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ABSTRACT

To determine whether or not cognitive tempo influences visual cue preferences in early readers, 65 kindergarten, first-grade, and second-grade children were tested on the Matching Familiar Figures (MFF) test and a cue selection nonsense trigram test. It was hypothesized that significant differences would be found in cue selection strategies of subjects at each grade and over all grades, with subjects exhibiting varying impulsivity and efficiency scores. Further, it was hypothesized that there would be a developmental trend in impulsivity and efficiency scores and on the cue selection preference task. Trends in cue selection for data pooled across all grade levels supported the hypothesis for an order by ranking of preferred cue (specifically, first letter, last letter, middle letter, and word shape). An examination of the data for the amount of influence impulsivity or efficiency scores had on cue preference indicated that neither had any truly predictive ability. Results were interpreted to indicate that cognitive tempo is developmental in nature. It was concluded that, since visual cue preference is not significantly influenced by impulsivity or efficiency, the initial step in reading instruction could be the training of all subjects in initial position visual focusing on word recognition tasks. (Author/RH)

The Effects of Cognitive Tempo on Cue Selection Strategies of Young Children

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Running Head: COGNITIVE TEMPO

Abstract

To determine whether or not cognitive tempo influenced visual cue preferences in early readers, 65 kindergarten, first and second grade children were tested on the Matching Familiar Figures (MFF) test and a cue selection nonsense trigram test. It was hypothesized that there would be a significant difference in cue selection strategies of subjects at each grade and over all grades with positive I scores, negative I scores, positive E scores, and negative E scores. Further, it was hypothesized that there would be a developmental trend in I scores, E scores, and on the cue selection preference task. Results of this study are interpreted to indicate that cognitive tempo is developmental in nature. Trends in cue selection for data pooled across all grade levels supported the hypothesis for an order by ranking of preferred cue; specifically, first letter, last letter, middle letter, and word shape. An examination of the data for the amount of influence I scores or E scores had on cue preference indicated that neither had any truly predictive ability. In conclusion, it is suggested that since visual cue preference is not significantly influenced by impulsivity (I) or efficiency (E), the initial step in reading instruction could be the training of all subjects on initial position visual focusing on word recognition tasks.

The Effects of Cognitive Tempo

on Cue Selection Strategies of Young Children

Little research has been conducted relating cognitive tempo to curriculum areas. Reading especially requires many skills characteristic of reflective processing, i.e., considering the differential adequacy of several solutions. At the same time those behaviors characteristic of impulsive processing, i.e., initiating a reasoning sequence without sufficient reflection on its possible validity, seem to have a negative influence on the beginning reading process. Since beginning readers bring an established pattern of hypothesis testing to new learning situations, the manner in which children process the perceptual input of print in beginning reading instruction will be influenced by these stylistic patterns. If cognitive tempos can evoke different initial strategies in the reading process, a better understanding of tempo and differential methods of instruction might suggest a better match between the two for children learning to read.

In the first years of school, whether they be preschool or kindergarten, reading readiness activities are initiated. Differences in the children are significant. Levels of physical, intellectual, linguistic, and emotional maturity of the children who are in one grade can very much more than their chronological age. Visual discrimination, auditory discrimination, and associative learning are all variables noted as components of reading readiness, however,

general intelligence seems to be the most predictive factor in reading readiness because IQ test results predict reading ability in upper grades better than results of reading readiness tests (Harris & Sipay, 1975). Sex differences in reading readiness tend to be small, and although girls tend to become ready to read earlier than boys, test results vary substantially from child to child (Harris, Morrison, Serwer, & Gold, 1968).

Though there have been many studies of the variables involved in reading readiness instruction, few investigators have considered cognitive tempo, i.e., the manner in which children respond based on the amount of time taken and the number of errors made. Cognitive tempo (Kagan, 1965a) delineates two categories of response. Impulsives are described as those children who tend to initiate a reasoning sequence suggested by the first hypothesis that occurs to them and/or report an answer without sufficient reflection on its possible validity. Reflectives are described as those children whose natural inclination seems to prompt them to reflect over the differential adequacy of several solutions. Not only are impulsives less analytical than reflectives, they also show signs of being more restless, less able to recognize and adhere to rules, and less able to control movements upon request (Bucky, Banta, & Gross, 1972).

The reading difficulties of some children are aggravated by their restlessness, inattentiveness, and fidgeting (Harris & Sipay,

1975). Perhaps this is due to uninteresting subject matter; however, it may be a result of the individual's learning style. There is some evidence to suggest that errors in word recognition may be due more to impulsivity than to a perceptual difficulty and that impulsives tend to fall behind in reading by the end of the second grade (Kagan, 1965b).

Definitions of reading vary, but most experts would agree that the processes involved for the proficient reader and for the beginner do not completely overlap (Samuels, 1976). Reading for the beginner is a mechanical process involving letter recognition, letter-sound relationships, cue selection, word recognition, sight word retention, numerous eye fixations, etc. Cue selection alone can be defined as the recognition of whole words by sight, shape, phonics, context clues, the significant first half, or unusual characteristics of the word (Spache & Spache, 1973) and may be relevant to the speed accuracy, and progress made by individual children in the process of learning to read.

Results of the limited research done relating initial reading experiences and cognitive tempo indicate several relationships. (a) Impulsives make partial identity errors, meaningful and nonmeaningful substitutions, and suffix errors (Kagan, 1965b). (b) Impulsive children in first grade had the highest reading errors by the end of second grade (Kagan, 1965b). (c) Impulsives made more

errors in reading English words (Kagan, 1965b). (d) Reflectives are better readers than impulsives and perform significantly better in vocabulary in synthetic approaches (Readance & Baldwin, 1978). (e) Reflectives score higher in word recognition tasks in beginning reading (Erikson & Otto, 1973). (f) Reflective first grade boys score better on tests of reading readiness than impulsive first grade boys (Shapiro, 1974).

Impulsives by definition make more mistakes on tasks than do reflectives. Their reading ability and comprehension are hindered by their fast and inaccurate responses. Some studies conclude that a child's learning style can influence reading achievement regardless of the instructional method (Readance & Baldwin, 1978) while others would argue that matching impulsive teaching to impulsives and reflective teaching to reflectives in early reading instruction would show no significant differences in reading achievement (King, 1972). However, the skills used in decoding words by skilled readers and those used by very beginning readers differ. Based on the fact that each child brings various skills to the new instructional situation, reading programs may need to alter their approaches to fit the individual needs of the children. Initial reading instruction trains children to look for certain cues that give specific information, while during later instruction these cues give way to more sophisticated cues. An analysis of the cue selected most

frequently by early readers reveals that first letter is the preferred cue (Marchbanks & Levin, 1976), with word shape the least preferred, and thus perhaps the least effective cue. The impulsives' visual scanning processes indicate a global nature (Siegleman, 1969), a fact that suggests a match to the configuration cue used in identifying word shape. If the cue preference is predictable by cognitive tempo, it might suggest that a training program to change the preference to the more efficient first letter cue would not be effective. However, if impulsivity is not a good predictor of cue preference, programs to alter cue selections could be suggested.

The purpose of this study is to examine the possibilities of suggesting a match between the learning style of the children and the specific method of cue selection introduced in the initial reading instruction so that possible training programs geared specifically to impulsives or reflectives could be created to maximize the opportunities available to all children.

Methods and Procedures

To determine whether or not cognitive tempo did indeed influence visual cue preferences in early readers, a sample of 23 kindergarten, 24 grade one, and 18 grade two children who were enrolled in a small school in a community of 45,000 were used in this study. Each of the children in the three grade levels was given the MFF and a cue selection preference test developed by the author to determine the

focusing point of the visual attention in nonsense trigrams.

In a review of the literature on the MFF an alternative scoring procedure was suggested that includes all subjects in the sample rather than the reflectives and impulsives alone (Salkind & Wright, 1977). It also attempts to separate tempo and cognition. Rather than using the median split suggested by the MFF, an impulsivity (I) score is generated from raw latency and errors ($z_e - z_l$), where z_e equals a standard score for errors and z_l = a standard score for latency. Large positive I scores are then indicative of impulsivity and large negative I scores indicate reflectivity. An efficiency (E) score is then generated from the raw data in a similar manner ($z_e + z_l$). Large positive E scores indicate inefficiency (slow inaccurates), while large negative E scores are indicative of efficiency (fast accurates).

Hypotheses

It was hypothesized that there would be a significant difference in cue selection strategies of subjects with highly positive I scores, i.e., subjects with highly positive I scores were hypothesized to be more global than other subjects in their selection indicated by their choice of alternatives most like the standard in word shape. Further, it was hypothesized that there would be a developmental trend among young children toward the selection of a first letter and away from word shape.

The data were pooled across all grades and z scores were determined to calculate I and E scores. The resulting means, standard deviations, and the distribution of positive and negative I and E scores are shown in Table 1 and 2.

Insert Table 1 about here

Insert Table 2 about here

Table 3 shows a breakdown by grade of the I and E data presented in Table 2. Frequencies are indicated for positive and negative I and E scores at each grade level and show that impulsivity (I scores) and efficiency (E scores) are influenced by grade.

Insert Table 3 about here

An examination of the cue selection data shows once again the relationship between the I and E scores and grade, and also indicates the possible relationship between grade and preference for a particular mode of cue selection, i.e., as grade increased, the mean number of times first letter is chosen increased (see Table 4). It also shows a reverse pattern between grade and word shape, i.e., as grade

increases, preference for word shape declines. If one were to disregard the first letter choices and look closely at which cue has the most influence over selection beyond first letter, the results are that last letter is most often chosen in kindergarten with middle letter chosen in grades one and two.

Insert Table 4 about here

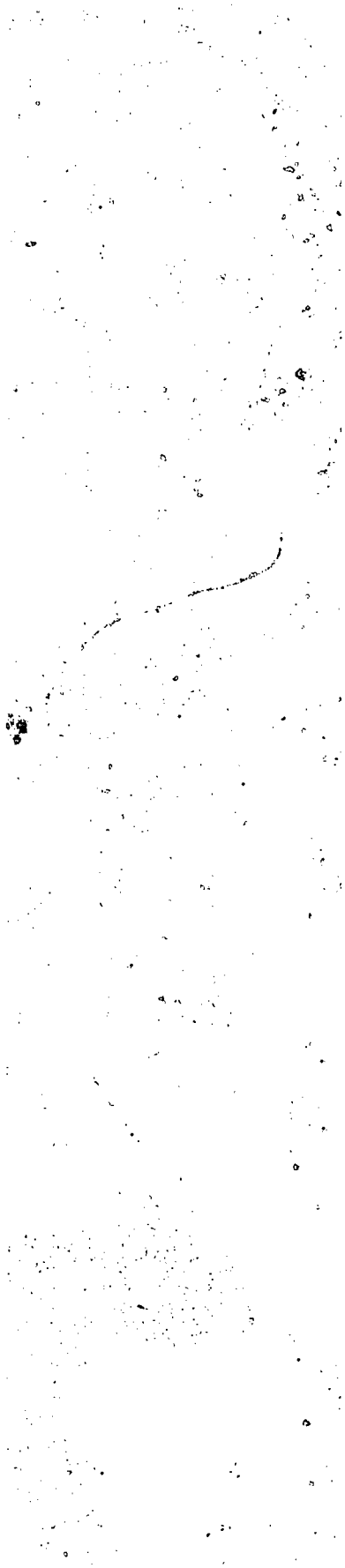
The Pearson product-moment correlations calculated for these data show the relationship more clearly: between grade and first letter (r = .27, p < .05), between grade and last letter (r = -.24), between grade and middle letter (r = -.02), and between grade and word shape (r = -.52, p < .05). The significant negative relationship between grade and word shape once again indicates that as grade increases, the preference for word shape declines. The significant positive relationship between grade and first letter indicates that as grade increases, tendencies toward first letter choices increase.

The raw data for cue selection were ranked for each subject to determine the order of preferential strategy, i.e., for an individual subject with scores of nine for first letter, four for last letter, one for middle letter, and three for word shape over the 16 trials, the ranks were one, two, four, and three, respectively. Data indicated these results: first letter = 3.38, last letter = 2.40, middle

letter = 2.36, and word shape = 1.86, once again indicating a significant overall difference in preferred cue ($\chi^2(3) = 47.03$, $p < .01$). This would suggest that the pattern of selection at all grade levels and over all grades was non-random.

It has been seen thus far that there are relationships between I scores, E scores, and grade. It was shown also that there were some significant differences between cue preferences at each grade level. One important question that remained unanswered was whether I scores, E scores, or grade accounts for the greatest amount of variance on each of the four dependent variables, i.e., first letter, last letter, middle letter, and word shape, both at each separate grade level and over all the grades.

The multiple regression analyzing the above variables indicates that 15 percent of the variance ($p < .01$) on first letter selection is accounted for by E scores in a negative direction with an increase in grade accounting for an additional two percent and I scores in a positive direction accounting for another one percent (see Table 5). The combined entries accounted for 19 percent of the variance on first letter selection ($p < .01$). It should be noted that the variance attributed to E scores in part results from the fact that the effects of that variable were assessed first in the analysis and the other two variables shared some of the variance. The entrance of the second variable is independent of the first but shares some



variance with the third. The entrance of the third variable is

Insert Table 5 about here

independent of both the first and the second. This pattern is characteristic of the following statements as well. Grade accounted for six percent of the variance ($p < .05$) for last letter selection with E scores in a positive direction and I scores in a positive direction accounting for another three percent and less than one percent, respectively. The combined entries accounted for only nine percent of the variance ($p < .05$) on middle letter, I scores in a negative direction for another five percent, and grade for less than one percent. The combined entries accounted for 14 percent of the variance on middle letter. Grade accounts for 27 percent of the variance ($p < .01$) on word shape in a negative direction, indicating a significant inverse relationship between grade and the selection of word shape. E scores in a positive direction account for one percent of the variance and I scores in a positive direction for less than one percent. The amount of variance accounted for by the entry of all three variables is 29 percent ($p < .01$).

Since grade contributed significantly to the prediction of three of the dependent variables, the data were analyzed without taking grade into consideration (see Table 6). Significant contributions

were then made by I scores and E scores on first letter, middle

Insert Table 6 about here

letter, and word shape. E scores in a negative direction accounted for 15 percent of the variance ($p < .01$) on first letter selection with I scores in a positive direction contributing less than one percent, for a combined total of slightly more than 15 percent of the variance accounted for the combined entries ($p < .05$).

On last letter, E scores in a positive direction accounted for six percent of the variance ($p < .05$), while I scores in a positive direction accounted for another one percent, for a combined total of seven percent. On middle letter, E scores in a positive direction accounted for nine percent of the variance ($p < .05$), while I scores in a negative direction accounted for five percent ($p < .05$), for a combined total of 14 percent by both entries ($p < .05$). E scores in a positive direction accounted for 10 percent of the variance on word shape ($p < .05$), while I scores in a positive direction accounted for four percent, with a combined total of 14 percent accounted for by both variables ($p < .05$).

The greatest amount of variance on first letter was accounted for by E scores in a negative direction, and the greatest amount of variance on last letter, middle letter, and word shape was accounted

for by E scores in a positive direction. This indicates that the E scores are better predictors of cue preference than the I scores.

Discussion

Historically, classroom instruction has been geared to fit the teaching style of the teacher rather than the learning style of the children. To maximize the output of each individual child requires an analysis of many different variables influencing the learning situation. This investigation was an attempt to analyze two of these variables: cognitive tempo and cue selection in trigram recognition, to determine whether or not cognitive tempo did indeed influence the method of selection.

Results of this study are interpreted to indicate cognitive tempo is developmental in nature. Specifically, kindergarten children are more impulsive than first grade children, who are in turn more impulsive than second grade children. Time scores increased with each additional grade and error scores decreased similarly. The reverse is also true, i.e., second grade children are more efficient than first grade children, who are in turn more efficient than kindergarten children.

Trends in cue selection supported the hypotheses for an order by ranking of preferred cue; specifically, first letter, last letter, middle letter, and word shape (see Table 4). These results are similar to those found by Marchbanks and Levin (1965). In addition,

within each grade first letter was chosen more frequently than any other cue. These findings, too, are similar to those of Marchbanks and Levin (1965) but also to those of Williams, Blumberg, and Williams (1970) and Rayner and Hagelberg (1975). However, a post hoc analysis using the sign test to find the difference between first letter and last letter using the kindergarten and grade one scores only reveals significant results, $z = 4.14$ ($p < .01$). These results indicate a particularly strong preference for first letter at all grade levels and across all grades.

Previously, impulsives have failed to develop a systematic strategy for effective search and have shown preferences for global scanning on the MFF when compared to reflectives (Siegleman, 1969). It would seem from Siegleman (1969) that impulsivity would account for more of the variance on word shape than on the other three cues. An examination of the evidence presented in Table 6, i.e., the effects of I scores and E scores as predictors for cue selection preference, indicates that the E scores account for the most variance on each of the dependent variables, suggesting perhaps that preferred visual cue selections are more a product of cognitive efficiency than of cognitive tempo. An examination of the I scores reveals, however, that I scores in a positive direction do account for four percent of the variance on word shape, one percent on last letter, and less than one percent on first letter. Indeed, impulsivity accounted for more

of the variance on word shape than it did on the other three cues; however I scores are not a significant predictor of any preferred cue.

A breakdown of the data by grade reveals correlations for kindergarten ($r = -.19$), grade one ($r = -.13$), and grade two ($r = -.63$), $p < .01$), indicating an inverse relationship between E scores and first letter preference at all grades, significant only in grade two. The multiple regression revealed that negative E scores accounted for four percent of the variance in kindergarten, two percent in grade one, and 40 percent in grade two. This suggests more evidence in support of first letter being the most salient visual cue for students after two years of reading instruction.

Summary

The main focus of this study was to determine whether or not cognitive tempo could be a significant predictor of visual cue preferences. In general, it is concluded that other factors have a greater influence on cue preference than cognitive tempo, which in this study was not a good predictor. If impulsivity were a significant predictor of word shape, further training research would be suggested using beginning reading programs geared to specific cognitive tempos of the subjects to accomodate the differences arising from the style and from the inability of training to significantly alter impulsivity itself. Because, however, impulsivity was not a significant predictor of word shape, one need not assume that cue selections cannot be

trained.

In conclusion, future research might investigate the effects of familiarization over a variety of tasks regardless of individual differences in style to determine how both the processing rate and efficiency are effected. Further examination of these issues and others should yield a more enlightened perspective into effective and efficient teaching strategies in the curriculum areas.

Table 1

Means and Standard Deviations for Errors and Latency for the Total Group

	Errors	Latency
Mean	16.03	119.28
Standard deviation	7.57	68.80

Table 2

Distribution of I Scores and E Scores for the Total Group

	Direction of the score	
	+	-
I scores	32	33
E scores	32	33

Table 3

Distribution of I Scores and E Scores at Each Grade Level Using Data Pooled Across All Grades[a]

	Direction of the score[a]					
	+	-	+	-	+	-
	Kindergarten		Grade one		Grade two	
I scores	16	7	12	12	4	14
E scores	16	7	10	14	6	12

Table 4

Means for I Scores, E Scores, and Cue Selection Preference Scores for all Grades

	Means		
	Kindergarten	Grade one	Grade two
I scores	.89	-.16	-.93
E scores	.44	-.16	-.34
First letter	6.96	8.96	10.33
Last letter	3.61	2.08	2.22
Middle letter	3.04	3.79	2.78
Word shape	2.39	1.17	.67

Table 5

Stepwise Multiple Regression Analysis for Predicting Cue Selection Preference with I Scores, E Scores, and Grade as Predictors

Variables	Beta weight	Multiple R	R square	F at final step	df	RSQ change	F at increment	df
First letter								
E scores	-.33	.39	.15	11.30**	1/63	.15	11.30**	1/63
Grade	+.22	.41	.17	6.62**	2/62	.02	1.79	1/62
I scores	+.12	.43	.19	4.73**	3/61	.01	.98	1/61
Last letter								
Grade	+.19	.25	.06	4.06*	1/63	.06	4.06*	1/63
E scores	-.17	.30	.09	3.04	2/62	.03	1.95	1/62
I scores	+.01	.30	.09	2.00	3/61	.00	.01	1/61
Middle letter								
E scores	+.30	.30	.09	6.02*	1/63	.09	6.02*	1/63
I scores	-.23	.37	.14	4.89*	2/62	.05	3.52	1/62
Grade	-.02	.37	.14	3.22	3/61	.00	.02	1/61
Word shape								
Grade	-.45	.52	.27	23.87**	1/63	.27	23.87**	1/63
E scores	+.13	.54	.29	12.51**	2/62	.01	1.11	1/62
I scores	+.06	.54	.29	8.36**	3/61	.00	.33	1/61

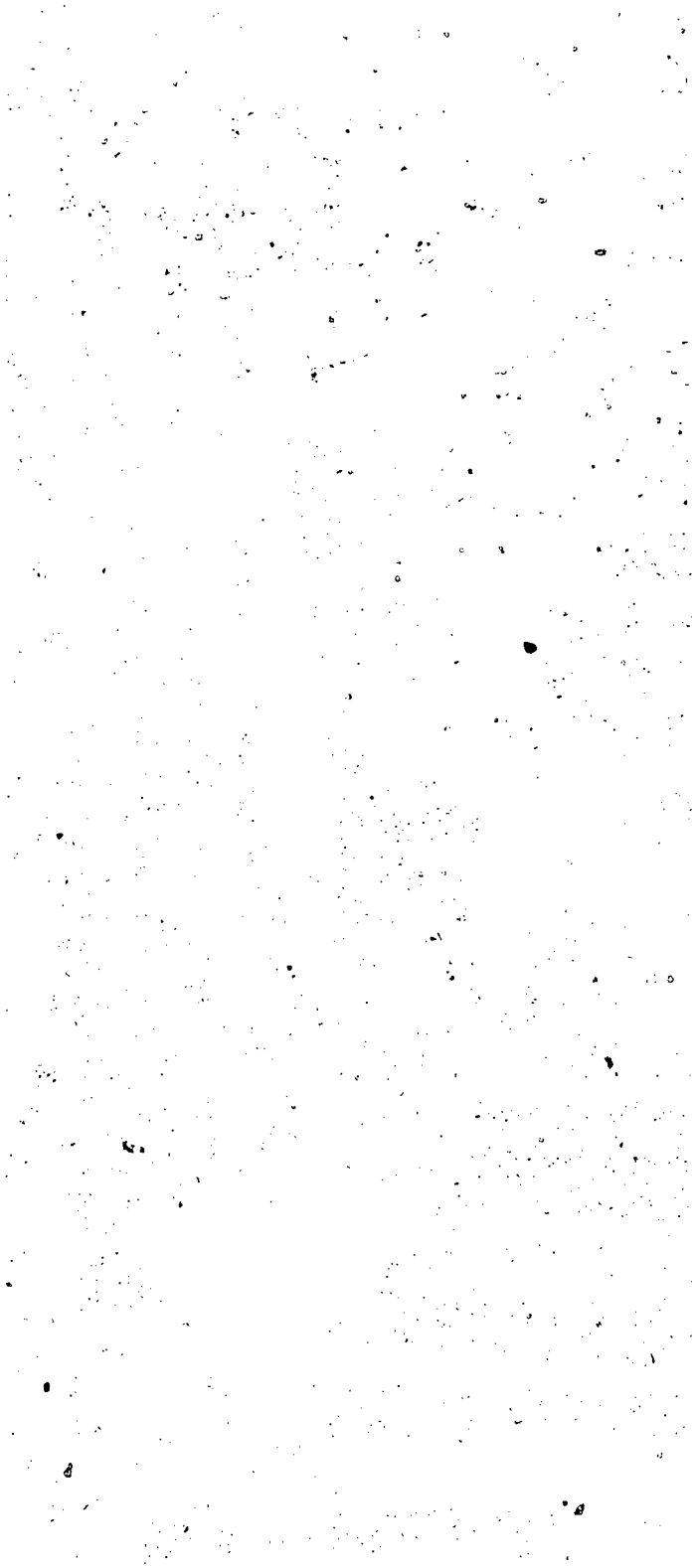
*p < .05
**p < .01

Table 6

Stepwise Multiple Regression Analysis for Predicting Cue Selection for the Total Group Using I Scores and E Scores as Predictors

Variables	Beta weight	Multiple R	R square	F at final step	df	RSQ change	F at increment	df
First letter								
E scores	-.39	.39	.15	11.30**	1/63	.15	11.30**	1/63
I scores	+.04	.39	.15	5.63*	2/62	.00	.12	1/62
Last letter								
E scores	+.24	.25	.06	4.06*	1/63	.06	4.06*	1/63
I scores	+.08	.26	.07	2.24	2/62	.01	.50	1/62
Middle letter								
E scores	+.30	.30	.09	6.02*	1/63	.09	6.02*	1/63
I scores	-.22	.37	.14	4.89*	2/62	.05	3.52*	1/62
Word shape								
E scores	+.30	.32	.10	7.06*	1/63	.10	7.06*	1/63
I scores	+.19	.37	.14	4.99*	2/62	.04	2.72	1/62

*p < .05
**p < .01



Bucky, S. F., Banta, T. J., & Gross, R. B. Development of motor impulse control and reflectivity. Perceptual and Motor Skills, 1972, 34, 813-814.

Erickson, L. G., & Otto, W. R. Effect of intra-list similarity and impulsivity-reflectivity on kindergarten children's word recognition performance. Journal of Educational Research, 1973, 66, 466-470.

Harris, A. J., Morrison, C., Serwer, B. L., & Gold, L. A continuation of the CRAFT project: Comparing reading approaches with disadvantaged urban Negro children in primary grades (Final Report U.S.O.E. Project No. 5-0570-2-12-1). New York: Selected Academic Readings, 1968.

Harris, A. J., & Sipay, E. R. Readiness for reading. How to increase reading ability, New York: David McKay, 1975.

Kagan, J. Individual differences in the resolution of response uncertainty. Journal of Personality and Social Psychology, 1965a, 1, 154-160.

Kagan, J. Reflection-impulsivity and reading ability in primary grade children. Child Development, 1965b, 36, 609-628.

King, E. B. (1972) An experimental investigation of the potential of reflection-impulsivity as a determinant of success in early reading achievement. Unpublished doctoral dissertation, Boston College.

Marchbanks, G., & Levin, H. Cues by which children recognize words. Journal of Educational Psychology, 1976, 56, 57-61.

Rayner, K., & Hagelberg, J. Word recognition cues for beginning and skilled readers. Journal of Experimental Child Psychology, 1975, 20, 444-455.

Readance, J. E., & Baldwin, R. S. The relationship of cognitive style and phonics instruction. Journal of Educational Research, in press.

Salkind, N., & Wright, J. C. The development of reflection-impulsivity and cognitive efficiency: An integrated model. Human Development, 1977, 20, 377-387.

Samuels, S. J. Modes of word recognition. In H. Singer & R. Ruddell (Eds.), Theoretical models and processes of reading (2nd ed.). Delaware: International Reading Association, 1976.

Shapiro, J. E. (1974) The relationship of reading readiness skills to reflectivity-impulsivity and to the effects of visual discrimination training on impulsive first grade boys. Unpublished doctoral dissertation, Syracuse University.

Siegleman, E. X. Reflective and impulsive observing behavior. Child Development, 1969, 40, 1213-1233.

Spache, G., & Spache, E. Reading in the elementary school (3rd ed.) Boston: Allyn & Bacon, 1973.

Williams, J., Blumberg, E., & Williams, D. Cues used in visual word recognition. Journal of Educational Psychology, 1970, 61, 310-315.