitude (IQ) scores. The heightened score following task-appropriate training on a nonverbal reasoning task clearly indicates ability to profit from experience that might be available for more satisfactory school learning if child-appropriate educational units were given the child. Budoff, Meskin, and Harrison's (1971) findings supported this hypothesis. They demonstrated that response to learning potential training, not IQ score or special or regular class placement, differentiated students' performance on a curriculum unit that emphasized empirical learning.

Like IQ scores, pretraining learning potential scores have been shown to correlate positively with socioeconomic indicators of disadvantage such as intactness of family, noninstitutionalization, English language competence, Stanford-Binet, and verbal and performance scale IQs (Budoff & Corman, in press). Posttraining scores continued to be related to performance IQ measures, e.g., Wechsler Performance IQ. The patterns of "disadvantage" most clearly evident in the relationships of the demographic

variables to Stanford-Binet, and WISC IQ, and pretraining scores were not evident with posttraining scores.

Studies of average IQ black and white children, differing in socioeconomic status, have demonstrated the reduction of social class differences following learning potential training, when two different measures of learning potential (LP) were used (Budoff & Corman, in press; Budoff & Corman, 1973). Although mean posttraining scores of middle class children were higher following training, large proportions of low income children, regardless of race, performed at the mean pretest level of their middle class peers following training.

The purpose of this study was to compare the relative predictive power of LP and IQ measures with Spanish-speaking students. The criterion measure was the Inter-American General Abilities Series (IAGAS), the only achievement test with comparable forms which measure competence in Spanish and English. The learning potential predictors were posttraining scores on the Raven's Matrices and Series Learning Potential measures administered with Spanish language instructions. The IQ predictors were WISC performance scale, administered in Spanish, and scores on the WISC vocabulary subtests, administered individually in Spanish and English. Prorated vocabulary scores provided an estimate of verbal IQ in both languages. These scores have been described by Albizu, Stanton, and Matlin (1966) as the best estimate of verbal IQ for Puerto Rican persons. Since motivation can influence test performance, the Picture Motivator Scale (Haywood, 1968) was administered in Spanish and English and was also included as a predictor.

Hausman (1972) explored the predictive validity of IQ scores (Primary Mental Abilities and WISC) and LP measures (Raven's and Kohs' Learning Potential) with bilingual Mexican American students. He reported that Picture Motivator and Raven's posttraining scores were significant predictors of arithmetic achievement on tests administered in Spanish. In the present study it was hypothesized that the two posttraining LP scores would be better predictors of achievement for this low income sample than either the English or Spanish verbal IQ measures. Since LP scores have been shown to be highly related to performance IQ (Budoff & Corman, in press), little difference between the predictive power of LP and performance IQ scores was expected.

METHOD

Subjects

One hundred eighty-eight Spanish-speaking students from two urban school districts in Massachusetts were tested. The 78 girls and 110 boys

ranged in age from 6-2 to 14-10 with a mean of 10-3 (± 2.2) years. Seventy six were in grades 1 to 3 (mean CA = 8.67 ± 1.50 years) and 112 in grades 4 to 6 (mean CA = 11.65 ± 1.25 years). The students in both schools were similar in age and IQ, and spoke Spanish primarily. However, one school program used Spanish as the primary language of instruction with English as a second language (transitional bilingual model), while the other school taught the students academic subjects in English.

Ninety two percent of the students were either born in Puerto Rico or their families had migrated from that island. Low socioeconomic status of the subjects was indicated by the mean family size of 6.26 (± 2.83) and the mean number of years of mother's education, which was 6.46 (± 2.84).

Instruments

WISC IQ. The Spanish translation of the performance subtest of the Wechsler Intelligence Scale for Children (Escala de Inteligencia Wechsler para Niños, 1954, Puerto Rican version) was given to all students. The vocabulary subtest of the WISC was administered in Spanish and English with language order counterbalanced. Estimate of verbal IQ score was obtained by prorating these scores.

LP measures. The two learning potential measures were group administered with instructions for testing and training presented in Spanish. The order in which the two measures were administered was counterbalanced to control for carryover effects of training on one measure to performance on the other.

1. *Raven Learning Potential Test.* Sets A, AB, B of the Raven Progressive Matrices (1956) were group administered to all students on the day prior to and the day following a 45-minute training session. Intermediate grade students were also administered Sets C, D, E (1958) because of the test ceilings.

A training booklet which contained nontest problems dealing with pattern completion, orientation of elements within a pattern, and double classification problems was distributed to each child. The trainer presented the problems on 2 x 2 slides from a Kodak Carousel projector on a blackboard. The students were required to draw in the missing element for the design before they looked at the six choices presented on the lower half of the page. For the double classification problems, it was found that children could easily derive one attribute at a time, but often did not hold the first attribute in mind while they derived the second relevant attribute. During development of the training procedure, the child's understanding was facilitated by having him draw the relevant attributes, one at a time as he derived them. This procedure helped concretize the elements of the solution process so that many children, after this type of practice, could do the

double classification problems mentally with very little trouble. The requirements of each problem type were presented in meaningful designs initially, e.g., an American flag with a piece missing, and then a geometric form to attune the child to the basic format of the Matrices test problems. Individual children were called to indicate the correct choice, and to give reasons for their choice. A slide with the answer included allowed them to compare their choice and to correct it, if necessary.

2. *Series Learning Potential Test*. The Series Learning Potential Test is a nonverbal reasoning task in which each item presents a horizontal series of pictures and a blank cell. Two comparable forms consisting of 65 items and including 40 pictorial series items, 10 geometric series, and 15 matrix items, are available for administration prior to and following training (Babad & Budoff, in press). The subjects must identify among the multiple choices the one which best completes the series. The concepts in a series of pictures vary systematically in type of figure, size (large/small), color (black/white), or orientation (up/down or either side). Thus, a blank cell may require a large, black puppy dog. The child is trained to identify each concept separately, trace its pattern in the series, and cross out the choices that are inappropriate for a correct solution. Sequentially, the child will be asked to choose a dimension, e.g., size, and a rhythmic "tune" — large, large, small; large, large, small; ———, large, small to identify the size of the missing figure. All the small figures among the answer choices would be eliminated. The child would do the same with each relevant dimension for the items. After the "tune" for each dimension is sung, incorrect choices are crossed out, until the single correct answer remains.

Picture Motivator Scale. The Picture Motivator Scale (Haywood, 1968) was group administered in both Spanish and English with language order counterbalanced. This scale is a 20-item forced choice measure of a student's motivational orientation, either intrinsic (high score) or extrinsic (low score).

The Inter-American General Abilities Series (IAGAS). This standardized multiple choice achievement test was administered in Spanish and English with language order counterbalanced. It is the only standardized achievement test available with comparable forms in Spanish and English. Levels 2 and 3 were used. Level 2, developed for use with second and third graders, consists of 100 items which measure oral vocabulary, numbers (oral and written), and nonverbal skills (classifications and analogies). Level 3, developed for grades 4, 5, and 6, consists of 150 items in six parts: sentence completion, figure analogies, computation, number series, word relations, and figure classifications. Both levels of the test combine subtests to yield three subscores: verbal, numerical, and nonverbal scores.

Procedure

The measures were administered in the following order: WISC IQ (performance and vocabulary), achievement, Picture Motivator, and learning potential. Standardized instructions for each instrument were used. Language order of administration of the Spanish and English vocabulary, achievement tests, and Picture Motivator Scale was counterbalanced with each pair of measures given on consecutive days. The learning potential measures were administered on three consecutive days – pretest, training, posttest, with order of the two measures counterbalanced. Both learning potential measures were not presented during the same week to any group of students.

RESULTS

Performance on Ability Measures

WISC IQ. Scores on the Spanish WISC Performance Scale and the vocabulary subtests in English and Spanish portray these Spanish-speaking children as intellectually below average. Many children's scores would classify them as mentally retarded. The average WISC performance IQ for the primary and intermediate grade students was 86.28 (± 14.82) and 85.71 (± 13.34), respectively. The prorated WISC verbal IQs obtained from the vocabulary subtest scores for the younger and older students respectively were: Spanish: 76.25 (± 16.15) and 77.47 (± 18.34); English: 52.44 (± 21.62) and 48.72 (± 22.72). Analysis of variance indicated that Spanish vocabulary scores were significantly higher than English scores ($F = 267.67$, $1/173$ *df*, $p < .001$), with no significant effect due to order of administration.

The tests administered in English illustrate the subjects' minimal understanding of the meaning of the words in English (mean scaled score 2.12 ± 2.67). Even when the words were administered in Spanish, the mean prorated verbal IQ score was in the borderline retarded range (mean scaled score = 6.47 ± 5.45).

Learning Potential. No systematic effect of order of administration of the two LP measures was found on either Raven posttraining score ($F = 0.00$, $1/148$ *df*) or Series LP posttraining score ($F = 0.63$, $1/143$ *df*). The mean pre and post scores of the students on the Raven Progressive Matrices and their percentile ranking by their chronological age norms are presented in Table 1. After the students were taught the strategies for solving the problems presented in the Raven test, their scores increased significantly ($t = 4.20$, $df = 73$, $p < .001$ for primary students; $t = 4.09$, $df = 110$, $p < .001$ for intermediate students). Posttraining scores on the

Raven placed these students at or above the average score for children of their chronological age although their pretraining scores averaged well below the mean.

Posttraining scores on the Series Learning Potential measure (Table 1) also increased significantly ($t = 3.32$, $df = 73$, $p < .01$ for primary students; $t = 2.56$, $df = 110$, $p < .05$ for intermediate students). One difficulty with the Series Test is that children older than 9 years of age tend to attain a de facto ceiling, which accounts for the lower average gain displayed by the intermediate grade students.

Picture Motivator Scale. Means on this test were 10.11 (± 2.96) in English and 9.76 (± 2.93) in Spanish. Analysis of variance revealed no significant effects due to language or order of language presentation. There was a significant difference between students in the two towns ($F = 6.875$, $df = 1/126$, $p < .01$). Students in one town were more intrinsically oriented than students in the other (mean = 10.5, $SD = 3.0$ for Town W; mean = 9.3, $SD = 2.9$ for Town L). This finding may indicate that the bilingual program of Town W, conducted largely in the child's native language, is more intrinsically motivating than a program which stresses attainment of English language competence.

Achievement test (IAGAS). Analysis of variance revealed no significant differences between Spanish and English scores on the nonverbal or numerical subtests and no significant effect due to the language order in which the subtests were administered. Scores on the verbal subtests varied with language order and language of administration. Higher scores were attained on the Spanish verbal achievement test ($t = 4.15$, $df = 182$, $p < .001$). Mean scores on the IAGAS for primary and intermediate students are presented in Table 2. Comparison with national norms obtained with a Mexican-American sample indicated that few students scored at or beyond their expected grade level even on the Spanish version; however, the considerable range of scores among the students indicated that some children were profiting more from their school experiences than others. These children were performing, on the average, well below their expected levels in both Spanish and English.

Prediction of Achievement by LP and IQ Measures

To test the relative predictive power of LP and IQ measures, a stepwise multiple regression analysis was performed on each of the six IAGAS achievement measures (Spanish and English scores on the verbal, nonverbal, and numeric subtests). Independent variables in these equations were posttraining scores on the Raven and Series LP measures (R_2 and S_2), age, WISC performance IQ, Spanish and English WISC vocabulary scores, and Spanish and English Picture Motivator scores. The order of entry of independent variables in these equations was determined by the

TABLE 1

Pretest and Posttest Means on Two Learning Potential Measures

	Raven						Series	
	Sets A,AB,B			Sets A,B,C,D,E			\bar{X}	SD
	\bar{X}	SD	Percentile ^a	\bar{X}	SD	Percentile ^a		
Primary students								
Pretest	17.21	6.97	25	---	---	--	23.94	11.48
Posttest	22.12	7.36	67	---	---	--	30.81	13.36
Intermediate students								
Pretest	24.56	6.53	25	30.14	10.54	22	38.84	11.83
Posttest	27.12	6.35	50	35.40	8.62	43	43.16	10.66

^aPercentiles are based on Raven's (1958) norms.

amount of variance accounted for by each variable. Results of these analyses are presented in Table 3.

TABLE 2
Mean Scores on the Inter-American General Abilities Series

Level 2 (Grades 1-3)			
Test	Average score	Standard deviation	Range of scores
Spanish verbal	17.919	5.73	0-30
English verbal	13.378	12.45	0-21
Spanish nonverbal	18.730	8.95	0-37
English nonverbal	19.865	6.76	1-34
Spanish numerical	12.703	7.02	2-28
English numerical	10.919	6.83	1-27
Level 3 (Grades 4-6)			
Spanish verbal	16.533	10.93	0-47
English verbal	11.911	6.08	2-35
Spanish nonverbal	27.600	10.63	3-47
English nonverbal	26.067	9.43	7-45
Spanish numerical	16.578	8.20	0-41
English numerical	18.400	8.87	0-37

The hypothesis that the LP measures would be better predictors of achievement than the verbal IQ measures was supported, particularly when the Series LP measure is considered. The best combination of predictors of nonverbal and numeric achievement in both Spanish and English was provided by the Series posttraining LP score, age, and WISC performance IQ. That is, students who were older or had a high posttraining score or performance IQ had the highest nonverbal and numeric achievement scores, regardless of whether achievement was measured in Spanish or English. The negative sign of the beta weight for the English Picture Motivator score indicated that more extrinsically motivated students also achieved higher scores on the English nonverbal (as well as verbal) subtests.

Raven posttraining scores, together with age, performance IQ, and Spanish WISC vocabulary scores, were significant predictors of verbal achievement in Spanish. High verbal achievement in English was related to age, high scores on the English WISC vocabulary test, and extrinsic motiva-

TABLE 3

T-tests of Independent Variables in Multiple Regressions

Independent variables	Dependent variables					
	Verbal		Nonverbal		Numeric	
	Spanish	English	Spanish	English	Spanish	English
Raven posttest	1.98*	.51	1.36	-.00	1.19	.63
Series posttest	-.05	1.22	2.58*	2.18*	3.04**	2.90**
Age	3.22**	2.11*	4.41***	6.04***	5.01***	5.04***
WISC perf.	2.79**	1.31	3.90***	5.81***	4.24***	3.64***
WISC voc.Span.	2.77**	1.54	1.08	1.12	.60	.98
WISC voc.Eng.	-1.20	2.37*	1.73	-.12	1.36	.81
Pict.Mot.Span.	.80	.48	-.78	1.09	1.40	.42
Pict.Mot.Eng.	-1.34	-2.38*	.19	-2.43*	-1.52	.73
r^2	.26	.18	.42	.44	.46	.43
F (df = 8/179)	7.94***	4.86***	16.21***	17.48***	18.84***	16.93***

* $p < .05$ ** $p < .01$ *** $p < .001$

tion. The verbal IQ measure significantly predicted achievement only on the verbal subtest given in the same language in which the WISC was administered.

DISCUSSION

The tests given in the traditional single administration format indicated the usual findings that these students tend to perform in the dull normal range on Spanish language versions of the WISC Performance Scale. The pretraining administration of the Raven Progressive Matrices indicated a

similar level of performance. When the vocabulary subtest is used as an estimate of verbal IQ, the means were also in the mentally retarded to dull normal ranges. Clearly these students are not competent when their spontaneous productions on school-oriented language or problem solving tasks are used as the basis for the estimates of intelligence. But these estimates reflect the combined effects of their recent arrival from Puerto Rico, the difference in their language, and their low socioeconomic status. Low income students, regardless of linguistic or cultural background appear to share a broad range of difficulties when confronted with the middle class style of reasoning problems in tests, and presumably, in school.

By contrast, showing these low income Spanish-speaking students *how* to perform more effectively on a reasoning task in a competence-inducing context seems to result in higher absolute levels of performances on the reasoning task. As an indication, these students increased their scores from an average Raven pretraining score at the 25th percentile to above average levels following training (mean of 67th percentile). While the performance IQ and Raven's pretraining scores were at comparable levels, posttraining scores reflected markedly increased competence on the Raven task. Further, posttraining learning potential scores were significantly related to the achievement scores in Spanish and English, as were the performance IQs, but the verbal IQ scores were related only to verbal achievement in the same language.

The achievement measure used in this study, however, is less valid than is desirable for a criterion of the learning potential procedure. These students performed poorly in Spanish and English on the achievement tests. On the average their skills fell well below the norms for the Mexican American population on which the tests were standardized. It may be argued that the low IQ scores do clearly indicate that these students' academic aptitude is low and in essential agreement with the low achievements. They will (and do) fail to progress satisfactorily in the traditional academically-focused programs. From scores on this test, the inference is drawn that these students are less intelligent, i.e., they cannot perform more adequately.

To indicate the broader significance of this increased capability following training, validity criteria are required that permit these children to demonstrate this general capability to reason without the negative effects of language-related learning that may hamper its expression. Specifically, the experimental paradigm must permit these children to learn concept-appropriate information and principles over time, unlike the achievement criterion which measures adequacy of past acquisition. Specially designed curricula that emphasizes learning concepts experientially have served to demonstrate this broader capability with low income IQ-defined EMRs

(Budoff, Meskin, & Harrison, 1971). This validity criterion can indicate the educational implications of the increased ability to reason following LP training with Spanish-speaking children as well. This hypothesis has been tested in subsequent research with these children which employed this criterion (Budoff, Corman and Gimon, 1974).

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FOOTNOTE

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