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The Learning Potential Test was administered three times to samples of bright, dull normal, and educable mentally retarded (EMR) children. Training in relevant problem solving strategies was interpolated following the second administration to separate the effects of practice and coaching. As hypothesized, lower-class dull normal and EMR subjects gained more than middle-class bright subjects from the coaching and the practice. Following training, the scores of substantial proportions of EMR and dull normal children fell in the range of the nontrained middle class bright sample. (Author)

STUDIES IN LEARNING POTENTIAL

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by

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SENSITIVITY OF LEARNING POTENTIAL MEASUREMENT IN THREE LEVELS OF ABILITY

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The growing doubts about the validity of traditional intelligence tests with members of low social-class and non-Western cultural groups send some test constructors rushing to collect new data for re-norming their old tests, cause others to replace the concept "intelligence" with the alternative term "scholastic aptitude," and lead still others to reconsider and reconstruct their conceptualization of intelligence. Budoff and his associates (Budoff, 1967, 1968, 1969, 1970) developed in recent years a conceptualization of intelligence based on learning potential, and found its derived measurement paradigm to be highly successful with lower class and educable mentally retarded (EMR) children.

IQ tests measure the degree to which children spontaneously acquire from their natural environment skills and knowledge relevant to school success. Children from non-middle class and non-Western environments do not have equal opportunity of access to these school preparatory experiences, and tend to perform poorly on IQ tests. This is true particularly for tests which emphasize verbal skills and stored information. To the detriment of these children, their low IQ scores are too often viewed as measures of general (inborn) ability, and as a result, they are treated as "slow learners" and/or "mentally retarded."

The learning potential concept is process-oriented and is derived from a conception in which intelligence is defined as the ability to profit from problem-relevant experience. The focus is on the child's educability and the trainability of cognitive processes. This conception is analogous to how "intelligence" would be defined in reference to computers. "Intelligent computers" are those who have been programmed to execute very complex operations, i.e., they have been "taught" the appropriate programs. The question asked by the learning potential assessment is whether, and to what degree, the lack of facility with the problems and contents of the IQ test items is due to slowness, to mental retardation, or to the absence of experiences which prepare the child to perform these tasks.

The learning potential measurement paradigm replaces the "one shot" test with a three-stage program - "pre-test - coach - test." The pre-test allows the subjects to familiarize themselves with the demands of the task. The coaching session, which immediately follows, provides relevant problem-solving strategies for the reasoning task. The post-test score includes both the child's initial "ability" and the effects of his learning. Potentially able but culturally deprived (and/or "culturally different") children may thus be expected to show substantial improvement from pre- to post-test.

Budoff and his associates (Budoff, 1968, 1970) have employed two nonverbal reasoning tasks in their learning potential assessment procedure. In these procedures, training is offered which is relevant to solving the problems found in an altered version of the Kohs Block Designs and Raven's Progressive Matrices. Results of these studies with educable mentally retarded and dull normal subjects allow one to validly distinguish three ability groups within this narrow IQ range - gainers, nongainers, and (pre-test) high-scorers. For example, Budoff, Meskin and Harrison (1971) reported marked differences between high-scorers, gainers and nongainers in ability to learn some principles of electricity after exposure to a manipulative science course. IQ or special versus regular class placement did not distinguish levels of attainment following the course.

Following training appropriate to reasoning tasks, substantial proportions of IQ-defined EMRs (educable mentally retarded) show great improvement, reaching the performance level of their non-retarded CA controls. This indicates the probability that they were misclassified. The predictive power of the learning potential measures is at least equal to that of performance IQ, often exceeding it. Systematic patterns of cognitive, motivational, and personality correlates of learning potential status have also been described (see Budoff, 1968, 1969, 1970 for details).

Babad and Budoff (1971) recently developed a group Learning Potential Test using a nonverbal reasoning task which belongs to the "super-ordinate concept" category -completion of series. While only picture series are coached, test series are also presented in geometric symbols. The test also includes several double-classification matrices. These latter items allow testing for the generalization of the learned strategies to non-trained problems. In the short coaching session, the subjects are trained to form the concepts of the series by using their sense of rhythm ("singing the tunes of the series"). They also learn to isolate concepts and solve one at a time.

Several characteristics make the Series Learning Potential Test particularly appropriate for disadvantaged children. It is based on a process-oriented approach which directly involves the child's ability to learn. The necessary strategies are provided and the children's sense of rhythm is utilized. The pictures are simple and attractive, and the concepts are not tricky - all the problems can be solved using the taught strategies. The role of background factors and stored information is minimized, the necessary verbalizations are simplified, and reliance on memory is reduced. The coaching session is a continuous success experience, and the children learn to understand the demands of the task and deal with them prior to the crucial post-testing. Also, both coaching and practice contribute to minimize the role of test-taking characteristics (e.g., anxiety, unfamiliarity, failure expectations) which often hinder the lower-class child.

Present techniques of mental measurement typically show a narrow spread within social-class groups, and a wide spread between social-class groups. If children whose experiences are not school-related (and who therefore show inferior performance in school-related measures) have an opportunity to learn how to solve reasoning problems, do they show a broader spread following tuition than they do on a "one shot" product-oriented test? Furthermore, how many of these underprivileged children can reach the level of their privileged peers when provided the relevant learning experiences? These were the questions that we set to explore in this study.

One general hypothesis was that the Series Learning Potential Test is sensitive to differences in ability in the low-achieving range. Thus, bright middle-class subjects would not demonstrate marked gains following practice or coaching since they were performing at their optimal levels in the pre-test. Working-class low-IQ subjects were expected to show marked gains following appropriate training and repeated exposure to the test, such that their post-training distributions would be flatter, indicating a greater spread of ability. Secondly, despite the large differences in IQ between the groups, it was hypothesized that some of the low IQ children would reach the pre-test level of their middle-class peers following appropriate training. The coaching is thus considered to facilitate "induced acquisition," which compensates for the middle-class children's spontaneous acquisition. Confirmation of this hypothesis would indicate that some low-IQ children are not inferior to their middle-class peers in potential ability and that some IQ-defined EMRs are educationally rather than mentally retarded.

Three groups of children in the middle elementary grades were selected - bright middle-class normals, dull lower-middle and lower-class normals, and lower-class educable mentally retarded (EMR) children. All were given the Learning Potential Test three times in a "test-test-coach-test" sequence. In this design, the practice effect ($T_2 - T_1$), the coaching effect ($T_3 - T_2$) and the practice coaching combination ($T_3 - T_1$) can be separated and studies independently.

Method

Subjects

Subjects were 126 (58 males, 68 females) white children in third, fourth and fifth grades of several New England schools divided into three groups: bright normal (N = 64, 21 males and 43 females, mean IQ of 113 [$\pm$ 12], predominantly from middle-class, suburban homes) dull normal (N = 37, 17 males and 20 females, mean IQ of 85 [$\pm$ 7], predominantly from blue-collar homes in an inner city district), and EMRs (N = 25, 20 males and 5 females, mean IQ of 68 [$\pm$ 7] from blue-collar homes in an inner city district). The EMR sample was drawn from segregated special classes. There was no indication in the school records of organic brain pathology in any student.

Materials

The two forms of the Series Learning Potential Test and the coaching booklet were used (see Babad and Budoff, 1971). Each of the two equivalent forms contains 65 items. The first 40 items consist of picture series which the subjects must complete by selecting one of several choices to fit in the blank space. Ten additional series items are presented in geometric symbols. The remaining 15 items consist of double classification matrices (five of which are presented in pictures, and ten in geometric symbols). The coaching booklet contains 17 picture series. The items use simple objects and change dimensions that all children can easily verbalize (e.g., applis, boys, black, white, large, small, etc.).

In standard administration of the test, Form A is the pre-test. It is immediately followed by a standardized coaching session in which the tester shows the students how to solve the problems. Several problem solving strategies are taught: 1) Each concept has a "rhythm," and one can solve it by "singing the tune." 2) A given series item can include more than one concept, and the child must then isolate them and "sing each tune separately." 3) One can eliminate the wrong choices for each tune without having to remember all at once. 4) A tune does not have to start at the beginning of the series. The post-test (Form B) is administered by the same tester three days after the initial session, and the subjects are reminded before they start of the "tricks" they have learned.

Procedure

The study was conducted in three sessions during the spring of the school year. The sequence for all groups was "test-test-coach-test," with the coaching immediately following the second administration of the test. The interval between sessions was two days. The administration of the tests and the coaching followed the standard instructions of the Learning Potential Test. All subjects received Form A in the first session and Form B in the third session. The second test was Form A for half of the subjects and Form B for the other half in each group. The tests were administered by trained assistants, experienced in the use of the Learning Potential Test.

Five dependent variables were investigated: Initial performance (T_1), final performance (T_3), practice score ($T_2 - T_1$), coaching gain score ($T_3 - T_2$), and combined practice and coaching gain score ($T_3 - T_1$).

Results and Discussion

The three gain scores were subjected to separate one-way analyses of variance. The results of the three analyses and of the subsequent *t* - tests are presented in Table 1. While the

Insert Table 1 here

F ratios for the coaching gain scores reached the .10 level of significance, the *F* ratios for practice gain scores and the combined practice and coaching gain scores reached the .001 level of significance. Thus, practice, coaching, and the practice and coaching combination differentially affected the three groups. The pattern of these results can be seen in Figure 1. The dull normal group gained from practice significantly more than both the bright normal and the educable retarded groups, with no difference between the gains of the latter two groups. The pattern of the coaching effect was different - the educable retarded group and the dull normal group gained significantly more than the bright normal group. The educable retarded group showed the highest coaching gain, but it was not significantly higher than the mean of the dull normal group. The combined gain scores show the same pattern, with the bright normal group gaining significantly less than the dull normal and educable retarded groups.

These results confirm the hypothesis regarding the sensitivity of the learning potential measurement in the low IQ-defined ability range. The two lower-class groups improved their performance more than the bright normals, and showed relatively greater ability when given the opportunity to understand the demands of the task and learn appropriate strategies. It is also interesting to note that while the dull normal group gained equally from practice and coaching, the IQ-defined educable retarded group gained mostly from the coaching, with a relatively small effect of mere re-exposure to the test.

Since the equivalent forms of the test were used in the second session, the analyses were repeated for each half. All effects and patterns were similar, and the means of the different groups were almost equal.

A question could be raised as to whether or not the pattern of the results reflected a ceiling effect with the bright normal group. This question is particularly relevant since the test was designed for a low-IQ population with relatively little increase in item difficulty and complexity of concepts toward the end of the test. Table 2 presents the means and the standard deviations of the initial and final performance of the three groups. The mean of the bright normal group was almost three standard deviations below the 65-point ceiling in the initial test, and more than two standard deviations below the ceiling in the final test.

Insert Table 2 here

The actual distribution of scores in this sample is even and bell-shaped, approximating the normal curve. There is no indication of skewedness which characterized ceiling effects. In light of the even distribution and the fact that there is no sudden increase in item difficulty (which could create a lower ceiling), it would seem that a ceiling effect did not play a role in determining the pattern of the results. (Incidentally, none of the bright normal subjects had a score of 64 or 65, and only five subjects had scores of 60 or above.)

A comparison of the standard deviations in Table 2 gives yet another indication of the test's sensitivity in the lower range. The standard deviations of the dull normal and the educable retarded groups in the first administration were twice as large as that of the bright normal group, indicating that these two distributions were flatter than the bright normal distribution. It is even more interesting to note that while the standard deviation of the bright normal group shrank slightly from the initial test to the final test, the standard deviation of the educable retarded group increased by more than 20%. With the curve flattened, a greater spread of ability was evident among the IQ-defined educable retarded subjects.

We hypothesized earlier that learning potential assessment compensates for the middle-class children's lifelong spontaneous acquisition by providing the underprivileged children with experiences which equip them to deal with the task at hand. The lower-class groups could thus be expected to reach the pre-test level of their higher ability controls following coaching. This hypothesis has important educational implications since a limited amount of training may raise some so-called retarded children to the level of performance of their non-retarded CA controls. The dull normal group seems an appropriate non-retarded comparison group for the educable retarded sample, exceeding its mean IQ by 17 points. The proportions of educable retarded subjects who fell at or above the mean initial score of the dull normal group in the initial and final tests was checked. We also checked the proportions falling at or above one standard deviation below the initial mean of the dull normal group. In the initial test, 16% of the educable retarded sample fell at or above the dull normal initial mean, and 36% fell at or above one standard deviation below that mean. In the final test, the proportions were 36% and 63% respectively. In other words, following thirty minutes of coaching, the proportion of so-called retarded subjects performing at the level of their non-retarded controls almost doubled. The trend is even more dramatic, although the figures are naturally lower, when the bright normal group is taken as a comparison group for the EMRs (note that there is a 45-point difference between the mean IQs of the two groups). While none of the EMRs reached the bright normal mean in the initial test and only 3% reached the -1SD point, the final test proportions were 13% and 20%, respectively. When the bright normal group is taken as a control for the dull normal group, the figures are 11% and 27% for the initial test, and 35% and 65% for the final test. Given that there is little IQ overlap between the three groups, these improved performance overlaps are rather impressive.

In conclusion, the Series Learning Potential Test was found to be sensitive to differences in ability among lower-class dull normal and educable retarded children. The learning potential assessment paradigm enabled these subjects to improve their performance and manifest higher ability than they show in a "one shot," product-oriented IQ test. Both dull normals and educable retarded subjects gained substantially from the coaching experience. The dull normals gained equally from the mere practice. Their middle-class, bright controls gained but little from either practice or coaching. The test seems to differentiate levels of ability to profit from experiences among blue-collar low-IQ children. The results also showed that a learning experience of 30 minutes enabled a substantial proportion of educable retarded subjects to reach the initial level of their non-retarded (dull and bright) CA controls. The improved performance of these low IQ children clearly reflects untapped potential abilities rather than a measurement artifact.

The implications of the learning potential measurement paradigm and of the findings of this study are far-reaching. First, a substantial proportion of so-called "mentally retarded children" may not be mentally retarded, as they are able to learn, improve, and apply their learning when appropriate opportunities and experiences are provided. The suspicion that classification of children and their assignment to special education on the basis of IQ tests is discriminating against the non-middle-class and non-Western groups seems to have some grounds. Finally, it is amazing to see how much progress can be accomplished in relatively short periods when proper, well-planned instruction is provided.

In the short run, learning potential types of measures should supplement IQ tests in determination of retardation and special class assignment. At least some able children by a Learning Potential assessment would be saved from the stigma and punishment of "retardation" and segregated special classes. In the long run, the "test-coach-test" paradigm could become an important tool in the hands of teachers and school psychologists, who could imporve the performance of school failing children by developing means to induce acquisition of problem solving strategies relevant to academic school success among children who have not developed them spontaneously.

Footnotes

[1]This research was supported by Grant OEG-0-8-080506-4597(607) from the Bureau of the Handicapped, U. S. Office of Education.

[2]The authors wish to extend their warm gratitude to Kathleen T. Dowd, whose invaluable assistance helped carry out this study and analyze its results.

[3]Requests for reprints should be sent to Dr. Milton Budoff at The Research Institute for Educational Problems, 12 Maple Avenue, Cambridge, Massachusetts 02139.

References

Babad, E. Y. and Budoff, M. The Learning Potential Test, Studies in Learning Potential, 1971, 2, in press.

Budoff, M. Learning Potential among institutionalized young adult retardates. American Journal of Mental Deficiency, 1967, 72, 404-411.

Budoff, M. Learning Potential as a supplementary assessment procedure. Learning Disorders, 1968, 3, 295-343.

Budoff, M. Learning Potential: A supplementary procedure for assessing the ability to reason. Seminars in Psychiatry, 1969, 1, 278-290.

Budoff, M. Learning Potential hypothesis: Its effects upon teacher expectancies for disadvantaged students. Paper presented at the Conference on Teacher Expectancies, Georgia State University, Atlanta, Georgia, October, 1970.

Budoff, M., Meskin, J. and Harrison, R.H. An educational test of the learning potential hypothesis. American Journal of Mental Deficiency, in press.

Table 1

Analyses of the Three Gain Scores for the Three Groups

	Practice Effect $T_2 - T_1$			Coaching Effect $T_3 - T_2$			Combined Effect $T_3 - T_1$		
	statistic	df	p	statistic	df	p	statistic	df	p
One way ANOVA between groups	$F = 16.3$	2,128	$<.001$	$F = 2.40$	2,128	$<.10$	$F = 9.32$	2,128	$<.001$
t-test between bright and dull normals	$t = 3.33$	99	$<.001$	$t = 2.26$	99	$<.025$	$t = 4.03$	99	$<.001$
t-test between bright normals and EMRs	$t = 0.56$	92	n.s.	$t = 2.69$	92	$<.005$	$t = 2.89$	92	$<.005$
t-test between dull normals and EMRs	$t = 2.54$	65	$<.01$	$t = 0.54$	65	n.s.	$t = 1.03$	65	n.s.

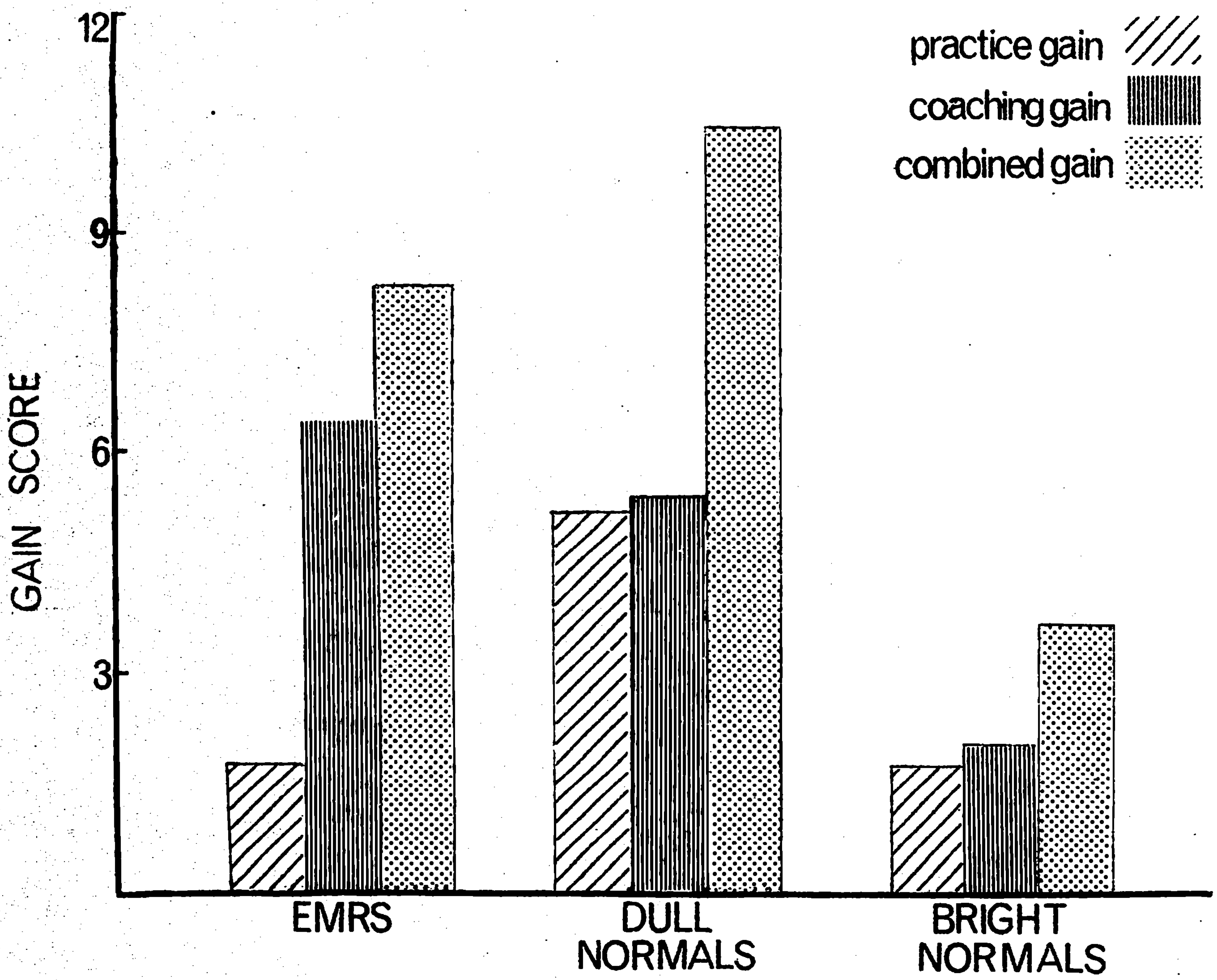
Table 2

Means and Standard Deviations of Initial Performance and Final Performance of the Three Groups

Group	Initial Performance		Final Performance	
	$\bar{X}$	SD	$\bar{X}$	SD
Bright Normal	51.9	5.01	55.4	4.73
Dull Normal	37.6	10.1	47.3	9.93
EMR	26.4	10.7	35.0	12.31

FIGURE CAPTION

Figure 1. Practice gain, coaching gain and combined gain of the three groups.


practice gain
coaching gain
combined gain
GAIN SCORE
12
9
6
3
EMRS
DULL NORMALS
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