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Effects of reflective-impulsivity on reading comprehension

Brooke Kerns

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THE EFFECTS OF
REFLECTIVE - IMPULSIVITY
ON READING COMPREHENSION

by
BROOKE KERNS

A RESEARCH PAPER
SUBMITTED IN PARTIAL FULFILLMENT OF THE
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This research paper has been
approved for the Graduate Committee
of Cardinal Stritch College by

Sister Marie Colette
(Adviser)

May 1, 1978
(date)

Acknowledgments

This research paper is dedicated to my parents for providing my education, and to my husband for his encouragement.

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CHAPTER I

INTRODUCTION

Reflective - impulsivity is a dimension of cognition that refers to speed of response in problem solving. This trait dimension was first introduced to the writer in May, 1977, by Mrs. Dorothy Millard, school psychologist and guidance counselor at Kennedy Middle School, Germantown, Wisconsin.

Millard conducted a research study for a psychology seminar at the University of Wisconsin-Milwaukee in 1972 entitled "The Effects of Impulsivity on Tests of Inductive Reasoning."¹ She used a test called Matching Familiar Figures to identify children as either reflective or impulsive and compared performance on several tests of inductive reasoning. Her hypothesis was that impulsive problem solvers would make more errors on tests of inductive reasoning because they are prone to choose solutions without careful evaluation. The results were inconclusive. Millard thought that this was due to a small sample (11 impulsive and 11 reflective subjects).

¹Dorothy Millard, "The Effects of Impulsivity on Tests of Inductive Reasoning." Unpublished research paper, University of Wisconsin-Milwaukee, 1972.

The writer developed an interest in conceptual tempo relating to reading ability soon after exposure to the reflective - impulsive dimension of cognition. The idea to compare reflective - impulsivity with reading comprehension, like scattered seed, took root, grew, and flowered.

Problem

The purpose of this study is to test the significance of the reflective - impulsivity dimension in reading comprehension of subjects in the seventh grade.

Hypothesis

The impulsive subjects will make more errors than the reflective subjects on the Comprehension subtest and will have a lower grade level score than reflective subjects on the Speed and Accuracy subtest of the Gates - MacGinitie Reading Tests.¹

Glossary of Terms

Conceptual Tempo: A dimension of cognitive style that deals with decision time in problem solving situations.

Conceptual tempo is also referred to as behavioral tempo.

Impulsivity: Defines a generalized tendency in children to manifest short decision times and low accuracy on the

¹Gates - MacGinitie Reading Tests, Survey E, Form 2, Teachers College Press, Teachers College, Columbia University, New York, 1964.

Matching Familiar Figures test.¹ Impulsive subjects are prone to choose solutions without careful evaluation in solving problems with high response uncertainty.

Matching Familiar Figures: A test consisting of 12 items, each containing a drawing of a familiar figure (the standard) and six or eight facsimiles (see Figure 1). The subject's task is to choose the facsimile which exactly matches the standard. Two measures are obtained from each subject: (a) the mean latency to the first response on all 12 items, that is, the response time; (b) the mean of the total number of errors on all 12 items. The Matching Familiar Figures test is abbreviated MFF. Some of the more recent research uses the abbreviation MFFT. (See Figure 1.)

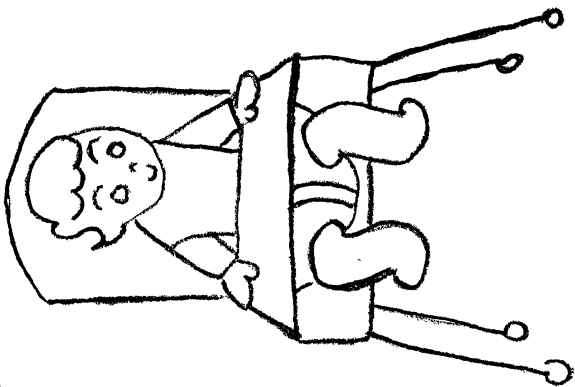
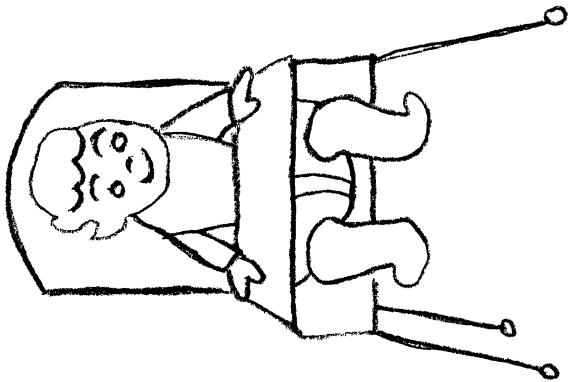
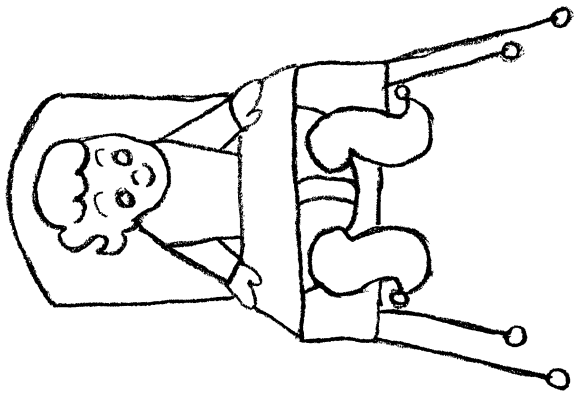
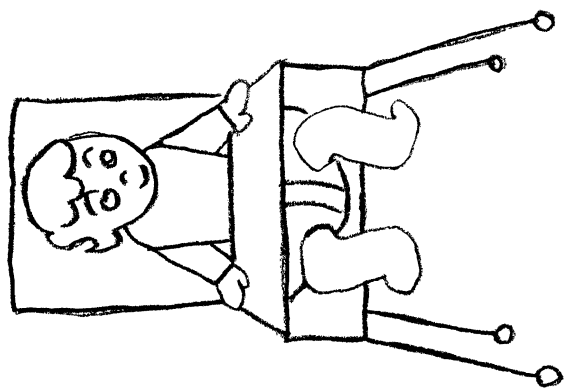
Reflectivity: This term refers to a generalized tendency in subjects to manifest long decision times and high accuracy on the MFF. The reflective subject carefully evaluates all possible solutions, thus requiring more time.

Response disposition: The tendency to respond either reflectively or impulsively across time and tasks.

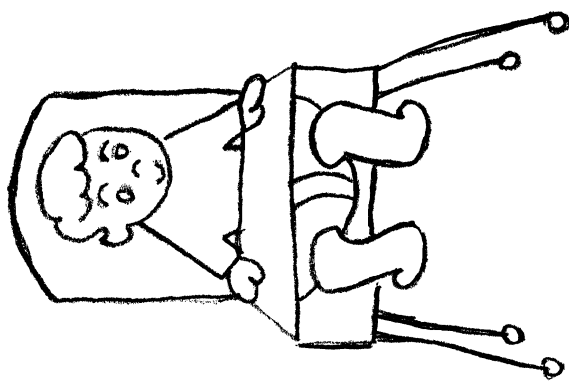
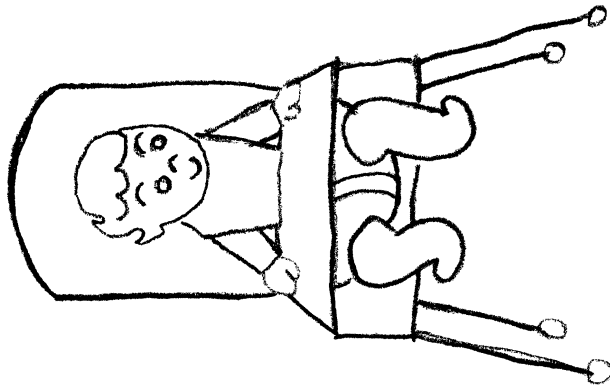
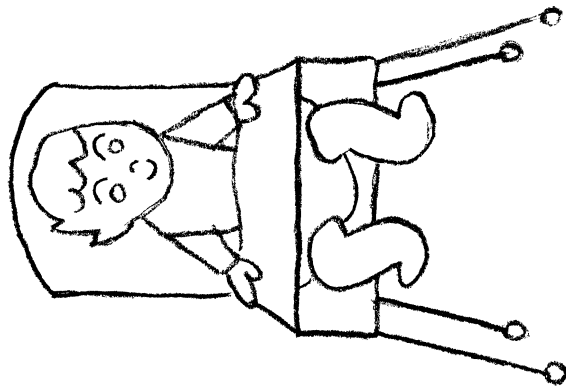
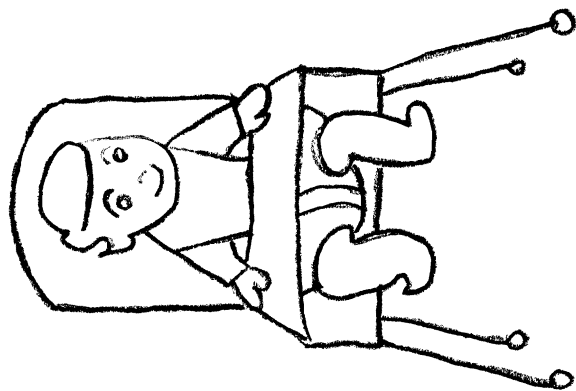
Response latency: A measure of the time between the presentation of the problem and the first solution offered. A basic assumption in research on reflective - impul-

¹Matching Familiar Figures, Jerome Kagan, James Hall, Harvard University, Cambridge, Massachusetts.

Figure 2. Sample variant figures in Matching Familiar Figures.



5



sivity is that response times are a faithful reflection of decision times.

Response uncertainty: This term refers to problems with many possible solutions. An example of low response uncertainty would be a multiple choice question with two possible solutions to choose from. High response uncertainty would be a problem with six to eight possible solutions where it is not immediately obvious which alternative is correct.

Limitations

A major limitation of this study was the size of the sample. The Germantown School District gave the writer permission to review Lorge - Thorndike¹ scores only for students she taught. Of the 130 seventh grade students in this population, 25 met the criteria of a Lorge - Thorndike score in the range of 100 - 110. Ault et al.² concluded that low error reliability of the MFF was remediated by larger sample sizes, among other suggestions.

Another limitation is the testing date of the Lorge - Thorndike. The most recent intelligence testing of this sample was in the spring of 1975. This study was con-

¹Lorge - Thorndike Intelligence Tests, Houghton Mifflin Publishing Co., 1900 South Batavia Avenue, Geneva, Ill. 60134.

²R. L. Ault, C. Mitchell, and D. P. Hartman, "Some Methodological Problems in Reflection - Impulsivity Research," Child Development 47 (1976):227-231.

ducted in the fall of 1977. More recent intelligence scores would have been preferred.

Population Sample

The Germantown School District covers an area of 52 square miles. Most of this is farmland. There are also many subdivisions and one large condominium complex. Germantown's diversity would average out to a middle income population. There are three minority students in the school district.

CHAPTER II

REVIEW OF THE LITERATURE

History

The reflective - impulsive dimension of cognitive style was postulated by Kagan et al.¹ during a study of children's categorizing strategies. It was observed that individuals demonstrate stylistic preference with respect to the tempo with which they respond to visual discrimination problems.

Kagan described the impulsive child as one who may act upon his initial hunch with little or no reflection, think through a false hypothesis, and provide an answer without critical evaluation.

Reflective children, in contrast, were found to display a high standard of performance, persistence in completing intellectual tasks, and few symptoms of hyperactivity.

Kagan developed the Matching Familiar Figures test as a means of identifying reflective and impulsive chil-

¹J. Kagan, B. L. Rosman, D. Day, J. Albert, and W. Phillips, "Information Processing in the Child: Significance of Analytic and Reflective Attitudes," Psychological Monographs, 78 (1964) (No. 1, Whole No. 578).

dren. He analyzed reflective and impulsive differences as follows: "The child who impulsively selects the first solution hypothesis that occurs to him is more likely to produce an incorrect answer than one who reflects on the differential validity of various possibilities."¹

Studies on the MFF by Kagan, Rosman, Day, Albert and Phillips, as reviewed by Kagan, revealed "Remarkable intraindividual consistency in speed of decision time across varied tasks and stability of decision time over long and short periods."²

Thus, conceptual tempo was discovered, measured, and defined. In the years that followed, psychiatry, psychology, and education researched many aspects of this cognitive dimension. Reflective - impulsivity was studied as it related to quality of academic performance, reading, socio-economic levels, intelligence, personality, learning and mental disabilities, testing, strategies and their modification, and sex differences. The MFF test originally developed by Kagan was also analyzed as to its credibility. The remainder of Chapter II is an attempt to review the literature that pertains to conceptual tempo in a normal educational setting.

¹Jerome Kagan, "Individual Differences in the Resolution of Response Uncertainty," Journal of Personality and Social Psychology 2 (1965):159.

²Ibid., p. 154.

Cognitive Style, Conceptual Tempo,
and Reading

The identification and remediation of ineffective reading behaviors is a continuous challenge for researchers, reading clinicians, reading specialists, and teachers.

According to Davey:

Too often we explain away poor achievement in reading by either identifying a student's 'deficiency' or by criticizing an instructional 'mismatch'. We then set forth our plan or prescription to either change the students or to change the instructional setting. Improvement in the reading success of students, however, requires a broader look at the interaction between a student's cognitive-perceptual characteristics and the educational environment. Cognitive style research can contribute to a better understanding of important student-environment relationships which affect reading achievement.¹

In agreement with Davey is Cohn's suggestion that:

. . . reading difficulty, instead of being a cause of other (academic) problems is, like them, only an effect which is a result of a kind of cognitive style that makes for less effective functioning in dealing with the total environment, of which schoolwork is only a part.²

Cognitive style is described by Santostefano, Rutledge, and Randall as:

Essentially, the concept of cognitive styles proposes that when an individual's cognition is active (not passive), selecting, sorting, organizing information according to particular system principles which are influenced by motivational and

¹Beth Davey, "Cognitive Styles and Reading Achievement," Journal of Reading 20 (November 1976):116.

²M. L. Cohn, "Field Dependence - Independence and Reading Comprehension," Dissertation Abstracts 29 (1968): 477.

personality factors.¹

Cognitive tempo is one aspect of cognitive style that appears to be linked to several aspects of reading behavior.

Kagan² conducted the first study relating reading ability to reflective - impulsivity. In this study 130 first and second graders were given visual matching problems, the Matching Familiar Figures test, and reading recognition tests. The reading recognition tests consisted of identification of letters and words. The examiner pronounced a letter or word and the child had to choose from five printed alternatives the correct answer. Kagan hypothesized that children characteristically reflective will commit fewer word recognition errors than impulsive children. His results confirmed this prediction.

Kagan found the types of errors most characteristic of the impulsive child were partial identity errors, suffix errors, and meaningful and nonmeaningful substitutions.

The impulsive child also made responses in which the first letter of the first or last syllable were in common with the stimulus word. The child apparently had a hypothesis about the word but offered an incorrect response

¹S. Santostefano, L. Rutledge, and D. Randall, "Cognitive Styles and Reading Disability," Psychology in the Schools 2 (1965):58.

²Jerome Kagan, "Reflection - Impulsivity and Reading Ability in Primary Grade Children," Child Development 36 (1965):609-628.

due to insufficient reflection upon the validity of the hypothesis. The impulsive children in the first grade also had the highest reading error scores at the end of grade two.

In a study of sixth graders relating conceptual tempo and reading achievement, Johnson¹ found that reflective students scored significantly higher on reading vocabulary and grade point indices than impulsive children. Intelligence in this study was controlled so that statistically significant differences would not affect the results.

Lesiak² found significant and positive relationships between reflectivity and critical reading abilities.

Smith³ also found in reflectives significant and positive relationships for the skills of identifying main ideas, recall of events, and reading for details. This study compared three measures of cognitive style, one of them the MFF, with five reading comprehension measures.

¹B. L. Johnson, "Conceptual Tempo and the Achievement of Elementary School Boys." Unpublished doctoral dissertation, Case Western Reserve University, Cleveland, Ohio, 1968.

²J. F. Lesiak, "The Relationship of the Reflection - Impulsivity Dimension and the Reading Ability of Elementary School Children at Two Grade Levels." Unpublished doctoral dissertation, The Ohio State University, Columbus, 1970.

³K. M. Smith, "The Influence of Cognitive Style and Intelligence Variables in Aided Reading Comprehension." Unpublished doctoral dissertation, University of Wisconsin, Madison, 1973.

The five areas tested in the Wisconsin Tests of Reading Skill Development, Level B - Comprehension were: identification of the main idea, sequence of events, predicting outcomes, judging cause and effect, and reading for details. Recalling details in short paragraphs correlated highly with the Matching Familiar Figures test. That reading skill also correlated highly with the analytic index of the Wechsler Intelligence Scale for Children and the Children's Embedded Figures Test.

A study by Hood, Kendall, and Roettger, confirmed by Hood and Kendall,¹ found oral reading differences for beginning readers of reflective and impulsive styles.

An index of reflection - impulsivity was administered to first grade children. Samples of oral reading behavior, Metropolitan Achievement Test scores, and Stanford Reading Inventory word recognition test scores were obtained. Reflective children made fewer oral reading miscues than impulsive children, and specifically fewer word substitution miscues. Reflective children made more repetitions, regressions, and proportionately more self corrections than impulsive children. The oral reading rates of the two groups were about the same. . . . In general it appeared that the self corrections in oral reading behavior of reflective children who are just beginning to learn to read reflect an attempt to obtain meaning, and that reflective children also exhibit better reading comprehension in achievement tests at the end of the first grade and possess more extensive sight vocabularies in the first semester

¹J. E. Hood, and J. R. Kendall. "A Qualitative Analysis of Oral Reading Miscues of Reflective and Impulsive Second Graders: A Follow-Up Study." Paper presented at the annual meeting of the American Educational Research Association, 1973.

of second grade.¹

Several studies have dealt with the relationship of reading readiness and the reflective - impulsive dimension.

Ericson and Otto found reflective - impulsivity to be a factor affecting the performance of kindergarten children on word recognition lists of similar and dissimilar words. They found:

. . . impulsive children tended to do poorer than reflective children on the reading tasks. It took them longer to learn the lists (although the difference was not significant), they gave significantly fewer correct word recognition responses (p less than .10) and they tended to make more false generalized responses (p less than .10).²

Ericson and Otto determined that the reflective subjects performed better because they weigh the alternative hypotheses and select a word only after considering individual letters.

Shapiro³ concluded that visual discrimination training could compensate for impulsive response style by

¹J. E. Hood, J. R. Kendall, and D. M. Roettger, "An Analysis of Oral Reading Behavior of Reflective and Impulsive Beginning Readers." Paper presented at the annual meeting of the American Educational Research Association, 1973, Bethesda, Maryland, p. 19. ERIC Document Reproduction Service, ED 078 376.

²L. Ericson, and W. Otto, "Effect of Intra-List Similarity and Impulsivity - Reflectivity on Kindergarten Children's Word Recognition Performance," Journal of Educational Research 66 (July 1973):469.

³J. E. Shapiro, "Effects of Visual Discrimination Training on Reading Readiness Test Performance of Impulsive First Grade Boys," Journal of Educational Research 69 (May 1976):338-340.

significantly increasing readiness test performance of first grade boys.

These studies relate a wide variety of reading skill proficiency to reflectiveness. Studies examining strategies in conceptual tempo provide reasons for these significant correlations.

Strategies and Their Modification

Ault summarizes some of the differences between reflective and impulsive children:

In general, reflective children have been found to perform better on visual discrimination tasks, serial recall, inductive reasoning, and reading in the primary grades.¹

More recent studies also show better performance for reflective children on academic achievement and problem solving;² ability to attend, persist, and concentrate on academic tasks;³ primary grade promotion;⁴ reading at the

¹Ruth L. Ault, "Problem Solving Strategies of Reflective, Impulsive, Fast-Accurate and Slow-Inaccurate Children," Child Development 44 (1973):259-266.

²R. Haskins, and J. D. McKinney, "Relative Effects of Response Tempo and Accuracy on Problem Solving and Academic Achievement," Child Development 47 (S '76): 690-696.

³James D. McKinney, "Problem Solving Strategies in Reflective and Impulsive Children," Journal of Educational Psychology 67 (1975):807-820.

⁴Stanley Messer, "Reflection - Impulsivity: Stability and School Failure," Journal of Educational Psychology 61 (D '70):487-490.

elementary and middle school levels;^{1,2,3} ability in questioning;⁴ and in arithmetic achievement.⁵

The task to discover why these differences exist began to be studied in the latter half of the 1960s. Careful examinations of the conceptual strategies used by reflective and impulsive subjects gives an explanation to the differences observed across a variety of tasks. Ault proposes: "The difficulty impulsive children exhibit may lie not in the speed of response, but rather in the problem-solving strategy employed."⁶

Ault's study uncovered strategy development in 182 elementary age children using a game of 20 questions. She

¹B. L. Johnson, "Conceptual Tempo and the Achievement of Elementary School Boys." Unpublished doctoral dissertation, Case Western Reserve University, Cleveland, Ohio, 1968.

²J. F. Lesiak, "The Relationship of the Reflection-Impulsivity Dimension and the Reading Ability of Elementary School Children at Two Grade Levels." Unpublished doctoral dissertation, The Ohio State University, Columbus, 1970.

³K. M. Smith, "The Influence of Cognitive Style and Intelligence Variables in Aided Reading Comprehension." Unpublished doctoral dissertation, University of Wisconsin, Madison, 1973.

⁴Ruth L. Ault, "Problem Solving Strategies of Reflective, Impulsive, Fast-Accurate and Slow-Inaccurate Children," Child Development 44 (1973):259-266.

⁵W. G. Cathcart, and W. Siedtke, "Reflectiveness/Impulsiveness and Mathematics Achievement," The Arithmetic Teacher 16 (November 1969):563-567.

⁶Ruth L. Ault, "Problem Solving Strategies of Reflective, Impulsive, Fast-Accurate and Slow-Inaccurate Children," Child Development 44 (1973):259.

found that impulsive subjects asked less mature questions than reflective and fast-accurate subjects. Ault also discovered that younger reflectives used strategies that were comparable to those of older children labeled impulsive. This finding suggests an equivalence in cognitive development at different age levels.

Kagan et al.¹ analyze the strategies affecting conceptual tempo:

The reflective child considers the differential validity of alternative answers, . . . and persists longer with difficult tasks. The reflective child wants to avoid making an error and inhibits potentially incorrect hypotheses. The impulsive child seems minimally concerned about mistakes and makes his decisions quickly. Individual differences in time taken to evaluate a solution hypothesis touch the problem-solving process in two places: (a) selection of a solution hypothesis to act upon and (b) evaluation of the quality of the solution obtained. The chronology of a typical problem-solving sequence passes through four phases. In phase one, the problem is decoded (read or listened to) and comprehended. In phase two, a 'best' hypothesis is selected to act upon. Some evaluation is appropriate at this point. In phase three, the hypothesis is implemented, and, once again, there should be some evaluation of the validity of the solution arrived at. Finally, in phase four, the solution is reported to an external agent.²

A study by Drake³ found strategies employed by impulsive subjects to be very different from those classified

¹J. Kagan, L. Pearson, and L. Welch, "Conceptual Impulsivity and Inductive Reasoning," Child Development 37 (1966):583-594.

²Ibid., pp. 583-584.

³D. M. Drake, "Perceptual Correlates of Impulsive and Reflective Behavior," Developmental Psychology 2 (1970):202-214.

as reflective. Drake found that the impulsive subjects, while taking the MFF, ignored some of the alternatives over the course of the response time. Reflectives were found to spend greater amounts of time comparing homologous parts of different figures than did impulsives.

A later study by McKinney¹ identified four basic levels of strategy development involving a transition from scanning, testing one stimulus pattern at a time in an orderly fashion, to focusing, which is testing a single attribute hypothesis and extracting one bit of information on each information trial. McKinney found a definite progression, with age, to the general strategy of focusing. He commented, ". . . focusing isn't normally acquired early in the elementary school period, nor is it completely developed at age 11. . . . this optimal strategy was adopted earlier by reflectives than by impulsives to use a focusing approach in a variety of problem situations."²

Studies by Siegelman,³ Zelniker et al.⁴ and

¹J. D. McKinney, "Problem Solving Strategies in Reflective and Impulsive Children," Journal of Educational Psychology 67 (D '75):807-820.

²Ibid., p. 818.

³E. Siegelman, "Reflective and Impulsive Observing Behavior," Child Development 40 (1969):1213-1222.

⁴T. Zelniker, W. E. Jeffrey, R. Ault, and J. Parson, "Analysis and Modification of Search Strategies of Impulsive and Reflective Children on the Matching Familiar Figures Test," Child Development 43 (1972):321-336.

McCluskey and Wright,¹ have also found that impulsive children use less efficient strategies for scanning the stimulus array in matching to sample tasks.

It seems that the conceptual strategy used by reflectives in processing information on the MFF also enables them to perform better on a variety of other tasks than their impulsive counterparts. Researchers began asking the question, "Can the impulsive tendency be modified to encourage reflective behavior, thus increasing their level of performance?" Just as there is "more than one way to skin a cat," there is also more than one way to modify a strategy.

Several experiments in modification by Albert,² Reali and Hall,³ and Yando and Kagan⁴ have shown that the response latencies of impulsive children can be increased by using a variety of techniques. Frequently, however,

¹K. A. McCluskey, and J. L. Wright, "Age and Reflection - Impulsivity as Determinants of Selective and Relevant Observant Behavior." Paper presented at the meeting of the Society for Research in Child Development, Philadelphia, March 1973.

²J. A. Albert, "Modification of Impulsive Conceptual Style." (Doctoral dissertation, University of Illinois, 1969.) Dissertation Abstracts International, 1970, 30 (7-B), 3377 (University Microfilms No. 70-778).

³N. Reali, and V. Hall, "Effect of Success and Failure on the Reflective and Impulsive Child," Developmental Psychology 3 (1970):392-402.

⁴Regina M. Yando, and Jerome Kagan, "The Effect of Teacher Tempo on the Child," Child Development 39 (1968): 27-34.

these treatments have not resulted in lower error rates.

The study by Yando and Kagan was distinctive because it measured the effect of the teacher's conceptual tempo on the students. The subjects were 80 boys and 80 girls randomly selected from the first grade classrooms of ten impulsive and ten reflective female teachers with different years of experience. The children were tested with the MFF at the beginning and end of the school year. Results showed that the children taught by experienced reflective teachers showed a greater increase in response time over the course of the academic year than all other children. The effect was more marked for boys than for girls.

Many other studies involved training procedures which attempted to teach impulsive children more efficient information processing skills.

Research by Egeland¹ involved training on the strategy to use in situations in which several alternatives are present simultaneously and it is not immediately obvious which alternative is correct. The strategy he taught one group of subjects was: 1) look at the standard and all the alternatives, 2) break the alternatives down into component parts, 3) select one component part and compare it across all alternatives, 4) check the standard to determine

¹Bryon Egeland, "Training Impulsive Children in the Use of More Efficient Scanning Techniques," Child Development 45 (1974):165-171.

the correct form of the component part, 5) successively eliminate alternatives that deviate from the standard on the particular component being studied, 6) continue to eliminate alternatives based on an analysis of component parts until only the correct alternative remains. A second group was taught only to delay their response and a third group was used as a control.

The results on the MFF immediately after the training indicated increased response time and decreased number of errors for both group one and group two. Administration of the MFF two months later showed that group one was able to maintain its low level of errors while group two increased in errors. The Gates - MacGinitie Reading Tests were also administered at the beginning and end of the school year. Group one showed improvement on the comprehension and vocabulary subtests while group two only improved on vocabulary.

Other studies similar to Egeland's using the approach of strategy training by Debus,¹ Ridberg et al.,² and Heider,³ have been more successful in improving

¹R. L. Debus, "Effects of Brief Observation of Model Behavior on Conceptual Tempo of Impulsive Children," Developmental Psychology 2 (1970):22-31.

²E. N. Ridberg, R. D. Parke, and E. M. Hetherington, "Modification of Impulsive and Reflective Cognitive Styles Through Observation of Film - Mediated Models," Developmental Psychology 5 (1971):369-377.

³Eleanor Rosch Heider, "Information Processing and the Modification of an Impulsive Conceptual Tempo," Child Development 42 (October 1971):1276-1281.

performance.

Ridberg et al. used peer modeling as a modifier. Their subjects viewed a film of a nine year old boy responding reflectively to the MFF. The results demonstrated that impulsivity was inhibited.

The use of anxiety was also examined as a modifier. One theory as to its effect is that the child who is made anxious will more likely call correct the first or second variant he happens to look at. The predicted effect of anxiety arousal is, therefore, decreased response times and increased errors.

A contrasting theory put forth by Messer¹ states that the subjects may be more careful after a few failures and will scan the possible solutions more carefully trying to do better. Decision times may be longer following failure than following success.

A third alternative is that it may just depend on the individual's reaction to anxiety.

Messer studied 60 third grade boys whose anxieties were aroused experimentally by having children fail in an intellectual task. The effect of the anxiety was assessed through use of the MFF.

The induced anxiety resulted in longer decision times for both impulsive and reflective children,

¹Stanley Messer, "The Effect of Anxiety Over Intellectual Performance on Reflection - Impulsivity in Children," Child Development 41 (September 1970):723-735.

and in fewer errors for the impulsives who increased in response time. This finding supported the proposition that anxiety (or concern about the quality of one's performance) is one antecedent of a reflective disposition.¹

A study by Denney² indicated that admonishment or forced delay did not generate a greater number of higher level questions. This research analyzed the strategies used in questions asked by subjects to identify a drawing. Denney concluded that, children must have requisite cognitive ability and strategy if response times are to result in improved performance.

The findings of Zelniker and Oppenheimer³ strongly suggest that guiding impulsive children to note differences may enhance their ability to recognize words and deal with visual stimuli in general.

Most researchers would probably agree that training procedures which merely operate on response latency cannot be expected to improve the quality of performance for impulsive children who have not learned efficient strategies for finding solutions. Training in an active search strategy is the most effective method to modify an impulsive tempo.

¹Ibid., p. 723.

²D. R. Denney, "Reflection and Impulsivity as Determinants of Conceptual Strategy," Child Development 44 (1973):614-623.

³T. Zelniker, and L. Oppenheimer, "Modification of Information Processing of Impulsive Children," Child Development 44 (S '73):445-450.

All studies on modification of conceptual tempo should be reviewed with the following warning by Margolis et al. in mind.

If the impulsive child is to develop a more generalized reflective response pattern, he needs sufficient opportunity to practice the wide variety of tasks modeled. To expect that an ingrained and pervasive tendency to respond impulsively will be considerably reduced after a few modeling sessions is probably to underestimate the strength of the disposition.¹

Socio-Economic Class Differences

Investigations into conceptual tempo in the 1960s led to the effect of socio-economic levels on reflection and impulsivity.

Schwebel conducted the first of two studies into this area in 1966. He studied this effect with the following research:

Verbal performance of 30 middle- and lower-class males (ages 9-12 years) was compared on four standard tasks. Analysis of the data indicated class difference in language usage is attributed to both language-speech competence and to impulsivity - reflection in response.²

On a free latency subtask the mean lower-class latency was 2.5 seconds compared to 7.5 seconds for the middle-class subjects. The lower-class subjects improved

¹H. Margolis, G. Brannigan, and M. A. Poston, "Modification of Impulsivity: Implications for Teaching," The Elementary School Journal 77 (January 1977):231-237.

²Andrew I. Schwebel, "Effects of Impulsivity on Performance of Verbal Tasks in Middle- and Lower-Class Children," American Journal of Orthopsychiatry 36 (1966): 12-21.

accuracy when modified by a forced latency.

Schwebel comments on his results:

Besides being handicapped by inadequately developed vocabularies, the LC (lower-class) children also were found to be hampered by a tendency toward impulsivity. Apparently much that has been attributed to 'just class differences' in the past can be explained in terms of differences in this variable.¹

The results of a 1967 study by Kaplan and Mandel² directly oppose Schwebel. Their study involved an object sorting task presented to six, eight, ten, and twelve year old boys of middle- and lower-class. There were 12 middle-class and 12 lower-class boys tested at each age level. They found that free-latency scored higher in accuracy than forced latency. Another finding in contrast to Schwebel was that the delay of response condition did not differentiate classes. Data indicated that at age six, the forced delay impedes the conceptual behavior measured, while at age eight, such behavior is facilitated by the condition. This study differentiated from Schwebel's in that it did not involve oral communication and broke the results down by age. Kaplan and Mandel conclude that,

Significant class differences occur on those tasks which require the child to communicate in verbal conceptual terms . . . and where the task is fixed

¹Ibid., p. 19.

²Marvin Kaplan, and Steven Mandel, "Class Differences in the Effects of Impulsivity, Goal Orientation, and Verbal Expression on an Object Sorting Test." Paper presented to the Society for Research in Child Development, New York, March 1967.

and the child must arrive at the 'true' answer.¹

Bosco² compared the visual information processing speed of 180 elementary school children. A tachistoscope presented a geometric shape and the interval between this stimulus and matching of it was timed.

Data indicated that disadvantaged children required more time to process visual information than did middle-class children, but the processing speed for the two groups tended to become more similar as grade level increased.³

The relationship between the reflective - impulsivity dimension of conceptual tempo and ability to inhibit movement and intelligence was studied in 50 black middle-class pre-school children by Harrison and Nadelman.⁴ The MFF was administered along with Maccoby's Draw a Line Slowly and Walk Slowly tests, which measure the ability to inhibit motor movement upon request. The result was that more reflective children were significantly able to inhibit movement upon request than the impulsive children. The ability to inhibit movement was correlated positively and significantly with response latency and negatively and significantly with errors. Girls were found to be more

¹Ibid., p. 495.

²James Bosco, "Visual Information Processing Speed of Lower- and Middle-Class Children," Child Development 43 (1972):1418-1422.

³Ibid., p. 1418.

⁴A. Harrison, and L. Nadelman, "Conceptual Tempo and Inhibition of Movement in Black Pre-School Children," Child Development 43 (Je '72):657-668.

reflective and better inhibitors than boys.

Schwebel and Bernstein¹ conducted a study four years after Schwebel's initial research into socio-economic classes and reflective - impulsivity. They investigated performance on subtests of the Wechsler Intelligence Scale for Children by 18 lower-class boys who ranged in age from 9-14. The WISC was administered under two conditions, the standard one and one in which an imposed latency period was included.

These boys generally did better in the latter condition, suggesting that the nature of the stimulus task affected the quality of the response produced.²

The authors believe that intelligence is formed by transactions with the environment and self-attitudes resulting from transactions. "Lower-class children experience frequent failure in their transactions with the school environment."³ A child with this history most likely adapts an impulsive response. Impulsive responding occurs because disappointment of erring is less if only a minimal effort toward success is committed. This, in turn, interferes with effective problem solving. The authors believe in altering the administration procedure of the WISC in order to regulate the impulsive response style.

¹Andrew I. Schwebel, and Andrew J. Bernstein, "The Effects of Impulsivity on the Performance of Lower-Class Children on Four WISC Subtests," American Journal of Orthopsychiatry 40 (July 1970):629-635.

²Ibid., p. 629.

³Ibid., p. 630.

Intelligence

Research by Kagan et al.¹ in 1964 uncovered a low insignificant positive correlation between response latency and IQ and a negative correlation between errors and IQ. A study by Harrison and Nadelman² supported the relationship between errors and IQ.

Lewis et al.³ found correlations between IQ and latency ranging from .30 to .45, and for intelligence and errors ranging from -.40 to -.67. Lewis et al. used brighter subjects than Harrison and Nadelman did and an easier form of the MFF. The differences in these variables may be influential in the correlation with latency.

In a study of conceptual strategy Denney comments:

There were substantial correlations between the measures of conceptual strategy and Lorge - Thorndike IQ scores. The measures of cognitive tempo, on the other hand (latency .07, errors -.14) were uniformly not correlated with IQ scores, which suggest that some independent factor contained within the Lorge - Thorndike score contributes substantially to the child's

¹J. Kagan, B. L. Rosman, D. Day, J. Albert, and W. Phillips, "Information Processing in the Child: Significance of Analytic and Reflective Attitudes," Psychological Monographs 78 (1964) (No. 1, Whole No. 578).

²A. Harrison, and L. Nadelman, "Conceptual Tempo and Inhibition of Movement in Black Pre-School Children," Child Development 43 (Je '72):657-668.

³M. Lewis, M. Rausch, L. Goldberg, and C. Dodd, "Error, Response Time and IQ: Sex Differences in Cognitive Style of Pre-School Children," Perceptual and Motor Skills 26 (1968):563-568.

conceptual strategy.¹

He also states that cognitive tempo is not the only factor underlying conceptual strategy.

Intelligence therefore does correlate with conceptual tempo and strategies.

An examination into how conceptual tempo affects performance on intelligence tests was conducted by Schwebel and Bernstein,² who produced better performance on four WISC subtests after an imposed latency. The researchers noted:

The relationship between response latency and quality (of performance) has been observed in tasks requiring the same types of skills as those demanded by items on the traditional intelligence tests: visual recognition and analysis, reading recognition ability, inductive reasoning, verbal abilities, perceptual motor coordination, and concept formation.³

They conclude that, ". . . impulsiveness can significantly affect performance on intelligence tests."⁴

Margolis et al. suggest implications of the adverse effect of impulsivity:

Test responses are often the chief basis for diagnosis, yet many educational evaluations of children

¹D. R. Denney, "Reflection and Impulsivity as Determinants of Conceptual Strategy," Child Development 44 (1973):614-623.

²Andrew I. Schwebel, and Andrew J. Bernstein, "The Effect of Impulsivity on the Performance of Lower-Class Children on Four WISC Subtests," American Journal of Orthopsychiatry 40 (July 1970):629-635.

³Ibid., p. 630.

⁴Ibid., p. 634.

who have learning difficulties fail to take into account the length of time the child took to reflect on the alternative solutions available. Consequently, remedial programs rarely stress systematic procedures for reducing impulsivity. . . . The result is a prescription of remedial activities not addressed to the specific variables that impede learning.¹

An earlier study by Margolis and Brannigan² suggests exploring the ramifications of establishing:

- (a) local norms for the Matching Familiar Figures test in order to assist in initially identifying impulsive children
- (b) local predictive norms for impulsive and reflective children on response uncertainty tests judged sensitive to the influences of impulsivity
- (c) local norms for particular tests based on modified administration procedures designed to reduce the influences of impulsivity.

Such norms may help mitigate the impulsivity dilemma by providing more accurate assessments of abilities.

A suggestion by Schwebel³ is that "planning of curricula could include training, perhaps by a conditioning process to think before responding."

¹H. Margolis, G. Brannigan, and M. A. Poston, "Modification of Impulsivity: Implications for Teaching," Elementary School Journal 77 (January 1977):231-237.

²H. Margolis, and G. Brannigan, "Conceptual Impulsivity as a Consideration in Test Interpretation," Psychology in the Schools 13 (October 1976):484-486.

³Andrew I. Schwebel, "Effects of Impulsivity on Performance of Verbal Tasks in Middle- and Lower-Class Children," American Journal of Orthopsychiatry 36 (1966): 12-21.

Reliability and Stability of
Matching Familiar Figures

Reflective - impulsivity was postulated as a cognitive disposition as a result of studies by Kagan et al.¹ in 1964. Kagan later commented on those results: "These studies revealed remarkable intraindividual consistency in speed of decision time across varied tasks and stability of decision time over long and short periods."² The studies used a matching to sample task that then became the MFF. Different forms were developed for children, pre-school children, and adults.

A double median split procedure is used to determine conceptual tempo. Reflectives are above the median on time and below the median on errors for the specific sample of subjects taking the MFF. Impulsive subjects are those whose time is below the median and whose errors are above the median. Categories for fast-accurates and slow-inaccurates also exist.

Kagan³ investigated long term stability in 1965 in

¹J. Kagan, B. L. Rosman, D. Day, J. Albert, and W. Phillips, "Information Processing in the Child: Significance of Analytic and Reflective Attitudes," Psychological Monographs 78 (1964) (No. 1, Whole No. 578).

²Jerome Kagan, "Individual Differences in the Resolution of Response Uncertainty," Journal of Personality and Social Psychology 2 (1965):154.

³Jerome Kagan, "Impulsive and Reflective Children: Significance of Conceptual Tempo." In J. Krumboltz (ed.), Learning and the Educational Process (Chicago: Rand - McNally, 1965).

which the MFF was administered to a group of subjects in grade one and retested in grade two. A second group tested in grade three and then retested in grade four. The total groups' correlations ranged from .48 to over .60. The correlations for error scores were .25 for boys and .51 for girls.

Yando and Kagan¹ studied the stability of average response time for first graders on two versions of the MFF resulting in correlations of .70 for girls and .13 for boys. Error scores were low, .23 for girls and .24 for boys. These tests were administered in the fall (Form F) and in the spring (Form S).

Short term stability was also tested by Yando and Kagan² in which second grade children were shown a standard and two variants with an additional variant added each week for ten weeks. The median correlation across the ten weeks was .68 for errors and .73 for response time.

Messer³ gave the MFF to first grade boys and then administered a more difficult form to the same subjects 2-1/2 years later. His correlations were significant for latency .31 and errors .33.

¹R. M. Yando and J. Kagan, "The Effects of Teacher Tempo on the Child," Child Development 39 (1968):27-34.

²Ibid.

³S. Messer, "Reflection - Impulsivity: Stability and School Failure," Journal of Educational Psychology 61 (1970):487-490.

Adams¹ found reliability coefficients ranging from .39 (errors for girls) to .58 (combined latencies for both sexes) on a study of 40 six year olds tested three weeks apart on the same form of the MFF.

These studies all reveal low but statistically significant correlations for short and long term reliability and stability. A group of studies in the mid 1970s began criticizing the psychometric credibility of the MFF.

Block et al.² argued that reflection and impulsivity are a function of accuracy and not of response tempo. Their study attempted to correlate performance on the MFF with psychological characteristics. Their subjects were 100 children between the ages of 48 and 61 months. The MFF and the California Child Q Set were given. This test consists of 100 widely ranging personality-relevant terms that are ordered, using a forced choice method, by a trained judge to express the judge's characterization of the personality of a child.

Kagan and Messer³ reply: " . . . among pre-school,

¹W. Adams, "Strategy Differences Between Reflective and Impulsive Children," Child Development 43 (1972): 1076-1080.

²J. Block, J. Block, and D. Harrington, "Some Misgivings about the Matching Familiar Figures Test as a Measure of Reflection - Impulsivity," Child Development 47 (1976):611-632.

³Jerome Kagan, and Stanley Messer, "A Reply to 'Some Misgivings About the Matching Familiar Figures Test as a Measure of Reflection - Impulsivity'," Developmental Psychology 11 (1975):244-248.

in contrast to school-age, children, longer response times are not always associated with more accurate performance."¹

Bentler and McClain² believe that the double median split procedure is weak because,

Loss of discrimination is associated with assuming that all children in a given quadrant have identical scores; errors of classification magnify random score differences; the dependency on sample medians can lead to arbitrary groupings.³

Ault⁴ summarized the strengths of the MFF as having good validity, as demonstrated over a wide variety of cognitive tasks. She also feels that the latency is reliable. The weaknesses are a low error reliability and a moderate negative correlation between latency and errors. Ault feels that efforts to influence error scores often fail because of its low error reliability. She recommends remediation of these weaknesses by using larger sample sizes, adequate research designs and appropriate statistical analyses.

Egeland and Weinberg⁵ conducted a study attempting

¹Ibid., p. 246.

²P. M. Bentler, and J. McClain, "A Multitrait-Multimethod Analysis of Reflection - Impulsivity," Child Development 47 (1976):218-226.

³Ibid., p. 221.

⁴R. L. Ault, C. Mitchell, and D. P. Hartmann, "Some Methodological Problems in Reflection - Impulsivity Research," Child Development 47 (1976):227-231.

⁵Byron Egeland, and Richard A. Weinberg, "The Matching Familiar Figures Test: A Look at its Psychometric Credibility," Child Development 47 (1976):483-491.

to evaluate the psychometric credibility of the MFF.

A study of the short term (one week) reliability of different versions of the MFFT for boys and girls at kindergarten, second, and fifth grades was conducted. The relations between time 1 and time 2 latencies and errors separately for males and females at all three grade levels, while significant, were low. Canonical correlations and time retest correlations based on combining raw time and error scores into a standard score were approximately .65-.75. The χ^2 analyses indicated that approximately 45%-70% of the subjects classified as impulsive or reflective at time 1 were classified in the same way at time 2. Reliability at the kindergarten level was particularly poor and suggests that the MFFT should not be used with children at that age. Mean differences were found among different forms of the MFFT and across grade level.¹

They also state that:

The lack of norms for the MFFT test performance further confounds the interpretation problem; since a child is classified as reflective on the basis of scores for a particular sample of children in a given context.²

While the data in their study show the MFF to be low in relation to ideal psychometric standards, the authors admit that it compares favorably with other measures of conceptual style.

¹Ibid., p. 483.

²Ibid., p. 484.

CHAPTER III

PROCEDURE

Permission to conduct this research study had to be obtained from several sources. The first step was to write a letter to the Director of Special Services for the Germantown School District describing the writer's proposed study and asking permission to use Lorge - Thorndike scores to select a sample. The proposal was sent on September 10, 1977, and permission was granted several days later to use the scores of only the students the writer teaches.

Twenty-five students were found to have a Lorge - Thorndike score in the range of 100 - 110. This criterion was chosen so that intelligence would be constant and not a variable.

A proposal containing a definition of reflective - impulsivity, the problem, hypothesis, and procedure was sent, on September 23, 1977, to the superintendent of schools and to the principal of Kennedy Middle School. The principal approved the study immediately. The superintendent approved it on September 30, 1977, indicating that parental permission would be necessary.

A letter was sent home with the 25 subjects on October 3, 1977, addressed to their parents. The letter

briefly described reflective - impulsivity and discussed the purpose of the study. The testing was outlined in detail, informing the parents on the tests to be given and the amount of time the testing would take. All of the letters were signed and returned within a week, indicating that permission was granted.

The Matching Familiar Figures test was administered individually to the subjects. Testing was done during the subjects' free time following lunch. Usually one child was tested each day, but on several occasions two students were tested during that time. The test took approximately 10 - 15 minutes per subject. Testing on the MFF was conducted between October 10 and November 10, 1977.

Reading Comprehension was tested using the Gates - MacGinitie Reading Tests, Form E. The Speed and Accuracy and Comprehension subtests were given. The Speed and Accuracy subtest is a four minute test and the Comprehension subtest is a 25 minute test. The test was administered during the students' reading class on November 15, 1977. Two subjects were absent on that day and were tested on November 18, 1977. Administration time was 29 minutes.

CHAPTER IV

RESULTS

Two scores were obtained for each subject on the MFF. The total number of errors for each of the twelve problems were averaged for each subject, as was the mean latency to the first response. The latency scores ranged from 12.29 to 83.75 seconds for impulsive and reflective subjects. The errors ranged from 5 to 24. Correlation of MFF errors to latency, using the Spearman Rank formula, was $-.73$.

TABLE 1

MFF MEAN ERRORS AND LATENCY FOR REFLECTIVE
AND IMPULSIVE SUBJECTS

	Mean Errors	Mean Latency
Reflective	11.2	44.85 seconds
Impulsive	20.1	15.25 seconds

The range of grade level scores on the Gates - MacGinitie Reading Tests for reflective and impulsive subjects on the Comprehension subtest was 3.0 to 10.0. The range for the Accuracy grade level scores on the Speed and Accuracy subtest was 3.7 to 11.7. The mean grade level score for impulsive subjects was 6.9. The mean for reflec-

tive subjects was 5.87.

The Spearman Rank formula was used to correlate data from the MFF with data from the Gates - MacGinitie Reading Tests.

TABLE 2
CORRELATION OF MFF WITH GATES -
MacGINITIE SUBTESTS

	Grade Level Score Speed and Accuracy Subtest	Number of Errors Comprehension Subtest
MFF Errors	.039	-.180
MFF Latency	-.012	.389

Discussion

These results are contrary to the hypothesis, which stated: The impulsive subjects will make more errors than the reflective subjects on the Comprehension subtest and will have a lower grade level score than reflective subjects on the Speed and Accuracy subtest of the Gates - MacGinitie Reading Tests.

The writer observed that Comprehension subtest scores were lower than reading class functioning levels for seven subjects. The Speed and Accuracy subtest grade level scores correlated more closely with the teacher's observations. The writer is also the subjects' reading teacher, providing daily observation of the functioning level of the subjects. Of the seven subjects scoring lower than their demonstrated classroom reading levels on the Comprehension

subtest, two were classified as impulsive and five were reflective.

This difference in scores was 1.7 grade levels lower for each of the two impulsive subjects. Reflective subjects scored 1.7, 1.9, 4.5, .9, and 4.2 grade levels lower than their demonstrated ability in reading class. This is a total of 3.4 grade levels lower for impulsive subjects and 13.3 grade levels lower for reflective subjects.

An examination of the content of the school reading program as compared to the Gates - MacGinitie Reading Tests content provides a possible explanation for the discrepancy.

The reading curriculum at Kennedy Middle School, Germantown, Wisconsin, uses the Houghton - Mifflin Basal Series which provides skill work, vocabulary development, short fiction stories, and comprehension questions at three cognitive levels. A Reading Center is also used by all students twelve weeks out of the school year. The Power Reading management system is used in the Reading Center and the skills reinforced in the classroom.

The Gates - MacGinitie Speed and Accuracy subtest consists of sentences with the last word left blank and four multiple choice alternatives provided. This test's administration time is four minutes. There is a great similarity between this subtest and a favorite program of

students in the Reading Center called SRA Reading for Understanding. This similarity could account for better test scores on the Speed and Accuracy subtest.

The Comprehension subtest consists of expository paragraphs with two or three blanks scattered throughout. Four multiple choice solutions are presented for each blank. The paragraphs cover subjects such as taxation, insurance, agriculture, history, and science. The difference in content may explain why the subjects did not score as highly on the Comprehension subtest as on the Speed and Accuracy subtest.

The writer also investigated reasons for the poor test performance of the seven subjects by interviewing some of them and closely examining the errors they made on the reading test. The two reflective subjects with the largest discrepancy between their score and their class work were asked how they thought they had done on the test. Both replied that they thought they had done satisfactorily, but are nervous when they take tests. One of the impulsive subjects seemed to mark the answer that was a short, familiar word, even if the sentence made little sense. It appears that this subject failed to use word attack skills. The remainder of these seven subjects failed to use the context clues in the paragraph to find the correct answer. Careful reading and a search strategy to find the clue was clearly lacking. Proof reading of the paragraphs inserting their

word choices in the blanks would have indicated to these subjects that the paragraphs did not make sense. All of the subjects finished the Comprehension subtest with time to spare.

A combination of nerves, carelessness, and a different content than that found in most of their reading class materials may have contributed to lower Comprehension subtest scores.

There is one other factor that may explain the non-significance of the correlations. Almost all of the long term studies on reflective - impulsivity have found that children get increasingly reflective with age. Because there are no norms with the MFF test, reflectiveness or impulsiveness is determined by a double median split of that particular population sample. A subject testing reflective with one sample, might test as impulsive in another sample. It is conceivable that this study's sample did not vary in range as much as similar studies using the MFF. Seventh grade students may have grown more reflective and thus eliminated some of the impulsive behavior demonstrated by younger children. The writer did not find literature on conceptual tempo that used subjects any older than elementary school age.

The analysis of these factors may provide insight into the discrepancy between the hypothesis and the results.

CHAPTER V

CONCLUSION

This study attempted to correlate reflective - impulsivity with reading ability. Previous research had strongly indicated that reflective subjects make fewer errors, and impulsive subjects make more errors, on a variety of tasks involving response uncertainty. Knowledge of this literature led the writer to hypothesize that the impulsive subjects would make more errors on a multiple choice reading test than reflective subjects.

Two instruments were chosen to measure these factors. The Matching Familiar Figures test was used to identify reflective and impulsive students. The Gates - MacGinitie Reading Tests (Comprehension and Speed and Accuracy subtests) were used to indicate grade level scores and to analyze the number of errors each subject made.

The results of this study did not support the hypothesis. Correlations were nonsignificant and the impulsive students actually scored higher than the reflective subjects on the Comprehension subtest.

In the process of interpreting the results the writer made some observations of the students' performance on both tests.

The search strategy used by the subjects and the improvement in accuracy as the subjects progressed through the MFF test was very interesting.

The analysis of the reading tests of the students who scored much lower than their demonstrated classroom ability indicated a lack of use of context clues. Many of the subjects did not employ a search strategy to locate a clue that would indicate the answer. These subjects were also careless in taking the test as they did not reread the paragraphs with their answers inserted in the blanks. Had the subjects reread they would have probably realized their mistakes. As a result of this, the writer has developed lesson plans teaching a context clue search strategy in multiple choice problems.

Since the completion of the study, the writer has been tempted to administer the MFF to students functioning in the classroom at very low reading levels and to students at very high reading levels to see if the low ability readers would be impulsive.

As the literature indicates, reflective - impulsivity is clearly a factor in any problem solving task in which the solution is not immediately obvious. This has particular impact on diagnostic, intelligence, and achievement testing because the results are heavily relied upon by researchers, teachers, administrators, and the public. The impulsive student's true ability is often judged incor-

rectly due to his impulsive response style.

The impact of conceptual tempo on middle school and high school age students' reading tests, intelligence tests, and achievement tests, has not been fully researched. Research in these concerns would benefit understanding of the dynamics of cognition.

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