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By-Rubin, Rosalyn

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This study was made to find out to what extent kindergartens contribute to school readiness. Ninety children with a mean chronological age of 4.9 were tested with the Metropolitan Readiness Test (MRT), the Illinois Test of Psycholinguistic Abilities (ITPA), and a Behavior Rating Scale and were retested one year later. During the intervening year, 36 of the children attended kindergarten, while 54 did not. The data were analyzed by sex. On the pretest scores, there were no differences between kindergarten (K) and nonkindergarten (N-K) boys. K girls, however, did score significantl y higher than N-K girls on total MRT and ITPA scores and on parts of the Behavior Rating Scale. Girls scored consistently higher than boys in overall pretesting. The results of the study support the prevailing view that as children reach kindergarten age, school readiness and language skills of girls are further developed than are those of boys and that growth in these areas cannot be attributed to any special influence of the normal type of kindergarten program in this study. (JS)

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January 30, 1969

U. S. DEPARTMENT OF
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Effects of Kindergarten Attendance on Development of School Readiness and Language Skills

Rosalyn Rubin

Department of Special Education
University of Minnesota
Minneapolis, Minnesota

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U. S. DEPARTMENT OF

HEALTH, EDUCATION, AND WELFARE

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Summary

Ninety children born between September 1 and December 31 of the same year were tested with the Metropolitan Readiness Test, the Illinois Test of Psycholinguistic Abilities and a Behavior Rating Scale at a mean CA of 4-9 and retested with the same instruments one year later. During the intervening year 36 of these children attended kindergarten classes while 54 did not. Comparisons of kindergarten-attenders versus non-attenders indicated that in the majority of instances growth in readiness and language skills during the year between initial and final testing could be attributed to factors other than influence of kindergarten education.

Introduction

While kindergarten education for the past several decades has been strongly "child development" oriented (Lambert, 1958) with primary focus on social and emotional adjustment (Heffernan and Todd, 1960) more recent literature in the field of pre-school education supports the position that such education should have among its major objectives the stimulation and facilitation of language development, number concepts, and the abilities to attend and to follow directions (Robison and Spodek, 1967; Wills and Lindberg, 1967).

The burgeoning literature stressing the importance of formulating preschool programs for the disadvantaged so as to reinforce development of the underlying skills which are necessary for success-

ful school learning experiences (Deutsch, 1966; Frost and Hawkes, 1966) bears obvious relevance for the early education of all children. There is an abundance of evidence to indicate that the pre-school years are of crucial importance in the development of conceptual learning sets and in the acquisition of basic skills (Bloom, 1964; Fowler, 1962; Hunt, 1961).

The present study was undertaken in an effort to discover the extent to which existing kindergarten programs do in actuality contribute to increased readiness for later school learning by determining the relative effects of a year of maturation and incidental out-of-school learning experiences plus a formal kindergarten program versus such a year without the kindergarten experience. The development of school readiness and language skills were measured by the Metropolitan Readiness Tests (MRT) and the Illinois Test of Psycholinguistic Abilities (ITPA) respectively.

Method

Subjects

A total of 90 children, 44 boys and 46 girls, who were participants in the Collaborative Perinatal Research Project[1] and were born at the University of Minnesota Hospitals between September 1 and

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[1]This study, "The Collaborative Project for the Study of Cerebral Palsy, Mental Retardation, and other Neurological and Sensory Disorders of Childhood," is a major investigation in twelve medical centers of the antecedents of neurologically related childhood disorders. At each hospital, all pregnant women who came for care were encouraged to participate in the study. The University of Minnesota Hospitals' sample is comprised of families of graduate students, welfare clients, and middle class private patients, with the former two groups predominating.

December 31 of the same year were tested during the summer immediately preceding their fifth birthday with the ITPA (1961), the MRT (1964) and a Behavior Rating Scale devised for use in this project. The tests were individually administered by trained educational examiners. Subjects were retested with the same instruments one year later, during the summer preceding their sixth birthday. In the course of the intervening year 36 of these children, 17 boys and 19 girls, attended kindergarten and 54 children, 27 boys and 27 girls did not attend kindergarten.

Kindergarten attendance or non-attendance was based primarily on policies of local school districts regarding the establishment of kindergarten classes and the setting of age limits for school entrance. With the exception of one child in a no-kindergarten district who attended a private school, those subjects who attended kindergarten resided in school districts which routinely permitted kindergarten entrance for all children who reached the age of five within the calendar year in which they enrolled in school. The subjects who did not attend kindergarten were excluded because they chanced to reside either in a school district which did not conduct kindergarten classes or in a district which did not allow children to enter kindergarten unless their fifth birthday occurred prior to September 1 of the year in which they were enrolled.

Subjects were located in 41 separate school districts in the State of Minnesota. In only eight of these districts were children within the age range under investigation enabled to attend kinder-

garten. These eight districts included the cities of Minneapolis and St. Paul as well as five of their adjacent suburbs. One child attended kindergarten in a small community outside of the metropolitan area. Of the 54 children who did not attend kindergarten 33 resided in suburbs of the Twin Cities and 21 were located in small towns and rural communities throughout the state.

A socioeconomic index score was computed for the family of each subject based on interview data gathered at the time that the pregnant mother first became a participant in the Collaborative Perinatal Research Project. The socioeconomic index scores were derived by averaging scores on three socioeconomic variables, education, occupation (using the occupational classification of the U.S. Bureau of the Census), and total family income (Myrianthopoulos and French, 1968), thus the higher the index score the higher the socioeconomic level of the family.

As may be seen in Table 1 the socioeconomic index scores of Kindergarten (K) boys, No-Kindergarten (N-K) boys, and No-Kindergarten (N-K) girls are highly similar. However, the distribution of socioeconomic index scores of the Kindergarten (K) girls is consistently higher than for the other three groups of subjects with over 75 per cent of the K girls ranking above the median for N-K girls. The possible effects of this discrepancy in socioeconomic level between the two groups of girls is problematical. Since higher socioeconomic level is typically associated with a more enriched experiential background and with better performance in school it

Table 1

Socioeconomic Index Scores of K and N-K Subjects

	Boys		Girls	
	Kdgn. (N = 17)	No-Kdgn. (N = 27)	Kdgn. (N = 19)	No-Kdgn. (N = 27)
Q_3	70	66	87	70
Mdn.	57	53	70	53
Q_1	37	37	60	33
Range	05-99	10-93	23-93	05-83

might be anticipated that higher socioeconomic girls would be more "ready" for kindergarten activities and thus be more apt to benefit from them. On the other hand it might be argued that because of a more restricted background of educationally oriented experiences the program provided in kindergarten would have more impact and make more of a "difference" to the lower socioeconomic children.

Measures

The Metropolitan Readiness Tests (1965) were designed to measure the extent to which children have developed such skills and abilities as auditory and visual perception, motor coordination, linguistic skills, knowledge of numbers and ability to pay attention and follow directions, all of which contribute to readiness for initial first grade work.

The Illinois Test of Psycholinguistic Abilities (1961) consists of the following nine subtests each designed to measure a specific aspect of psycholinguistic ability:

1) auditory decoding - comprehension of spoken words
2) visual decoding - comprehension of pictures and printed words
3) auditory-vocal association - simple verbal analogies
4) visual-motor association - knowledge of meaningful relationships between pictured objects and symbols
5) vocal encoding - expressing ideas in spoken words
6) motor encoding - expressing ideas in gestures
7) auditory-vocal automatic - use of grammatical rules in predicting linguistic events
8) auditory-vocal sequencing - digit span
9) visual-motor sequencing - placing a series of picture symbols in original order of presentation from memory

The Behavior Rating Scale filled out by the examiner at the time of testing provided information regarding five areas of test behavior: attention span, cooperation, perseverance, social poise, and interest in test activities as well as a rating of test conditions.

Results

The statistical analysis was conducted separately by sex utilizing MRT raw scores and ITPA Language Age scores. Initial (pretest) mean scores of the K and N-K groups on the MRT and ITPA were compared by an analysis of variance procedure (using statistical program UMSTA 570 from the University of Minnesota Computer Center Library).[2] While there were no differences between pretest scores of K and N-K boys on either the MRT (Table 2) or the ITPA (Table 3), it may be seen from the data presented in Tables 2 and 4 that significant pretest differences favoring K over N-K girls did exist on MRT and ITPA Total scores as well as on the Numbers and Copying subtests of the MRT and the Auditory-Vocal Association, Vocal Encoding, and Auditory Decoding sections of the ITPA. Since these initial differences did exist between the two groups of girls the analysis of posttest scores for all subjects was done by analysis of covariance using initial score on each variable as the covariate.

It is of interest to note that the prevailing view that Kindergarten girls are more "ready" for school than are boys of the

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[2]All statistical analyses were carried out at the University of Minnesota Computer Center by Douglas Anderson.

Table 2

Comparison of Kindergarten and No-Kindergarten
Mean MRT Pre-Test Raw Scores

MRT Subtest	Boys			Girls		
	Kdgn. (N=17)	No-Kdgn. (N=27)	P	Kdgn. (N=19)	No-Kdgn. (N=27)	P
Word Meaning	5.06	4.59	.563	6.68	5.41	.041*
Listening	6.24	5.19	.363	8.21	6.07	.009**
Matching	1.94	1.78	.809	4.79	3.15	.068
Alphabet	3.12	1.96	.243	6.05	3.59	.060
Numbers	3.59	4.07	.593	6.94	5.15	.099
Copying	.29	.22	.792	2.32	1.07	.058
MRT Total	20.00	17.81	.561	35.00	24.19	.006**

Table 3

Comparison of Kindergarten and No-Kindergarten
Mean ITPA Pre-Test Language Age

Scores for Boys

ITPA Subtests	Kdgn. (N=17)	N-Kdgn. (N=27)	P
Auditory-Vocal Automatic	55.06	54.59	.922
Visual Decoding	56.06	54.44	.757
Motor Encoding	45.41	55.56	.297
Auditory-Vocal Association	51.82	55.00	.525
Visual-Motor Sequencing	50.94	52.22	.729
Vocal Encoding	50.94	61.70	.280
Auditory-Vocal Sequencing	55.47	63.96	.132
Visual-Motor Association	53.29	49.96	.523
Auditory Decoding	55.29	61.59	.272
ITPA Total	52.59	54.41	.555

Table 4

Comparison of Kindergarten and No-Kindergarten
Mean ITPA Pre-Test Language Age
Scores for Girls

ITPA Subtests	Kdgn. (N=19)	N-Kdgn. (N=27)	P
Auditory-Vocal Automatic	59.53	58.26	.794
Visual Decoding	62.42	60.63	.680
Motor Encoding	48.58	47.56	.814
Auditory-Vocal Association	64.21	56.48	.022*
Visual-Motor Sequencing	58.37	53.19	.226
Vocal Encoding	64.47	53.44	.032*
Auditory-Vocal Sequencing	59.68	59.63	.990
Visual-Motor Association	53.21	55.56	.637
Auditory Decoding	80.00	66.74	.034*
ITPA Total	61.21	56.70	.041*

same chronological age is supported by the finding that MRT pretest scores show consistent differences favoring both groups of girls over both groups of boys on all subtests as well as on total raw score.

Table 5 presents adjusted mean posttest scores of K and N-K subjects on the MRT. There was no difference between the two groups of boys on Total Raw Score and the only significant difference in subtest scores occurred on Matching where K boys scored higher than N-K boys (significant at .05 level). Significant differences favoring K over N-K girls were found on MRT Total Raw Score (.05 level) and on the Numbers and Copying subtests (both beyond the .01 level).

Table 6 presents the adjusted mean ITPA posttest scores of K and N-K boys. Significant differences favoring the K boys occurred on the Total Language Age score (.015 level) as well as on one of the nine subtests, Auditory Decoding (.05 level).

Adjusted mean posttest scores of K and N-K girls on the ITPA are shown in Table 7. There were no significant differences between the two groups on Total Language Age scores or on eight of the nine subtests. On only one subtest, Visual-Motor Association, was there a significant difference (.01 level) favoring the K girls.

The mean chronological ages of boys and girls in this study were 56.6 and 56.8 respectively. There were no differences in CA between K and N-K subjects of the same sex. The ITPA Total Language Age scores for N-K children of both sexes closely approximate their actual

Table 5

Analysis of Covariance of Mean Posttest
MRT Raw Scores

MRT Subtests	Adjusted Mean Scores: Boys Kdgn. (N=17)	Boys N-Kdgn. (N=27)	Boys P	Girls Kdgn. (N=19)	Girls N-Kdgn. (N=27)	Girls P
Word Meaning	8.40	7.93	.614	8.72	8.16	.429
Listening	7.64	8.19	.451	9.50	8.09	.067
Matching	5.49	3.76	.045*	7.77	6.23	.117
Alphabet	4.62	4.69	.954	8.75	6.73	.088
Numbers	9.79	7.46	.073	12.45	9.35	.001**
Copying	3.73	2.25	.063	5.88	3.75	.006**
MRT Total Raw Score	39.45	34.42	.197	50.92	43.80	.045*

Table 6

Analysis of Covariance of Mean ITPA Posttest Language Age Scores for Boys

ITPA Subtests	Adjusted Mean Scores Kdgn. (N=17)	N-Kdgn. (N=27)	P
Auditory-Vocal Automatic	67.34	64.82	.582
Visual Decoding	72.08	70.39	.732
Motor Encoding	61.14	57.54	.453
Auditory-Vocal Association	71.45	65.49	.065
Visual-Motor Sequencing	67.08	59.28	.099
Vocal Encoding	72.56	64.72	.224
Auditory-Vocal Sequencing	70.37	68.54	.645
Visual-Motor Association	71.17	63.48	.150
Auditory Decoding	81.93	71.00	.035*
ITPA Total	69.89	64.59	.015*

Table 7

Analysis of Covariance of ITPA Posttest Language Age Scores for Girls

ITPA Subtests	Adjusted Mean Scores Kgn. (N=19)	N-Kdgn. (N=27)	P
Auditory-Vocal Automatic	77.53	73.96	.432
Visual Decoding	72.82	65.49	.118
Motor Encoding	65.27	58.44	.139
Auditory-Vocal Association	77.80	74.66	.379
Visual-Motor Sequencing	72.99	64.86	.057
Vocal Encoding	81.19	73.20	.130
Auditory-Vocal Sequencing	67.50	69.06	.629
Visual-Motor Association	75.81	61.46	.008**
Auditory Decoding	81.96	76.77	.371
ITPA Total	72.30	69.31	.193

chronological ages while the language age scores of K boys were below their CAs and the girls K group scored slightly above their actual CA.

As indicated in Table 8 there were no initial differences between K and N-K boys on the Behavior Rating Scale. However, there were differences which were significant between the .01 and .05 levels favoring K over N-K girls on Attention Span and Social Poise as well as on Test Conditions.

As may be noted in Table 9 there were no differences in post-test ratings between K and N-K children of either sex, so that the initial differences favoring K over N-K girls had disappeared by the time of the final testing.

Summary and Discussion

Before and after measures of school readiness, language skills, and test behavior were obtained for a group of children (N = 36) who attended Kindergarten for one year. These same measures were obtained for a group of children (N = 54) of the same chronological age who did not attend Kindergarten during the one year interval between test administrations.

Results of the initial battery of tests administered at an average CA of 4-9 lend support to the prevailing view that, as children reach Kindergarten age, the school readiness and language skills of girls are further developed than are those of boys. Also in accord with previous research it was found that the high socio-economic level of one group of subjects (Kindergarten girls) was

Table 8

Comparison of Kindergarten and No-Kindergarten
Mean Pre-Test Behavior Ratings

Ratings	Boys			Girls		
	Kdgn.	N-Kdgn.	P	Kdgn.	N-Kdgn.	P
Test Conditions	2.35	2.52	.488	2.63	2.60	.672
Attention Span	1.82	2.22	.103	2.68	2.26	.028*
Cooperation	2.29	2.11	.440	2.79	2.44	.077
Perseverance	1.65	1.85	.379	2.47	2.04	.062
Social Poise	2.12	2.04	.725	2.68	2.22	.037*
Interest in Test Activities	2.00	2.07	.752	2.68	2.22	.022*

Table 9

Analysis of Covariance of
Posttest Behavior Ratings

Ratings	Adjusted Mean Scores					
	Boys			Girls		
	Kdgn. (N=17)	N-Kdgn. (N=27)	P	Kdgn. (N=19)	N-Kdgn. (N=27)	P
Test Conditions	2.39	2.39	.998	2.73	2.56	.240
Attention Span	2.60	2.36	.282	2.65	2.58	.665
Cooperation	2.68	2.68	.977	2.62	2.75	.464
Perseverance	2.52	2.60	.733	2.52	2.37	.469
Social Poise	2.52	2.39	.325	2.50	2.42	.641
Interest in Test Activities	2.59	2.40	.333	2.63	2.48	.399

accompanied by elevated initial scores on many of the variables under investigation.

Overall results of this study showing few differences between K and N-K groups on the specific measures applied, suggest that growth in school readiness and language skills of Kindergarten-attenders and non-attenders alike during the period from CA 4-9 to CA 5-9 could not be attributed, in the majority of instances to any special influence of the type of normal kindergarten experiences represented in this study.

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