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ABSTRACT

To answer questions concerning the simple and multivariate relationships of intelligence, divergent thinking, and self-concept with reading achievement, measures of verbal divergent thinking and self-concept were administered to 188 students from an urban, lower middle class, elementary school. Reading achievement and intelligence scores were identified from school records. Flexibility was the divergent thinking variable most highly related with reading. In the multiple regression analysis, flexibility appeared in each of the optimum prediction sets. The relationships of the other verbal divergent thinking variables (fluency and originality) and self-concept were complex and interactional with sex and grade level. (Author)

The Prediction of Upper Grade Reading Achievement With Measures of Intelligence, Divergent Thinking, and Self-concept*

by

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Purpose

This research was conducted to answer questions concerning the relationships of convergent thinking, divergent thinking, and self-concept with reading achievement. The influence of sex and grade level on these relationships was investigated. Four questions were investigated in the study:

1. What is the relationship between intelligence and reading achievement, and does this relationship vary with sex and grade level?

2. What is the relationship between each verbal divergent thinking ability, fluency, flexibility, and originality, and reading achievement, and does this relationship vary with sex and grade level?

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3. What is the relationship between self-concept and reading achievement, and does this relationship vary with sex and grade level?

4. What is the multivariate relationship between intelligence, each verbal divergent thinking ability, self-concept and reading achievement, and does the relationship vary with sex and grade level?

Related Literature

Intelligence, verbal divergent thinking, and self-concept are considered important variables in reading achievement. Ruddell's Communication Model (1972) emphasized three main processes readers use in comprehending oral and written language: (a) decoding strategies; (b) meaning strategies; and (c) interpretation abilities. Of the three processes "meaning strategies" are most related to the variables in this study. Meaning is derived through the interpretative process, a function of experience, memory, and critical and creative thinking abilities.

Several studies have shown that divergent thinking, combined with measures of convergent thinking, improves prediction of academic achievement. Feldhusen, Denny, and Condon (1965) reported significant correlations among a standard achievement score in reading, verbal and quantitative ability measures, and tests of originality, fluency, and flexibility from a study with junior high school students. Flexibility was the divergent thinking variable most highly correlated with reading achievement. When 97 of the students were again tested four years later, flexibility

was again significantly correlated with reading achievement and appeared in the optimum prediction sets for reading achievement among both males and females (Feldhusen, Treffinger, and Elias, 1970).

In a study of 332 fourth-, fifth-, and sixth-graders, MacDougall (1966) found low but significant relationships between cirtical reading and creative thinking scores in grades four and five, but not in grade six. She reported that verbal creativity was more highly related to reading than was nonverbal creativity and that flexibility, among fluency, flexibility, originality, and elaboration showed the highest relationship with the critical reading scores. When studying the relationship between originality and reading, Long and Henderson (1965) found that the group of children that was high in originality was significantly higher in reading as well.

Lavin's (1965) review of the literature concerning prediction of academic achievement suggested that independent variables studied should include self-concept and other personality variables as well as convergent and divergent thinking abilities and assessment of prior knowledge. Studying the relationship of self-concept and reading among fourth- and sixth-graders, Bledsoe (1967) found that reading achievement was significantly related to self-concept for the fourth-grade boys and girls and sixth-grade boys. A low but significant correlation between self-concept and reading achievement was reported by Sears (1970) from a study of 154 sixth-graders. Purkey (1970) summarized the research stating that generally self-concept and academic achievement are significantly related.

Wattenberg and Clifford (1967) reported that measures of self-concept measured in kindergarten were predictive of reading achievement two years later. Lamy (1963) reported that measurements of self-perception in combination with intelligence scores were better predictors of reading achievement than either variable was alone.

Thus, some research evidence indicates that convergent thinking, divergent thinking, and self-concept are all important dimensions to be considered in a study of reading. However few studies have investigated the interrelationships of sex and grade level with these variables and reading achievement (Lavin, 1965).

Procedures

The sample included intact fourth- and sixth-grade classes of a lower middle class, almost exclusively white, urban elementary school. There were 188 subjects (91 boys, 97 girls; 96 sixth-graders, 92 fourth-graders). Incomplete data resulted in the elimination of three fourth-grade males, two fourth-grade females, four sixth-grade males, and three sixth-grade females.

The instruments administered by trained examiners were the Torrance Tests of Creative Thinking (TTCT, Torrance, 1966) and the Piers-Harris Children's Self-concept Scale (SC, Piers & Harris, 1964). Subtests of the TTCT (Just Suppose, Unusual Uses, and Product Improvement) were chosen to yield scores for verbal fluency, verbal flexibility, and verbal originality. These divergent thinking abilities emphasize understanding symbolic and semantic content, factors important in reading comprehension. The TTCT were scored by trained scorers following directions described

by Torrance (1966).

The self-concept measure assesses the way a child feels about himself or herself in the areas of behavior, intellectual and school status, physical appearance and attributes, anxiety, popularity, and happiness and satisfaction (Piers & Harris, 1964).

Scores from the Reading Subtest of the Metropolitan Achievement Test (MAT, Durost, Bixler, Hildreth, Lund & Wrightstone, 1962) and the Otis-Lennon Mental Ability Tests (Otis-Lennon, 1969), administered one month previously by the classroom teachers, were identified from school records.

Correlational and step-wise multiple regression analyses were computed with the total sample (N = 188), by sex (girls' N = 97, boys' N = 91), and by grade level (grade 6 N = 96, grade 4 N = 92). An alpha level of .05 was used.

Results

There was a significant, positive relationship between intelligence and reading achievement as shown in Table 1. No significant differences were found in the relationship by sex or by grade level. The girls measured significantly higher in reading achievement (See Table 2), although no significant difference was found in measured intelligence.

There was a significant, positive relationship between each verbal divergent thinking score (fluency, flexibility, and originality) and reading achievement as shown in Table 3. Flexibility was the divergent thinking variable most highly related to reading achievement. No significant differences by sex. Originality was significantly related to reading achievement in

Table 1

Correlations of Intelligence and Reading Achievement for the Total Sample, by Sex, and by Grade Level

Group	IQ and RA	z
Total (N = 188)	.709*	
Boys (N=91)	.727*	n.s.
Girls (N=97)	.689*	
Grade 6 (N=96)	.738*	n.s.
Grade 4 (N=92)	.784*	

* $p < 0.001$

Table 2

Means and Standard Deviations for Intelligence and Reading for the Total Sample, by Sex, and by Grade Level

Group		IQ	z	RA	z
Total (N = 188)	$\bar{X}$	98.98		5.3	
	s	14.45		1.9	
Boys (N=91)	$\bar{X}$	97.98		5.0	
	s	15.66		2.0	
			n.s.		2.5*
Girls (N=97)	$\bar{X}$	99.93		5.7	
	s	13.23		1.8	
Grade 6 (N=96)	$\bar{X}$	99.15		6.0	
	s	14.41		1.9	
			n.s.		
Grade 4 (N=92)	$\bar{X}$	98.82		4.6	
	s	14.57		1.7	

* $p < 0.05$

Table 3

Correlations of Fluency, Flexibility, and Originality with Reading Achievement for the Total Sample by Sex, and by Grade Level

Group	Fluency	z	Flexibility	z	Originality	z
Total (N = 188)	.50**		.56**		.33**	
Boys (N=91)	.46**	n.s.	.52**	n.s.	.31*	n.s.
Girls (N=97)	.53**		.58**		.34**	
Grade 6 (N=96)	.37**	n.s.	.41**	n.s.	.19	n.s.
Grade 4 (N=92)	.54**		.60**		.40**	

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

the fourth-grade subsample, but not in the sixth-grade subsample. Means and standard deviations for fluency, flexibility, and originality are presented in Table 4.

As indicated in Table 5, no significant relationship was found between self-concept and reading achievement for the total sample, although a significant, positive relationship was found for the boys. No significant differences were found by grade level. Means and standard deviations for self-concept are presented in Table 6.

Table 7 summarizes the findings concerning the interrelationships of the measures of convergent thinking, divergent thinking, self-concept with reading. Flexibility added significantly to the multiple correlation between intelligence and reading achievement for the total sample and in all subsamples. In one subsample, originality added significantly to the multiple correlation; in another subsample, self-concept added significantly to the multiple correlation. The relationships of intelligence, fluency, flexibility, originality, and self-concept are not simple and constant. There were complex interactions among the variables and the factors of sex and grade level in this sample.

Discussion and Implications

The independent variables chosen for this present study were based on Ruddell's Communication Model (1972) which focuses on the processes that readers use in comprehending oral and written language.

The highly significant correlation between intelligence and reading achievement found in this study corroborates research

Table 4

Means and Standard Deviations for Fluency, Flexibility and Originality for the Total Sample, by Sex and by Grade Level

Group		Fluency	z	Flexibility	z	Originality	z
Total (N = 188)	$\bar{X}$	17.46		11.44		16.22	
	s	11.47		6.34		16.21	
Boys (N=91)	$\bar{X}$	15.82		10.35		15.26	
	s	12.51	n.s.	6.71	2.32*	17.74	n.s.
Girls (N=97)	$\bar{X}$	18.99		12.46		17.12	
	s	10.24		5.82		14.66	
Grade 6 (N=96)	$\bar{X}$	20.86		13.58		19.50	
	s	12.31	4.35***	6.36	5.08***	17.46	2.91**
Grade 4 (N=92)	$\bar{X}$	13.90		9.21		12.80	
	s	9.34		5.52		14.08	

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

Table 5

Correlations of Self-concept and Reading Achievement for the Total Sample, by Sex, and by Grade Level

Group	SC and RA	z
Total (N = 188)	.12	
Boys (N=91)	.25*	1.98*
Girls (N=97)	-.04	
Grade 6 (N=96)	.13	n.s.
Grade 4 (N=92)	.16	

* p < .05

Table 6

Means and Standard Deviations for Self-concept for the Total Sample, by Sex, and by Grade Level

Group		SC	z
Total (N = 188)	$\bar{X}$	54.82	
	s	14.44	
Boys (N=91)	$\bar{X}$	54.46	
	s	15.06	
			n.s.
Girls (N=97)	$\bar{X}$	55.16	
	s	13.90	
Grade 6 (N=96)	$\bar{X}$	54.18	
	s	13.25	
			n.s.
Grade 4 (N=92)	$\bar{X}$	55.50	
	s	15.63	

Table 7

Multiple Regression Analyses Summary Table

Group	Predictors	R	R^2	F
Total (N=188)	1. IQ	.709	.503	188.52***
	2. Flexibility	.753	.567	25.29**
	3. Originality	.765	.585	8.23**
	4. Self-concept	.767	.588	n.s.
Boys (N=91)	1. IQ	.727	.529	100.03***
	2. Flexibility	.745	.555	5.19*
	3. Originality	.765	.586	5.39*
	4. Self-concept	.769	.591	n.s.
	5. Fluency	.770	.592	n.s.
Girls (N=97)	1. IQ	.689	.475	85.92***
	2. Flexibility	.762	.581	23.84**
	3. Self-concept	.787	.620	9.51**
	4. Originality	.792	.628	n.s.
	5. Fluency	.793	.628	n.s.
Grade 6 (N=96)	1. IQ	.738	.544	112.27***
	2. Flexibility	.743	.552	1.54
	3. Originality	.763	.582	6.58*
	4. Fluency	.763	.582	n.s.
	5. Self-concept	.763	.582	n.s.
Grade 4 (N=92)	1. IQ	.784	.615	143.47***
	2. Flexibility	.808	.653	9.88**
	3. Fluency	.811	.657	n.s.
	4. Self-concept	.811	.657	n.s.
	5. Originality	.811	.657	n.s.

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

results previously reported (Lavin, 1965). However, with no significant difference found in measured intelligence, the girls measured significantly higher in reading achievement. This result does not lend support to the frequently suggested criticism of group-administered intelligence tests: i. e., that group intelligence tests are more accurately described as a measure of reading ability. One or more factors such as the nature of the reading criterion measure and the amount of dependence on reading and verbal skills in the Otis-Lennon complicates the relationship between intelligence and reading achievement. Similar results are reported by other studies (Anderson, Hughes, & Dixon, 1956; Durkin, 1966).

The observed correlations of each verbal creativity score with reading achievement supported the expected positive relationship. Flexibility showed the highest relationship with reading comprehension, which was consistent with the results of previous research (Feldhusen, Denny, & Condon, 1965; Feldhusen, Treffinger, & Elias, 1970; MacDougall, 1966).

The effect of self-concept in this study was not constant and uniform. For the total group, no significant relationship between self-concept and reading achievement was found. However, the low, positive correlation is comparable with the results reported by Bledsoe (1967). It is important to analyze for sex differences in studies concerned with the relationship of self-concept and other variables with reading. The results in this study showed significantly different correlations for self-concept with reading for the boys than for the girls ($p < .05$) while the

self-concept means were not significantly different.

The observed multiple correlations for intelligence, fluency, flexibility, originality, and self-concept suggest that, under a multidimensional view of human abilities, verbal divergent thinking abilities and self-concept contribute significantly to the prediction of reading achievement. While intelligence scores remain the best predictors, we can use assessments of other traits and abilities to enhance prediction significantly. Among fluency, flexibility, and originality, flexibility was the variable most highly related in the multivariate relationship with reading achievement. This result is consistent with those reported in previous studies (Feldhusen, Denny, & Condon, 1965; Feldhusen, Treffinger, & Elias, 1970; MacDougall, 1966).

However, the effects of the variables were not constant and uniform. In the subsample of boys, originality added significantly to the prediction; in the subsample of girls, self-concept added significantly to the prediction. There were complex interactions among the independent variables and reading achievement with the factors of sex and grade level in this sample.

In addition, while the verbal divergent thinking variables and self-concept significantly increased the prediction of reading achievement, 35 to 45% of the variance associated with reading achievement remained unexplained. There is a need to study the multivariate prediction of reading achievement with the inclusion of other, statistically-independent variables.

This study attempted to clarify the ways that divergent thinking relates with reading achievement, convergent thinking,

and affective factors such as self-concept in order to encourage teachers and school administrators to examine existing activities and programs. Further study with these and other appropriate instruments on a wider cross-section of the population would provide more information for teachers and others seeking to foster the kinds of divergent thinking strategies necessary to improve creative reading in each child.

An assumption in the present study was that reading programs can function more effectively if some of the factors encouraging divergent thinking are seen as major objectives of reading programs. To provide the kinds of experiences that will stimulate individual growth, reading programs should be developed to foster qualities of open-mindedness, tolerance for uncertainty, a preference for complexity, motivation for learning, and the desire to search for meaning.

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