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ABSTRACT

The Purdue Perceptual-Motor Survey, a standardized test of perceptual-motor ability, was administered to 98 disadvantaged rural 1st, 2nd, 3rd, and 4th graders. Comparisons between the mean scores of the disadvantaged sample and the norm group, and within the group of disadvantaged children, were made on the basis of both the total test scores and the scores on individual subtests. The disadvantaged group was compared to the norm group on overall group performance as well as by grade and sex. Comparisons were made within the disadvantaged group by grade and sex. Findings suggested that disadvantaged children are significantly less proficient in motor skills than are unselected children. An inconsistent pattern of grade differences indicated that the motor development of the disadvantaged group is uneven by comparison with the norm group. Significant sex differences between the 2 groups were also noted. Evidence to support related studies which suggest a slower rate of growth in learning patterns of disadvantaged children and a "cumulative deficit" in the acquisition of learning skills by disadvantaged children was also suggested. (The document contains 39 tables in addition to the narrative.) (BO)

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The Wisconsin State Universities Consortium of Research Development

Research Report

AN INVESTIGATION OF THE PERCEPTUAL - MOTOR ABILITY OF SMALL TOWN AND RURAL DISADVANTAGED CHILDREN

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Cooperative Research

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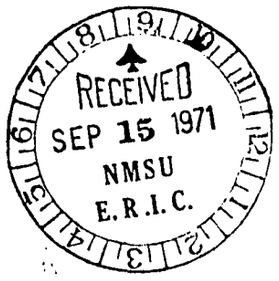

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U.S. DEPARTMENT OF
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Summary

The Purdue Perceptual-Motor Survey, a standardized test of perceptual-motor ability developed by Eugene Roach and Newell Kephart, was administered to a group of ninety-eight disadvantaged rural first, second, third, and fourth grade children. Comparisons were made between the mean scores of the disadvantaged sample and the norm group. Comparisons were also made within the group of disadvantaged children. The comparisons were made on the basis of both the total test scores and the scores on the individual subtests. The disadvantaged group was compared to the norm group on overall group performance as well as by grade and sex. Comparisons were made within the disadvantaged group by grade and sex.

The findings suggest that disadvantaged children are significantly less proficient in motor skills than are unselected children. An inconsistent pattern of grade differences suggests that the motor development of the disadvantaged group is uneven by comparison with the norm group. Significant sex differences between the two groups were also noted. Evidence to support related studies which suggest a slower rate of growth in learning patterns of disadvantaged children and a "cumulative deficit" in the acquisition of learning skills by disadvantaged children is suggested.

Introduction

Disadvantaged children have always been a part of our society, but their special problems and needs have been brought into sharp focus during the past decade. The increasing tendency for people with little education and few marketable skills to concentrate in urban areas which, in turn, offer fewer and fewer opportunities of employment for unskilled labor has provided many urban schools with a population from economically and culturally deprived homes which has become so large that it can no longer be either assimilated or ignored. The same technology which demands education and training for urban jobs affects many rural areas of the country, where marginal land, lack of education and training, and lack of money combine to provide many farmers and the rural non-farm residents whose livelihood is dependent on them with little more than a subsistence income and no practical means for escaping from the situation other than that of joining the throngs migrating to the cities.

Disadvantaged children present a serious problem to American education in that, as a group, they lack many attributes which educators regard as essential to learning success. These deficiencies are usually related to the influence of the economically and culturally deprived homes from which these children come.

A negative attitude toward education--an inability to understand how formal education as it is presently structured can help him to improve his way of life--is frequently cited as a major deterrent to learning success for the disadvantaged child. Another is the relative

lack of ability on the part of these children to think in conceptual terms. The perceptual-motor experiences which are basic to conceptual thinking and routinely provided in middle-class homes during pre-school years are frequently lacking in deprived homes. Success in the critical early years of school is dependent on the pre-school acquisition of these skills. The interrelationships between these two characteristics further complicate the problem in that the child, lacking the basic perceptual and cognitive learnings necessary for educational success, finds support for his negative attitudes in his constant failure.

It is to the second of these factors that this study is addressed. It has been widely implied in both popular and professional literature that disadvantaged children in our society cannot fully profit from formal learning because their motor skills, perceptual patterns, and subsequent ability to form concepts have been restricted by environmental conditions. Although the primary relationship of perceptual-motor skills to successful learning has been documented by numerous research studies, evaluations of the extent to which these skills are possessed by disadvantaged children tend to be general in nature and based on observation and personal experience rather than descriptive and experimental studies. The difficulty of using information of this type to make responsible judgments about the problems and needs of these children has been summarized by Clark (1965)

> Do culturally disadvantaged children learn differently from other children; Are they more prone to certain kinds of learning disability? . . . Have the inadequacies been diagnosed exactly, or has the focus been on the symptoms--poor reading and language skills, for example?

and by Deutsch (1965)

> It must be pointed out that the relationship between social background and school performance is not a simple one. Rather, evidence which is accumulating points more and more to the influence of background variables on patterns of perceptual, language and cognitive development of the child, and the subsequent diffusion of the effects of such patterns into all areas of the child's academic and psychological performance. To understand these effects requires delineating the underlying skills in which these children are not sufficiently proficient. A related problem is that of defining what aspects of the background are most influential in producing what kinds of deficits in what skills.

Recognition of the fact that our schools provide poorly for the disadvantaged child has become a problem of national importance. It is hoped that plans to meet their educational needs will continue to be implemented. In order to insure the best possible results, it would be well if the planners were provided with accurate information as to "what aspects of the background are most influential in producing what kinds of deficits in what skills."

This study was undertaken for the purpose of augmenting the information available concerning the special learning problems of disadvantaged children.

Methods

The central purpose of this study was to determine the significance of the differences between the responses of disadvantaged and unselected children on a standardized test of perceptual-motor ability, and to determine if grade and sex had any significant effect on the responses of disadvantaged children on a standardized test of perceptual-motor ability.

The procedures and design of this investigation were based on the following null hypotheses.

1. There were no significant differences between disadvantaged and unselected children on the combined measures of the test of perceptual-motor ability.

2. There were no significant grade differences between disadvantaged and unselected children on the combined measures of the test of perceptual-motor ability.

3. There were no significant sex differences between disadvantaged and unselected children on the combined measures of the test of perceptual-motor ability.

4. There were no significant differences between disadvantaged and unselected children on the subtest measures of the test of perceptual-motor-ability.

5. There were no significant grade differences among disadvantaged children on the combined measures of the test of perceptual-motor ability.

6. There were no significant sex differences among disadvantaged children on the combined measures of the test of perceptual-motor ability.

7. There were no significant grade differences among disadvantaged children on the subtest measures of the test of perceptual-motor ability.

8. There were no significant sex differences among disadvantaged children on the subtest measures of the test of perceptual-motor ability.

The sample. Ninety-eight children, selected by stratified random sample, comprised the sample for this study. The children were pupils

in grades one, two, three and four of the Ellsworth, Wisconsin public schools, and were identified as disadvantaged on the basis of their parent's mean educational level being less than grade twelve.

The Instrument. The Purdue Perceptual-Motor Survey, a standardized individual test of perceptual-motor skills developed by Eugene Roach and Newell Kephart (1966) was used to assess the perceptual-motor skills of this group. The test consists of thirty subtests, and was administered in the cooperating schools during the months of March and April, 1969.

Analysis of the data. Null hypotheses of no significant differences between the means of the disadvantaged group and the normative, or unselected group and between the means of the disadvantaged sample alone when considered by grade and sex were tested in this study. For those hypotheses which required a comparison of the mean of the disadvantaged children with that of the unselected group, the t test was used. For those hypotheses which required a comparison of means within the sample group, analysis of variance was used. The level of significance was established at .05.

Findings

Of the eight hypotheses tested in this study, the first three were concerned with the differences between the disadvantaged and the unselected group on the combined measures, or total individual scores, of the two groups. The fourth hypothesis was concerned with the differences between the disadvantaged and unselected children on the subtest measures. The remaining four hypotheses dealt with differences among the disadvantaged children. Hypotheses five and six were concerned with these differences on the combined measures of the test. Hypotheses seven and eight were concerned with these differences on the subtest measures of the test.

Comparisons of disadvantaged children with unselected children--combined measures. The mean score on the combined measures for the disadvantaged children without regard for grade or sex was found to be significantly lower than the same measure for unselected children. This difference was significant at the .01 level of significance.

Null hypotheses regarding sex and grade differences between the two groups were also rejected for the combined measures. Although no significant sex differences were observed between disadvantaged and unselected girls, the differences between disadvantaged and unselected boys were significant at the .01 level. These differences favored the unselected group.

Significant grade differences were also noted. The mean scores on the combined measures for grades two and four favored the unselected group at the .01 level of significance. No significant grade differences were observed between the means of disadvantaged and unselected children for grades one and three.

Comparisons of disadvantaged children with unselected children--subtest measures. Separate t values were calculated for each of the thirty subtests of the test for each of the four grades. Of the 120 separate values, seventy-four showed no differences between disadvantaged and unselected children, thirty-four showed significant differences favoring the unselected group, and twelve showed significant differences favoring the disadvantaged group.

It was observed that twenty-one of the thirty-four subtests which revealed significant differences favoring the unselected children were concentrated in those sections of the test which evaluated motor skills concerned with body image and perceptual-motor match. This pattern suggests that the disadvantaged children were especially weak in these areas. The twelve subtests which indicated significant differences favoring the disadvantaged group were not concentrated in any one area, but scattered throughout the test.

Relationships among disadvantaged children by grade and sex--combined measures. The analysis of variance test of the grade means of the combined measures of the disadvantaged children alone revealed grade differences in the performance of these children which were significant at the .01 level. By observation, it was apparent that this significance was primarily due to the large difference between the means of grade two and grade three.

No significant sex differences were noted in this analysis. The rejection of the null hypothesis regarding interaction suggests the possibility that significant sex differences may have been masked by the interaction. If this was the case, the significant sex differences favored the girls.

Relationships among disadvantaged children by grade and sex--subtest measures. The analysis of variance test of the subtest measures of disadvantaged children alone revealed significant grade differences on thirteen of the thirty tests. In all but one case, the significant variation could be traced to a duplication of the pattern noted in the combined measures, i.e., a large difference between the mean scores of second and third graders.

Significant sex differences were noted on five of the thirty subtests. In all cases except one, these differences favored the girls.

Conclusions

On the basis of this study, it appeared that the perceptual-motor skills of rural and small town disadvantaged children, as measured by the Purdue Perceptual-Motor Survey, were inferior to the perceptual-motor skills of unselected children measured by the same instrument. These findings tend to confirm the generalizations in the literature which suggest these deficiencies exist.

Examination of the statistical findings revealed two general trends in the patterns of the motor skills of the disadvantaged children tested. First, although the means of the disadvantaged children on the combined measures were significantly lower than those of the unselected children when considered on an overall basis, this was not true at all grade levels. While significant differences favoring the unselected group were noted at grades two and four, no significant differences appeared between the two means for grades one and three.

Thus, it appears that the rate of growth in motor skills of disadvantaged children in these grades is not consistent. Roach and Kephart (1966) report that the rate of growth for the unselected group was consistent. They observed no significant differences between grades.

It is possible, therefore, that the perceptual-motor development of these disadvantaged children is characterized by unevenness rather than the consistency reported as characteristic of the unselected group.

Another possible explanation for this developmental pattern is a slower rate of growth. The investigator observed that, in the normative data, there is a large difference between the means of the first and second grade unselected children. While not regarded as significant, this difference was large by comparison to the other differences between adjacent means. Thus it is possible that the developmental pattern of disadvantaged children may be similar to that of unselected children, but the rate of growth is slower.

A second noticeable trend in the findings is the tendency for the performance of disadvantaged children to deteriorate as grade level increases. This tendency is particularly noticeable on the subtests, and is especially evident in those subtests which evaluate those skills which are associated with body image and perceptual-motor match. The tendency for the performance of disadvantaged to deteriorate with age in other learning areas is frequently mentioned in studies of these children. It has been labelled a "cumulative deficit phenomenon" by Martin Deutsch (1967), and appears to be active especially between grades one and five. The present study appeared to support the concept of cumulative deficit in perceptual-motor areas.

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TABLE I

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN ON THE COMBINED MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY

N	98
Sums	7,942
SS	660,296
$\bar{X}$	81.041
Mu	84.785
$s_{\bar{x}}$	1.324
t	2.828
df	97
$t_{.05}$	1.987
$t_{.01}$	2.631
$P < .01$	

TABLE II

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN BY GRADE ON THE COMBINED MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY

	Grade 1	Grade 2	Grade 3	Grade 4
N	25	25	23	25
Sums	1,881	1,931	1,959	2,171
SS	145,563	153,527	170,203	191,003
$\bar{X}$	75.240	77.240	85.174	86.840
Mu	72.960	85.520	86.780	93.880
$s_{\bar{x}}$	2.594	2.701	2.572	2.030
t	0.878	3.065	0.414	3.467
df	24	24	22	24
t_{05}	2.064	2.064	2.074	2.064
t_{01}	2.797	2.797	2.819	2.797
P	$>.05$	$<.01$	$>.05$	$<.01$

TABLE III

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN BY SEX ON THE COMBINED MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY

	Male	Female
N	52	46
Sums	4,102	3,840
SS	333,530	326,766
$\bar{X}$	78.886	83.478
Mu	85.34	83.66
$s_{\bar{x}}$	1.935	1.732
t	3.333	0.105
df	51	45
t_{05}	2.011	2.016
t_{01}	2.682	2.693
P	$< .01$	$> .05$

TABLE IV

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN ON THE SUBTEST MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY
GRADE 1

Subtest	Mu	$\bar{X}$	$s_{\bar{x}}$	t
Walking Board				
Forward	3.46	3.720	.108	2.407*
Backward	2.52	2.760	.176	1.363
Sidewise	2.92	2.880	.167	0.239
Jumping	2.46	2.120	.145	2.344*
Ident. of Body Parts	2.48	2.120	.260	1.384
Imitation of Movement	2.68	2.040	.122	5.245**
Obstacle Course	3.00	3.000	.283	0.000
Kraus-Weber	3.50	3.600	.173	0.578
Angels-in-the-Snow	2.24	2.200	.129	0.310
Circle	3.00	3.000	.183	0.000
Double Circle	2.12	1.920	.152	1.315
Lateral Line	3.00	3.160	.180	0.889
Vertical Line	2.86	2.480	.154	2.467*
Rhythmic Writing				
Rhythm	2.14	2.400	.129	2.015
Reproduction	1.78	2.040	.091	2.857**
Orientation	2.36	2.560	.130	1.538
Both Eyes				
Lateral	2.70	2.840	.197	0.710
Vertical	2.48	2.680	.198	1.010
Diagonal	2.42	2.280	.158	0.886
Rotary	2.36	2.120	.167	1.437
Right Eye				
Lateral	2.28	2.840	.180	3.111**
Vertical	2.22	2.520	.184	1.630
Diagonal	2.04	2.040	.178	0.000
Rotary	2.00	1.840	.160	1.000
Left Eye				
Lateral	2.20	2.760	.194	2.886**
Vertical	2.00	2.440	.201	2.189*
Diagonal	2.02	2.080	.172	0.348
Rotary	1.78	1.920	.140	1.000
Developmental Drawing				
Form	1.94	2.080	.128	1.093
Organization	2.00	2.480	.284	1.690

*significant at .05 level $t_{05(24)} = 2.064$

**significant at .01 level $t_{01(24)} = 2.797$

TABLE V

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN ON THE SUBTEST MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY
GRADE 2

Subtest	Mu	$\bar{X}$	$s_{\bar{x}}$	t
Walking Board				
Forward	3.66	3.680	.095	0.210
Backward	2.88	2.640	.190	1.263
Sidewise	3.20	2.880	.185	1.729
Jumping	2.52	2.400	.173	0.693
Ident. of Body Parts	2.86	2.600	.265	0.981
Imitation of Movement	2.82	2.320	.111	4.504**
Obstacle Course	3.30	2.560	.306	2.418*
Kraus-Weber	3.62	3.680	.125	0.480
Angels-in-the-Snow	2.60	2.400	.115	1.739
Circle	3.18	3.160	.138	0.144
Double Circle	2.50	2.200	.183	1.639
Lateral Line	3.22	2.880	.218	1.559
Vertical Line	3.00	2.520	.117	4.102**
Rhythmic Writing				
Rhythm	2.70	2.400	.100	3.000**
Reproduction	2.32	2.040	.040	7.000**
Orientation	2.84	2.880	.145	0.275
Both Eyes				
Lateral	3.08	3.040	.196	0.204
Vertical	3.04	2.920	.182	0.659
Diagonal	2.96	2.320	.180	3.556**
Rotary	2.84	2.360	.181	2.651*
Right Eye				
Lateral	2.88	2.720	.196	0.816
Vertical	2.80	2.640	.199	0.804
Diagonal	2.74	2.120	.167	3.712**
Rotary	2.60	2.120	.156	3.076**
Left Eye				
Lateral	2.86	2.840	.197	0.101
Vertical	2.82	2.600	.200	1.100
Diagonal	2.68	2.040	.158	4.050**
Rotary	2.52	1.960	.158	3.544**
Developmental Drawing				
Form	2.28	2.040	.108	2.222*
Organization	2.20	2.680	.287	1.672

*significant at .05 level — $t_{05(24)} = 2.064$

**significant at .01 level — $t_{01(24)} = 2.797$

TABLE VI

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN ON THE SUBTEST MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY
GRADE 3

Subtest	Mu	$\bar{X}$	$s_{\bar{x}}$	t
Walking Board				
Forward	3.70	3.869	.072	2.347*
Backward	3.06	3.304	.147	1.659
Sidewise	3.28	3.478	.106	1.867
Jumping	2.90	2.478	.187	2.256*
Ident. of Body Parts	3.20	2.521	.226	3.004**
Imitation of Movement	2.96	2.304	.147	4.462**
Obstacle Course	3.18	2.783	.308	1.288
Kraus-Weber	3.50	3.870	.072	5.139**
Angels-in-the-Snow	2.70	2.130	.158	3.607**
Circle	3.38	2.783	.166	3.596**
Double Circle	2.84	2.130	.145	4.896**
Lateral Lines	3.48	2.739	.229	3.235**
Vertical Lines	3.18	2.043	.194	5.860**
Rhythmic Writing				
Rhythm	2.82	3.000	.141	1.276
Reproduction	2.88	2.826	.081	0.667
Orientation	3.14	3.087	.124	0.427
Both Eyes				
Lateral	2.84	3.217	.153	2.464*
Vertical	2.74	3.000	.178	1.460
Diagonal	2.74	2.739	.169	0.005
Rotary	2.60	2.696	.171	0.561
Right Eye				
Lateral	2.70	3.348	.162	4.000**
Vertical	2.64	3.000	.166	2.168*
Diagonal	2.46	2.652	.184	1.043
Rotary	2.44	2.521	.165	0.490
Left Eye				
Lateral	2.76	3.304	.171	3.181**
Vertical	2.74	2.870	.192	0.677
Diagonal	2.64	2.565	.164	0.457
Rotary	2.50	2.391	.163	0.668
Developmental Drawing				
Form	2.22	2.043	.147	1.204
Organization	2.56	3.304	.222	3.351**

*significant at .05 level — $t_{05(22)} = 2.074$

**significant at .01 level — $t_{01(22)} = 2.819$

TABLE VII

COMPARISON OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN ON THE SUBTEST MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY
GRADE 4

Subtest	Mu	$\bar{X}$	$s_{\bar{x}}$	t
Walking Board				
Forward	3.72	3.840	.075	1.600
Backward	3.30	3.080	.162	1.358
Sidewise	3.40	3.240	.176	0.909
Jumping	2.88	2.400	.163	2.944**
Ident. of Body Parts	3.42	2.800	.231	2.683*
Imitation of Movement	3.22	2.400	.141	5.815**
Obstacle Course	3.56	2.560	.306	3.267**
Kraus-Weber	3.82	3.840	.075	0.267
Angels-in-the-Snow	2.54	2.640	.172	0.581
Circle	3.48	3.160	.138	2.318*
Double Circle	2.82	1.960	.196	4.387**
Lateral Lines	3.62	2.960	.227	2.907**
Vertical Lines	3.34	2.840	.180	2.778*
Rhythmic Writing				
Rhythm	3.32	3.160	.111	1.441
Reproduction	3.08	2.920	.080	2.000
Orientation	3.32	3.240	.105	0.761
Both Eyes				
Lateral	3.36	3.320	.170	0.235
Vertical	3.23	3.280	.178	0.280
Diagonal	3.06	2.880	.185	0.972
Rotary	2.96	2.720	.187	1.283
Right Eye				
Lateral	3.06	3.200	.163	0.858
Vertical	2.90	3.080	.152	1.184
Diagonal	2.84	2.720	.169	0.710
Rotary	2.66	2.440	.174	1.264
Left Eye				
Lateral	3.14	3.240	.145	0.689
Vertical	2.98	3.000	.163	0.122
Diagonal	2.88	2.520	.154	2.377*
Rotary	2.82	2.480	.154	2.207*
Developmental Drawing				
Form	2.26	2.160	.075	1.333
Organization	2.90	3.560	.174	3.793**

*significant at .05 level
**significant at .01 level

$t_{05(24)} = 2.064$
$t_{01(24)} = 2.797$

TABLE VIII

SUMMARY OF TABLES IV THROUGH VII--COMPARISONS OF SCORES OF UNSELECTED AND DISADVANTAGED CHILDREN ON THE SUBTEST MEASURES OF THE PURDUE PERCEPTUAL-MOTOR SURVEY

Subtest	Grade 1	Grade 2	Grade 3	Grade 4	
Walking Board					Balance and Posture
Forward	*'	-	*'	-	
Backward	-	-	-	-	
Sidewise	-	-	-	-	
Jumping	*	-	*	**	
Ident. of Body Parts	-	-	**	*	Body Image and Differentiation
Imitation of Movement	**	**	**	**	
Obstacle Course	-	*	-	**	
Kraus-Weber	-	-	**'	-	
Angels-in-the-Snow	-	-	**	-	
Circle	-	-	**	*	Perceptual-Motor Match
Double Circle	-	-	**	**	
Lateral Lines	-	-	**	**	
Vertical Lines	*	**	**	*	
Rhythmic Writing					
Rhythm	-	**	-	-	
Reproduction	**'	**	-	-	
Orientation	-	-	-	-	
Both Eyes					Ocular Pursuit
Lateral	-	-	*'	-	
Vertical	-	-	-	-	
Diagonal	-	**	-	-	
Rotary	-	*	-	-	
Right Eye					
Lateral	**'	-	**'	-	
Vertical	-	-	*'	-	
Diagonal	-	**	-	-	
Rotary	-	**	-	-	
Left Eye					
Lateral	**	-	**'	-	
Vertical	*'	-	-	-	
Diagonal	-	**	-	*	
Rotary	-	**	-	*	
Developmental Drawing					Form
Form	-	*	-	-	
Organization	-	-	**'	**'	

*significant at .05 level, favoring unselected group
**significant at .01 level, favoring unselected group
*'significant at .05 level, favoring disadvantaged group
**'significant at .01 level, favoring disadvantaged group

TABLE IX

ANALYSIS OF VARIANCE--COMBINED MEASURE SCORES OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	71.231	77.923	83.142	83.250	315.546
Female	79.583	76.500	88.333	90.153	334.569
Totals	150.814	154.423	171.475	173.403	650.115

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sexes	1	545.567	545.567	3.680	3.95	6.93	$>.05$
Grades	3	2,419.581	806.527	5.441	2.71	4.01	$<.01$
Interaction	3	6,080.710	2,026.903	13.673	2.71	4.01	$<.01$
Within	90	13,340.804	148.231				
Total	97						

TABLE X

ANALYSIS OF VARIANCE--WALKING BOARD-FORWARD SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	3.538	3.615	3.857	3.833	14.843
Female	3.917	3.750	3.889	3.846	15.402
Totals	7.455	7.365	7.746	7.679	30.245

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.470	0.470	2.435	3.95	6.93	>.05
Grade	3	0.591	0.197	1.020	2.71	4.01	>.05
Interaction	3	0.507	0.169				>.05
Within	90	17.437	0.193				
Total	97						

TABLE XI

ANALYSIS OF VARIANCE--WALKING BOARD-BACKWARD SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.538	2.846	3.429	3.083	11.896
Female	3.000	2.417	3.111	3.077	11.605
Totals	5.538	5.263	6.540	6.160	23.501

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.133	0.133				$> .05$
Grade	3	6.103	2.034	2.860	2.71	4.01	$< .05$
Interaction	3	1.664	0.554				$> .05$
Within	90	63.998	0.711				
Total	97						

TABLE XII

ANALYSIS OF VARIANCE--WALKING BOARD-SIDEWISE SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.462	2.846	3.429	3.250	11.987
Female	3.333	2.917	3.556	3.231	13.037
Totals	5.795	5.763	6.985	6.481	25.024

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.664	1.664	2.641	3.95	6.93	$>.05$
Grade	3	6.260	2.087	3.312	2.71	4.01	$<.05$
Interaction	3	3.039	1.013	1.608	2.71	4.01	$>.05$
Within	90	56.716	0.630				
Total	97						

TABLE XIII

ANALYSIS OF VARIANCE--JUMPING SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.923	2.000	2.071	2.167	8.161
Female	2.333	2.833	3.111	2.615	10.892
Totals	4.256	4.833	5.182	4.782	19,053

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	11.241	11.241	19.549	3.95	6.93	<.01
Grade	3	2.641	0.880	1.530	2.71	4.01	>.05
Interaction	3	1.689	0.563		2.71	4.01	>.05
Within	90	51.819	0.575				
Total	97						

TABLE XIV

ANALYSIS OF VARIANCE--IDENTIFICATION OF BODY PARTS SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.307	2.308	2.214	2.917	8.746
Female	3.000	2.917	3.000	2.692	11.609
Totals	4.307	5.225	5.214	5.609	20.355

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	39.657	39.657	30.646	3.95	6.93	<.01
Grade	3	5.524	1.841	1.422	2.71	4.01	>.05
Interaction	3	-16.101	-5.367	4.147	2.71	4.01	<.01
Within	90	116.498	1.294				
Total	97						

TABLE XV

ANALYSIS OF VARIANCE--IMITATION OF MOVEMENT SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.923	2.154	2.286	2.167	8.530
Female	2.167	2.500	2.333	2.615	9.615
Totals	4.090	4.654	4.619	4.782	18.145

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.773	1.773	4.334	3.95	6.93	<.05
Grade	3	1.689	0.563	1.376	2.71	4.01	>.05
Interaction	3	0.531	0.177				>.05
Within	90	36.883	0.409				
Total	97						

TABLE XVI

ANALYSIS OF VARIANCE--OBSTACLE COURSE SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	3.231	3.308	2.500	2.250	11.289
Female	2.750	1.750	3.222	2.846	10.568
Totals	5.981	5.058	5.722	5.096	21.857

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.784	0.784				>.05
Grade	3	3.823	1.274				>.05
Interaction	3	8.479	2.826	1.359	2.71	4.01	>.05
Within	90	187.075	2.078				
Total	97						

TABLE XVII

ANALYSIS OF VARIANCE--KRAUS-WEBER SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	3.308	3.615	3.857	3.917	14.697
Female	3.917	3.750	3.889	3.769	15.325
Totals	7.225	7.365	7.746	7.686	30.022

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.591	0.591	1.738	3.95	6.93	>.05
Grade	3	1.134	0.378	1.111	2.71	4.01	>.05
Interaction	3	1.894	0.631	1.858	2.71	4.01	>.05
Within	90	30.571	0.340				
Total	97						

TABLE XVIII

ANALYSIS OF VARIANCE--ANGELS-IN-THE-SNOW SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.923	2.462	1.929	2.417	8.731
Female	2.500	2.333	2.444	2.846	10.123
Totals	4.423	4.795	4.373	5,263	18.854

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	2.919	2.919	6.030	3.95	6.93	<.05
Grade	3	3.076	1.025	2.117	2.71	4.01	>.05
Interaction	3	1.894	0.631	1.303	2.71	4.01	>.05
Within	90	43.581	0.484				
Total	97						

TABLE XIX

ANALYSIS OF VARIANCE--CIRCLE SUBTEST MENAS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.692	2.923	2.786	3.083	11.484
Female	3.333	3.417	2.778	3.231	12.759
Totals	6.025	6.340	5.564	6.314	24.243

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	2.460	2.460	4.226	3.95	6.93	<.05
Grade	3	2.352	0.784	1.347	2.71	4.01	>.05
Interaction	3	1.628	0.542		2.71	4.01	>.05
Within	90	52.414	0.582				
Total	97						

TABLE XX

ANALYSIS OF VARIANCE--DOUBLE CIRCLE SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.923	2.462	1.929	2.083	8.397
Female	1.917	1.917	2.444	1.846	8.124
Totals	3.840	4.379	4.373	3.929	16.521

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.109	0.109				>.05
Grade	3	1.484	0.494				>.05
Interaction	3	3.618	1.206	1.703	2.71	4.01	>.05
Within	90	63.748	0.708				
Total	97						

TABLE XXI

ANALYSIS OF VARIANCE--LATERAL LINE SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.769	3.077	2.429	3.000	11.275
Female	3.583	2.667	3.222	2.923	12.395
Totals	6.352	5.744	5.651	5.923	23.670

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.882	1.882	1.752	3.95	6.93	>.05
Grade	3	1.749	0.583				>.05
Interaction	3	6.947	2.315	2.155	2.71	4.01	>.05
Within	90	96.723	1.074				
Total	97						

TABLE XX.II

ANALYSIS OF VARIANCE--VERTICAL LINES SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.384	2.538	2.071	3.083	10.076
Female	2.583	2.500	2.000	2.615	9.698
Totals	4.967	5.038	4.071	5.698	19.774

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.217	0.217				>.05
Grade	3	8.081	2.693	4.098	2.71	4.01	<.01
Interaction	3	1.387	0.462				>.05
Within	90	59.148	0.657				
Total	97						

TABLE XXIII

ANALYSIS OF VARIANCE--RHYTHMIC WRITING-RHYTHM SUBTEST MEANS
OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.154	2.462	2.929	3.167	10.712
Female	2.667	2.333	3.111	3.153	11.264
Totals	4.821	4.795	6.040	6.320	21.976

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.458	0.458	1.312	3.95	6.93	$>.05$
Grade	3	11.591	3.863	11.068	2.71	4.01	$<.01$
Interaction	3	1.435	0.478	1.369	2.71	4.01	$>.05$
Within	90	31.434	0.349				
Total	97						

TABLE XXIV

ANALYSIS OF VARIANCE--RHYTHMIC WRITING-REPRODUCTION SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.077	2.000	2.786	2.833	9.696
Female	2.000	2.083	2.889	3.000	9.972
Totals	4.077	4.083	5.675	5.833	19.668

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.109	0.109				>.05
Grade	3	16.970	5.656	40.113	2.71	4.01	<.01
Interaction	3	0.205	0.068				>.05
Within	90	12.753	0.141				
Total	97						

TABLE XXV

ANALYSIS OF VARIANCE--RHYTHMIC WRITING-ORIENTATION SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.615	2.692	3.071	3.333	11.711
Female	2.500	3.083	3.111	3.154	11.848
Totals	5.115	5.775	6.182	6.487	23.559

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.036	0.036				>.05
Grade	3	6.368	2.123	5.320	2.71	4.01	<.01
Interaction	3	1.170	0.390				>.05
Within	90	35.940	0.399				
Total	97						

TABLE XXVI

ANALYSIS OF VARIANCE--OCULAR PURSUIT--BOTH EYES, LATERAL SUBTEST
MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.692	3.154	3.071	3.083	12.000
Female	3.000	2.917	3.444	3.538	12.899
Totals	5.692	6.071	6.515	6.621	24.899

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.218	1.218	1.509	3.95	6.93	>.05
Grade	3	3.305	1.101	1.364	2.71	4.01	>.05
Interaction	3	1.785	0.595				>.05
Within	90	72.677	0.807				
Total	97						

TABLE XXVII

ANALYSIS OF VARIANCE--OCULAR PURSUIT--BOTH EYES, VERTICAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.538	3.000	2.857	3.083	11.478
Female	2.833	2.833	3.222	3.462	12.350
Totals	5.371	5.833	6.079	6.545	23.828

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.146	1.146	1.357	3.95	6.93	>.05
Grade	3	4.330	1.443	1.709	2.71	4.01	>.05
Interaction	3	1.218	0.406				>.05
Within	90	75.983	0.844				
Total	97						

TABLE XXVIII

ANALYSIS OF VARIANCE--OCULAR PURSUIT--BOTH EYES, DIAGONAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.231	2.385	2.786	2.667	10.069
Female	2.333	2.250	2.667	3.077	10.327
Totals	4.564	4.635	5.453	5.744	20.396

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.096	0.096				>.05
Grade	3	6.284	2.094	2.762	2.71	4.01	<.05
Interaction	3	1.170	0.390				>.05
Within	90	68.249	0.758				
Total	97						

TABLE XXIX

ANALYSIS OF VARIANCE--OCULAR PURSUIT--BOTH EYES, ROTARY SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.154	2.385	2.786	2.417	9.742
Female	2.083	2.333	2.556	3.000	9.972
Totals	4.237	4.718	5.342	5.417	19.714

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.084	0.084				>.05
Grade	3	5.620	1.873	2.413	2.71	4.01	>.05
Interaction	3	2.340	0.780	1.005	2.71	4.01	>.05
Within	90	69.849	0.776				
Total	97						

TABLE XXX

ANALYSIS OF VARIANCE--OCULAR PURSUIT--RIGHT EYE, LATERAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.769	2.692	3.214	3.000	11.675
Female	2.917	2.750	3.556	3.385	12.608
Totals	5.686	5.442	6.770	6.385	24.283

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.315	1.315	1.694	3.95	6.93	>.05
Grade	3	6.827	2.275	2.931	2.71	4.01	<.05
Interaction	3	0.434	0.144				>.05
Within	90	69.900	0.776				
Total	97						

TABLE XXXI

ANALYSIS OF VARIANCE--OCULAR PURSUIT--RIGHT EYE, VERTICAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.538	2.538	3.000	2.750	10.826
Female	2.500	2.750	3.000	3.385	11.635
Totals	5.038	5.288	6.000	6.135	22.461

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.989	0.989	1.289	3.95	6.93	>.05
Grade	3	5.174	1.724	2.247	2.71	4.01	>.05
Interaction	3	1.725	0.575				>.05
Within	90	69.039	0.767				
Total	97						

TABLE XXXII

ANALYSIS OF VARIANCE--OCULAR PURSUIT--RIGHT EYE, DIAGONAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.000	2.231	2.714	2.417	9.362
Female	2.083	2.000	2.556	3.000	9.639
Totals	4.083	4.231	5.270	5.417	19.001

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.109	0.109				$>.05$
Grade	3	8.624	2.874	3.852	2.71	4.01	$<.05$
Interaction	3	2.448	0.816	1.093	2.71	4.01	$>.05$
Within	90	67.221	0.746				
Total	97						

TABLE XXXIII

ANALYSIS OF VARIANCE--OCULAR PURSUIT--RIGHT EYE, ROTARY SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.846	2.154	2.500	2.333	8.833
Female	1.833	2.083	2.556	2.538	9.010
Totals	3.679	4.237	5.056	4.871	17.843

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.036	0.036				>.05
Grade	3	7.128	2.376	3.473	2.71	4.01	<.05
Interaction	3	0.277	0.092				>.05
Within	90	61.588	0.684				
Total	97						

TABLE XXXIV

ANALYSIS OF VARIANCE--OCULAR PURSUIT--LEFT EYE, LATERAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.769	2.846	3.071	3.083	11.769
Female	2.750	2.833	3.667	3.385	12.635
Totals	5.519	5.679	6.738	6.468	24.404

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	1.134	1.134	1.440	3.95	6.93	>.05
Grade	3	6.380	2.126	2.701	2.71	4.01	>.05
Interaction	3	1.568	0.522				>.05
Within	90	70.840	0.787				
Total	97						

TABLE XXXV

ANALYSIS OF VARIANCE--OCULAR PURSUIT--LEFT EYE, VERTICAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.462	2.538	2.786	2.750	10.536
Female	2.417	2.667	3.000	3.231	11.315
Totals	4.879	5.205	5.786	5.981	21.851

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.917	0.917	1.020	3.95	6.93	$>.05$
Grade	3	4.704	1.568	1.744	2.71	4.01	$>.05$
Interaction	3	0.868	0.289				$>.05$
Within	90	80.961	0.899				
Total	97						

TABLE XXXVI

ANALYSIS OF VARIANCE--OCULAR PURSUIT--LEFT EYE, DIAGONAL SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.154	2.077	2.571	2.250	9.052
Female	2.000	2.000	2.556	2.769	9.325
Totals	4.154	4.077	5.127	5.019	18.377

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.121	0.121				$>.05$
Grade	3	5.584	1.861	2.849	2.71	4.01	$<.05$
Interaction	3	1.689	0.563				$>.05$
Within	90	58.824	0.653				
Total	97						

TABLE XXXVII

ANALYSIS OF VARIANCE--OCULAR PURSUIT--LEFT EYE, ROTARYNSUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	1.846	1.923	2.357	2.250	8.376
Female	2.000	2.000	2.444	2.692	9.136
Totals	3.846	3.923	4.801	4.942	17.512

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.868	0.868	1.473	3.95	6.93	>.05
Grade	3	5.946	1.982	3.365	2.71	4.01	<.05
Interaction	3	0.543	0.181				>.05
Within	90	53.070	0.589				
Total	97						

TABLE XXXVIII

ANALYSIS OF VARIANCE--DEVELOPMENTAL DRAWING--FORM SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.231	2.154	2.071	2.250	8.706
Female	1.917	1.917	2.000	2.077	7.911
Totals	4.148	4.071	4.071	4.327	16.617

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{01}	P
Sex	1	0.953	0.953	2.870	3.95	6.93	>.05
Grade	3	0.253	0.084				>.05
Interaction	3	0.193	0.064				>.05
Within	90	29.936	0.332				
Total	97						

TABLE XXXIX

ANALYSIS OF VARIANCE--DEVELOPMENTAL DRAWING--ORGANIZATION SUBTEST MEANS OF DISADVANTAGED CHILDREN BY SEX AND GRADE

	Grade 1	Grade 2	Grade 3	Grade 4	Totals
Male	2.308	2.846	3.429	3.250	11.833
Female	2.667	2.500	3.111	3.846	12.124
Totals	4.975	5.346	6.540	7.096	23.957

Source of Variation	df	Sums of Squares	Mean Square	F	F_{05}	F_{03}	P
Sex	1	0.133	0.133				>.05
Grade	3	17.923	5.974	3.943	2.71	4.01	<.05
Interaction	3	4.113	1.371				>.05
Within	90	136.388	1.515				
Total	97						