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ABSTRACT

The present investigation looked at selective attention in impulsive and reflective children using a central/incidental task similar to that used by Hagen, 1967. In order to examine developmental change in selective attention, children at kindergarten, second, and fifth grades were tested. The central recall task involved presenting the child with a board containing pictures on 3" x 5" cards. The child was then presented with each of the cards and asked to point to the spot on the original board where the picture had been seen. It was hypothesized that impulsive children would demonstrate less efficient selective attention and, as a result, would recall less central information and possibly more incidental information than their reflective counterparts. The results showed that the impulsive children recalled less central as well as incidental information, which did not support the notion that impulsive children were deficient in selective attention. Results did support the developmental trend in the recall of central information found in previous investigations described by Hagen (Hagen & Hale, 1973). Impulsive and reflective children appear to differ on dimensions other than response latency. (Author/PC)

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SELECTIVE ATTENTION OF IMPULSIVE AND REFLECTIVE CHILDREN

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Research, Development, and Demonstration
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Minneapolis, Minnesota

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2. R. Hoffmeister, B. Best, & D. Moores. The Acquistion of Sign Language in Deaf Children of Deaf Parents: Progress Report. Research Report #65. June 1974.

3. P. Krus. Use of Family History Data to Predict Intellectual and Educational Functioning Longitudinally from Ages Four to Seven. Research Report #64. June 1974.

4. P. Krus. Analyzing for Individual Differences in Evaluating Compensatory Education Programs. Occasional Paper #27. June 1974.

5. J. Rondal. The Role of Speech in the Regulation of Behavior. Research Report #64. June 1974.

6. N. Buium, J. Rynders, & J. Turnure. A Semantic-Relational-Concepts Based Theory of Language Acquistion as Applied to Down's Syndrome Children: Implication for a Language Enchancement Program. Research Report #62. May 1974.

7. D. Moores, M. Harlow, & S. Fisher. Post Secondary Programs for the Deaf: II. External View. Research Report #61. March 1974.

8. D. Moores, M. Harlow, & S. Fisher. Post Secondary Programs for the Deaf: I. External View. Research Report #60. March 1974.

9. D. Krus. Synopsis of basic theory and techniques of order analysis. Occasional Paper #26. April 1974.

10. S. Samuels, J. Spiroff & H. Singer. Effect of pictures and contextual conditions on learning to read. Occasional Paper #25. March 1974.

11. A. Taylor, M. Thurlow & J. Turnure. Elaboration as an instructional technique in the vocabulary development of EMR children Research Report #59. March 1974.

12. N. Buium & J. Turnure. The universailty of self-generated verbal mediators as a means of enhancing memory processes. Research Report #58. January 1974.

13. D. Moores, K. Weiss, & M. Goodwin. Evaluation of programs for hearing impaired children: Report of 1972-73. Research Report #57. December 1973.

14. J. Turnure & W. Charlesworth, D. Moores, J. Rynders, M. Horrobin, S. Samuels, & R. Wozniak. American Psychological Association Symposium Papers. Occasional Paper #24. December 1973.

15. N. Buium. Interrogative types of parental speech to language learning children: a linguistic universal? Research Report #56. December 1973.

16. D. Krus. An outline of the basic concepts of order analysis. Occasional Paper #23. February, 1974.

17. D. Krus. Order analysis: A fortran program for generalizable multidimensional analysis of binary data matrices. Occasional Paper #22. November 1973.

18. W. Bart. The pseudo-problem of IQ. Occasional Paper #21. October 1973.

19. J. Turnure & M. Thurlow. Verbal elaboration and the enhancement of language abilities in the mentally retarded: The role of interrogative sentence-forms. Occasional Paper #20. October 1973.

20. P. Dahl, S. Samuels & T. Archwamety. A master based experimental program for teaching poor readers high speech word recognition skills. Research Report #55. September 1973.

21. R. Riegel, F. Danner & L. Donnelly. Development trends in the generation and utilization of associative relations for recall by EMR and non-retarded children: The SORTS test. Research Report #54. August, 1973.

22. R. Hoffmeister & D. Moores. The acquisition of specific reference in the linguistic system of a deaf child of deaf parents. Research Report #53. August 1973.

23. W. Bart & M. Smith. An interpretive framework of cognitive structures. Occasional Paper #19. June 1973.

24. C. Clark & J. Greco. MELDS (Minnesota Early Language Development Sequence) Glossary of Rebuses and Signs. Occasional Paper #18. June 1973.

25. J. Turnure. Interrelations of orienting response, response latency and stimulus choice in children's learning. Research Report #52. May 1973.

26. S. Samuels & P. Dahl. Automaticity, reading and mental retardation. Occasional Paper #17. May 1973.

27. S. Samuels & P. Dahl. Relationships among IQ, learning ability, and reading achievement. Occasional Paper #16. May 1973.

28. N. Buium & J. Rynders. The early maternal linguistic environment of normal and Down's Syndrome (Mongoloid) language learning children. Reaearch Report #51. May 1973.

29. T. Archwamety & S. Samuels. A mastery based experimental program for teaching mentally retarded children word recognition and reading comprehension skills through use of hypotheais/test procedures. Research Report #50. May 1973.

30. W. Bart. The process of cognitive structure complexification. Research Report #49. April 1973.

31. B. Beat. Classificatory development in deaf children: Research on language and cognitive development. Occasional Paper #15. April 1973.

32. R. Riegel, A. Taylor, & F. Danner. The effects of training in the use of grouping strategy on the learning and memory capabilities of young EMR children. Research Report #48. April 1973.

33. J. Turnure & M. Thurlow. The latency of forward and backward association responses in an elaboration task. Reaearch Report #47. March 1973.

34. R. Riegel & A. Taylor. Strategies in the classroom: A summer remedial program for young handicapped children. Occasional Paper #14. March 1973.

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Byron Egeland and Anne Thibodeau
University of Minnesota

Research, Development and Demonstration
Center in Education of Handicapped Children
Minneapolis, Minnesota

June, 1974

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Department of Health, Education and Welfare

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RESEARCH AND DEVELOPMENT CENTER
IN EDUCATION OF HANDICAPPED CHILDREN
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The University of Minnesota Research, Development and Demonstration Center in Education of Handicapped Children has been established to concentrate on intervention strategies and materials which develop and improve language and communication skills in young handicapped children.

The long term objective of the Center is to improve the language and communication abilities of handicapped children by means of identification of linguistically and potentially linguistically handicapped children, development and evaluation of intervention strategies with young handicapped children and dissemination of findings and products of benefit to young handicapped children.

Selective Attention of Impulsive and Reflective Children

Byron Egeland Anne Thibodeau

Recently there has been an increasing awareness of conceptual tempo as an important dimension to consider in attempting to understand the way young children learn. Conceptual tempo refers to the way in which a child responds to tasks of high response uncertainty. A child who responds quickly and with less accuracy in situations of high response uncertainty is typically labeled cognitively impulsive (Kagan, 1965). The operational index of the reflection-impulsivity dimension is response latency and number of errors on Kagan's Matching Familiar Figures Test (MFF). The MFF is a visual discrimination match-to-sample task that involves finding one of six alternatives that exactly matches a standard.

The educational interest in conceptual tempo stems from the fact that it has been shown that the performance of reflective children is generally superior to that of impulsive children on tasks such as intelligence tests (Harrison & Nadelman, 1972), reading (Kagan, 1965), arithmetic achievement (Cathcart & Liedtke, 1969), and school success in general (Messer, 1970). In addition, the modification of impulsive responding has been shown to have a positive effect on the child's reading performance (Egeland, 1974). The difficulty that impulsive children have with tasks such as reading may be due to the fact that they process information in an inefficient way.

Based on eye movement studies of impulsive children there is evidence to indicate that they have difficulty breaking a stimulus down into component parts and focusing on the distinctive features of those component parts (Seigelman, 1969; Drake, 1970). These investigators found that impulsive

children ignore many alternatives when solving a match-to-sample task and use only a fraction of the information available. Impulsive children appear to locate an alternative, spend a disproportionate amount of time looking at it, and then select that alternative as the correct one without considering the other alternatives. Rather than break the stimulus down into component parts, impulsive subjects compare the alternative globally with the standard and attempt to eliminate or confirm it on a global basis.

These studies suggest that impulsive children are deficient in their ability to attend selectively to critical features of a stimulus display and ignore other irrelevant features. This capacity corresponds to the filtering mechanism proposed by the information processing models of Broadbent (1958), Neisser (1967), and Treisman (1969). The models suggest that a filtering mechanism causes certain information in the individual's environment to be attended to and other information ignored. Impulsive children quite likely fail to inhibit attention to incidental information in a stimulus display.

Hagen has utilized a central/incidental recall paradigm derived from the filter models of information processing to investigate selective attention. The basic experimental situation involves a brief presentation of a stimulus display, certain elements of which are designated as central information. Immediately following presentation, recall of central and incidental information is assessed. High incidental learning is assumed to indicate attention to the incidental aspects of the display, while high central learning in combination with low incidental learning is assumed to indicate selective attention to the task relevant information. Hagen (1967) reports a developmental increase in the ability to attend selectively. Central task performance improved with age, while incidental performance

did not increase and actually decreased slightly at the oldest age level. Correlational analyses from the same study indicate a positive correlation between central and incidental task scores at the younger age levels, but negative correlations at the oldest age levels.

According to Hagen and Hale (1973), results seem to indicate that incidental learning is determined by a process which involves two stages. The first stage is an initial discrimination of the relevant and irrelevant material and the second stage involves focusing attention on certain information for further processing, storage in memory and later retrieval. While there may be developmental improvement in both stages, Hagen contends that the developmental improvement in selective attention reflects age differences in performance at the second stage. The findings of Drucker and Hagen (1969) support this view in that the developmental trend toward increased selective attention was not significantly changed by attempts to increase the degree to which discrimination of the relevant and irrelevant materials was possible. According to Hagen and Hale (1973), the negative correlation between central and incidental information in older subjects indicates that success in task performance is accomplished, at least in part, due to inhibition of attention to incidental information.

The present investigation looked at selective attention in impulsive and reflective children using a central/incidental task similar to that used by Hagen. In order to examine developmental change in selective attention, children at kindergarten, second, and fifth-grade levels were tested. It was hypothesized that impulsive children would demonstrate less efficient selective attention, recalling less central information than their reflective counterparts and possibly more incidental information. It was expected

that reflective children would recall more central information than incidental information, with the magnitude of this difference increasing developmentally. In addition, based on Hagen's developmental findings, it was hypothesized that the combined data of impulsive and reflective children would show an increase in central recall and a decrease in incidental recall for older children.

Method

Subjects

Initially, 90 kindergarten, 106 second-grade and 125 fifth-grade children from a suburban Minneapolis school system were administered the Matching Familiar Figures test. Based on response time and total errors on the test, a double median split was used to select a sample of 36 impulsive and 36 reflective children at each grade level. The sample consisted of 33 boys and 39 girls ranging in age from 5 years, 5 months to 6 years, 7 months at the kindergarten level; 37 boys and 35 girls ranging in age from 7 years, 5 months, to 9 years, 3 months at the second-grade level; and 28 boys and 44 girls ranging in age from 10 years, to 12 years, 7 months at the fifth-grade level.

Materials

Materials used in this study were adapted from Hagen (1967). Stimuli for the central/incidental task were presented on a 22" x 10" board on which five 3" x 5" cards were secured and outlined in black. On each of the five cards were two black line drawings. The drawings were pairings of animals and household objects: cat-lamp, dog-table, fish-telephone, camel-TV, deer-clock. The animal drawing always appeared in the upper position and the drawings were approximately one-half inch apart. Ten additional 3" x 5"

cards were used, each containing a drawing of an animal or household object identical to those which appeared on the set of cards containing the animal and object pairs. The drawings on the cards containing either the animal or object always appeared in the same position on the cards as they had on the cards with animal and object pairs. For the incidental recall task, five 2 1/2" x 3" cards were used, each containing a drawing of an animal identical to that which appeared on the cards containing pairs. A 22" x 10" white card was used in testing recall of central information. Five 3" x 5" rectangles outlined in black appeared on one side of the card.

Procedure

The procedure for this study involved individual testing of subjects. The stimuli board containing five cards with drawings was placed before the subject. The pictures of animals were designated as central information in this study and after the pairs of drawings were exposed to the child for eight seconds a second board was used to cover the stimuli. Before the stimuli were exposed, the child was told that his task was to try to remember the position of each animal picture on the stimuli board. The instructions were repeated until the experimenter felt that the child understood what he was to do. Immediately following exposure to the stimuli, Ss were administered tasks to assess recall of central and incidental information.

The central recall task involved presenting the child the board containing the outlines of 3" x 5" cards. The child was then presented each of the 3" x 5" cards having a drawing of an animal and asked to point to the box where that animal had been seen. For the incidental recall task, the subject was shown an array of the five cards having only drawings of household objects. The child was handed the 2 1/2" x 3" cards containing animal drawings, one at a time, and instructed to indicate which household object the animal had

been paired with. Total testing time for this task was approximately 10 minutes.

At each grade level, one-half of the impulsive and one-half of the reflective subjects performed the central recall task first while the other half of the subjects in each group performed the incidental recall task first. Performance on the central and incidental tasks was designated in terms of errors on each task. Errors on the central task consisted of failure to indicate the correct position of the animal on the board. Errors on the incidental recall task consisted of failure to match the household object with the animal drawing originally paired with that object.

Following completion of the central/incidental task, each subject was administered Form B of the Peabody Picture Vocabulary Test. This IQ measure was used to determine if possible IQ differences existed between the impulsive and reflective group.

Results

Initially, sex differences on the selective attention task and on the MFF were analyzed as well as IQ differences between impulsive and reflective groups. Impulsive children had a mean IQ of 107.6, which is not significantly different from the mean of 109.1 for the reflective group (F = 1.09, df = 1/24). The MFF mean time and error scores for impulsive and reflective subjects at each grade level are reported in Table 1. The mean number of errors on the MFF was 13.7 for boys and 12.1 for girls which is not a significant difference (F = 2.40, df = 1/214). The mean length of time to first response was 133.4 seconds for boys and 148.3 for girls which again is not significant (F = 1.11, df = 1/124). Similarily, there were no sex differences in the mean number of errors made on the recall of central and incidental information. Mean number of errors on central recall for boys was 2.4 and for girls the mean

was 2.5 (F = .05, df = 1/214); on incidental recall the means were 4.0 and 3.8 for boys and girls respectively (F = .66, df = 1/214).

Insert Table 1 about here

A 2 (conceptual style) x 2 (order) x 3 (grade) analysis of variance was performed on the error scores for recall of central information as reported in Table 2. Main effects for conceptual style (F = 5.39, df = 1/204, $p < .02$), grade (F = 23.20, df = 2/204, $p < .0001$) and order (F = 12.12, df = 1/204, $p < .0006$) were found; however, there were no significant interactions.

Insert Table 2 about here

A similar analysis, which is reported in Table 3, was carried out on the error scores for incidental information. This analysis yielded a significant main effect for conceptual style (F = 5.53, df = 1/204, $p < .01$). There were no other significant main effects or interactions.

Insert Table 3 about here

Mean error scores for the impulsive and reflective groups for each grade are presented in Table 4. The mean number of errors on the central recall task for the reflective group across all grades was 2.2, while the mean errors for the impulsive group was 2.7, indicating significantly fewer central errors for the reflective group. Similar differences were found for error scores on incidental recall. The impulsive group had an average of 4.0 errors while the reflective group across all grade levels had a mean error score of 3.7 on incidental recall.

Combining central recall scores across impulsive and reflective groups shows that the kindergarten children had a mean error score of 3.2; second

grade, 2.4; and fifth grade, 1.6. The results indicate a developmental trend in the recall of central information with older children recalling more information than younger children. For recall of incidental information, the mean number of errors was approximately the same across the grade levels.

Insert Table 4 about here

The significant main effect for order of presentation found in the analysis of central recall data indicated that more central information was recalled when central information was recalled first followed by recall of incidental information. When central information was recalled first, the mean number of errors was 2.1 and when central was recalled second the mean was 2.8. The mean number of errors when the incidental task was presented first and second was 3.9 and 3.8 respectively, which indicates that children made approximately the same number of errors on incidental recall regardless of whether the task was presented first or second.

Correlations between central and incidental error scores at each grade were -.09 for kindergarten; .04 for second grade; and .12 for fifth grade. These nonsignificant correlations contradict Hagen's (1967) previous findings of a positive correlation between central and incidental recall at the younger age levels and a negative correlation at the older age levels.

Discussion

It was hypothesized that impulsive children would demonstrate less efficient selective attention and as a result they would recall less central information and possibly more incidental information than their reflective counterparts. The results showed that the impulsive children recalled less central and incidental information as compared to reflective children, which does not support the notion that impulsive children are deficient in

selective attention as measured by Hagen's task. The poorer performance of the impulsive subjects on both central and incidental recall tasks suggests a deficiency in the ability to encode information for storage rather than a deficiency in selective attention. The relative difference in recall of central and incidental information was approximately the same for impulsive and reflective subjects with both groups recalling more central than incidental information. The central/incidental task involves two different recall tasks. While the central task involves recall of serial position, the incidental task is one of recalling paired associates. Since the degree to which these tasks can be compared has not been established, it is impossible to base conclusions about selective attention on the relative difference between central and incidental recall.

The overall poor performance of impulsive children cannot be explained in terms of the theories of selective attention presented by Hagen (Hagen & Hale, 1973) and Neisser (1967). The fact that reflective children recalled more central and incidental information suggests that these subjects utilized better strategies for information processing and recall. It is quite possible that the impulsive children dealt with the information in a global, undifferentiated way that resulted in less efficient processing of the information for later recall. Indirect evidence for the fact that impulsive children attend to stimuli in a global, undifferentiated fashion has been found in the eye movement investigations of Drake (1970) and Siegleman (1969) which show that impulsive children do not systematically analyze stimulus material or break it down into component parts. Impulsive subjects in this study may have processed the information in a global way and recalled the stimuli by use of iconic storage. This type of strategy is less efficient than a more

careful analysis of the material and use of verbal labeling, rehearsal and other memory strategies. Hagen and Kingsley (1968) and Wheeler and Dusek (1973) found that by forcing young children to label the stimuli they produced higher central recall scores. It would be interesting to determine if similar results would be obtained with impulsive children since they appear to process information in a way similar to younger children.

Unlike findings reported by Hagen (1967), the present results did not show positive correlations between central and incidental scores for younger children and negative correlations at older age levels. The correlations in the study were nonsignificant at each grade level. Although Hagen interprets these correlation differences to indicate that older subjects are actively excluding irrelevant information, the present findings do not support the conclusion that this is occurring.

The current results did support the developmental trend in the recall of central information found in previous investigations described by Hagen (Hagen & Hale, 1973). When data for impulsive and reflective children were combined, a significant developmental increase in recall of central information was found, but there was no significant difference in recall of incidental information over all age levels.

The results of the present investigation raise some questions regarding Hagen's selective attention task. The central/incidental task is basically a recall task and the child's ability to attend selectively is inferred from his recall score using two different recall tasks administered after a brief exposure to the stimuli. The order of recall of central and incidental information is a potentially important variable. In previous investigations (Hagen, 1967; Drucker and Hagen, 1969; Hagen and Huntsman, 1971), central

information was recalled before incidental information without counterbalancing groups to control for a possible order effect. In the present investigation, results indicate a significant order effect in recall of central information with significantly more errors being made when the central recall task was presented after the incidental task. There was no significant order effect for recall of incidental information. This order effect, which was also found in an earlier investigation by Wheeler and Dusek (1973), may account for the higher central recall scores found in previous investigations. Hale and Piper (1973) have pointed out that other factors, such as the spatial relationship of the stimuli or the use of multidimensional materials, must be taken into consideration in comparing evidence from various selective attention investigations.

The results of this investigation offer evidence to support the notion that impulsive and reflective children differ on dimensions other than response latency. The results of the present study suggest that impulsive children may benefit from training in information processing and recall skills. It seems likely that the poor academic achievement reported for impulsive children is associated with deficiencies in these skills. It has been demonstrated previously that impulsive children can be trained to better scan and analyze stimulus materials in terms of relevant component parts and this training results in some improvement in academic achievement (Egeland, 1974). Hunt (1973) has been successful in teaching retarded children to use various strategies for organizing and remembering materials. Similar training approaches involving labeling and rehearsal skills need to be attempted with impulsive children.

References

Broadbent, D.E. Perception and Communication. New York: Pergamon Press, 1958.

Cathcart, G. and Liedtke, W. Reflectiveness/impulsiveness and mathematics achievement. The Arithmetic Teacher, 1969, 16, 563-567.

Drake, D.M. Perceptual correlates of impulsive and reflective behavior. Developmental Psychology, 1970, 2, 202-214.

Drucker, J. and Hagen, J. Developmental trends in the processing of task-relevant and task-irrelevant information. Child Development, 1969, 40, 371-382.

Egeland, B. Training impulsive children in the use of more efficient scanning techniques. Child Development, 1974, 45, 165-171.

Hagen, J. The effect of distraction on selective attention. Child Development, 1967, 38, 685-694.

Hagen, J. and Hale, G. The development of attention in children. In A. D. Pick (Ed.), Minnesota Symposia on Child Psychology. Minneapolis: University of Minnesota Press, 1973.

Hagen, J. and Huntsman, R. Selective attention in mental retardates. Developmental Psychology, 1971, 5, 151-160.

Hagen, J. and Kingsley, P. Labeling effects in short-term memory. Child Development, 1968, 39, 113-121.

Hale, G. and Piper, R. Developmental trends in children's incidental learning: Some critical stimulus differences. Developmental Psychology, 1973, 8, 327-335.

Harrison, A. and Nadelman, L. Conceptual tempo and inhibition of movement in black preschool children. Child Development, 1972, 43, 657-668.

Kagen, J. Impulsive and reflective children: Significance of conceptual tempo. In J.D. Krumboltz (Ed.), Learning and the Educational Process. Chicago: Rand McNally, 1965, 133-161.

Messer, S. Reflection-impulsivity: Stability and school failure. Journal of Educational Psychology, 1970, 61, 487-490.

Neisser, U. Cognitive Psychology. New York: Appleton-Century-Crofts, 1967.

Riegel, H., Danner, ..., Johnson, L. and Kjerland, L. Improving organization and memory: A sequentially arranged set of activities to improve the learning and retention capabilities of young educationally handicapped children, (Teacher's manual). Research, Development and Demonstration Center in Education of Handicapped Children, University of Minnesota, May 1973.

Treisman, A.M. Strategies and models of selective attention. Psychological Review, 1969, 76, 282-299.

Seigelman, E. Reflective and impulsive observing behavior. Child Development, 1969, 40, 1213-1222.

Wheeler, R. and Dusek, J. The effects of attentional and cognitive factors on

children's incidental learning. Child Development, 1973, 44, 253-258.

Table 1

Mean Time and Error Scores on the
Matching Familiar Figures Test

Matching Familiar Figures Test	Grade		
	Kindergarten	Second	Fifth
	Reflective		
Errors	12.8	5.9	4.7
Time (Seconds)	166.5	256.0	202.3
	Impulsive		
Errors	25.0	16.6	11.9
Time (Seconds)	59.5	77.1	85.6

Table 2

Analysis of Variance Summary for Central Recall

Source	df	MS	F	p
Between A (Impulsive/Reflective)	1	10.66	5.39	.02
B (Grade)	2	45.92	23.20	.00001
C (Order)	1	24.00	12.12	.0006
A x B	2	1.51	.76	.ns
A x C	1	.46	.23	.ns
B x C	2	.51	.26	.ns
A x B x C	2	.199	.10	.ns
Error	204	1.98		

Table 3

Analysis of Variance Summary for Incidental Recall

Source	df	MS	F	p
Between A (Impulsive/Reflective)	1	6.34	5.53	.01
B (Grade)	2	2.20	1.91	.14
C (Order)	1	.11	.10	.ns
A x B	2	.06	.05	.ns
A x C	1	.23	.19	.ns
B x C	2	2.53	2.20	.11
A x B x C	2	.45	.39	.67
Error	204	1.15		

Table 4

Mean Error Scores for Central and Incidental Recall

Selective Attention	Grade		
	Kindergarten	Second	Fifth
	Reflective		
Central	2.9	2.1	1.6
Incidental	3.8	3.8	3.5
	Impulsive		
Central	3.5	2.8	1.7
Incidental	4.2	4.0	3.9

Footnote

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35. D. Moores. Early childhood special education for the hearing impaired. Occasional Paper #13. February 1973.

36. R. Riegel & A. Taylor. A comparison of conceptual strategies for grouping and remembering employed by educable mentally retarded and non-retarded children. Research Report #46. February 1973.

37. J. Rynders. Two basic considerations in utilizing mothers as tutors of their very young retarded or potentially retarded children. Occasional Paper #12. January 1973.

38. R. Bruininks, J. Rynders & J. Gross. Social acceptance of mildly retarded pupils in resource rooms and regular classes. Research Report #45. January 1973.

39. J. Turnure & M. Thurlow. The effects of interrogative elaborations on the learning of normal and EMR children. Research Report #44. January 1973. (Proceedings of the International Association for the Scientific Study of Mental Deficiency, in press).

40. J. Turnure & S. Samuels. Attention and reading achievement in first grade boys and girls. Research Report #43. November 1972. (Journal of Educational Psychology, in press).

41. R. Riegel, A. Taylor, S. Clarren, & F. Danner. Training educationally handicapped children to use associative grouping strategies for the organization and recall of categorizable materials. Research Report #42. November 1972.

42. R. Riegel, F. Danner, & A. Taylor. Steps in sequence: Training educationally handicapped children to use strategies for learning. Development Report #2. November 1972.

43. A. Taylor, M. Thurlow, & J. Turnure. The teacher's introduction to: The math vocabulary program. Development Report #1. March 1973.

44. J. Turnure & M. Thurlow. The effects of structural variations in elaboration on learning by normal and EMR children. Research Report #41. September 1972.

45. A. Taylor & N. Bender. Variations of strategy training and the recognition memory of EMR children. Research Report #40. September 1972. (American Educational Research Journal, in press).

46. D. Moores, C. McIntyre, & K. Weiss. Evaluation of programs for hearing impaired children: Report of 1971-72. Research Report #39. September 1972.

47. R. Rubin. Follow-up of applicants for admission to graduate programs in special education. Occasional Paper #11. July 1972.

48. D. Moores. Communication - Some unanswered questions and some unquestioned answers. Occasional Paper #10. July 1972.

49. A. Taylor & S. Whitely. Overt verbalization and the continued production of effective elaborations by EMR children. Research Report #38. June 1972. (American Journal of Mental Deficiency, in press).

50. R. Riegel. Measuring educationally handicapped children's organizational strategies by sampling overt groupings. Research Report #37. May 1972.

51. E. Gallistel, M. Boyle, L. Curran, & M. Hawthorne. The relation of visual and auditory aptitudes to first grade low readers' achievement under sight-word and systematic phonic instruction. Research Report #36. May 1972.

52. E. Gallistel & P. Fischer. Decoding skills acquired by low readers taught in regular classrooms using clinical techniques. Research Report #35. May 1972.

53. J. Turnure & M. Thurlow. Verbal elaboration in children: Variations in procedures and design. Research Report #34. March 1972.

54. D. Krus & W. Bart. An ordering-theoretic method of multidimensional scaling of items. Research Report #33. March 1972.

55. J. Turnure & S. Larsen. Effects of various instruction and reinforcement conditions on the learning of a three-position oddity problem by nursery school children. Research Report #32. March 1972.

56. J. Turnure & S. Larsen. Outerdirectedness in mentally retarded children as a function of sex of experimenter and sex of subject. Research Report #31. March 1972.

57. J. Rynders & J. Horrobin. A mobile unit for delivering educational services to Down's Syndrome (Mongoloid) infants. Research Report #30. January 1972. (Presented at Council for Exceptional Children, Special National Conference, Memphis, December, 1971).

58. F. Danner & A. Taylor. Pictures and relational imagery training in children's learning. Research Report #29. December 1971. (Journal of Experimental Child Psychology, in press).

59. J. Turnure & M. Thurlow. Verbal elaboration phenomena in nursery school children. Research Report #28. December 1971. (Study II: Proceedings of 81st Annual Convention of the American Psychological Association, in press).

60. D. Moores & C. McIntyre. Evaluation of programs for hearing impaired children: Progress report 1970-71. Research Report #27. December 1971.

61. S. Samuels. Success and failure in learning to read: A critique of the research. Occasional Paper #9. November 1971. (In M. Kling, The Literature of Research in Reading with Emphasis on Modes, Rutgers University, 1971).

62. S. Samuels. Attention and visual memory in reading acquisition. Research Report #26. November 1971.

63. J. Turnure & M. Thurlow. Verbal elaboration and the promotion of transfer of training in educable mentally retarded children. Research Report #25. November 1971. (Journal of Experimental Child Psychology, 1973, 15, 137-148.

64. A. Taylor, M. Josberger, & S. Whitely. Elaboration training and verbalization as factors facilitating retarded children's recall. Research Report #24. October 1971. (Journal of Educational Psychology, in press).

65. W. Bart & D. Krus. An ordering-theoretic method to determine hierarchies among items. Research Report #23. September 1971.

66. A. Taylor, M. Josberger, & J. Knowlton. Mental elaboration and learning in retarded children. Research Report #22. September 1971. (Mental Elaboration and Learning in EMR children. American Journal of Mental Deficiency, 1972, 77, 69-76).

67. J. Turnure & S. Larsen. Outerdirectedness in educable mentally retarded boys and girls. Research Report #21. September 1971. (American Journal of Mental Deficiency, in press).

68. R. Bruininks, T. Glaman, & C. Clark. Prevalency of learning disabilities: findings, issues, and recommendations. Research Report #20. June 1971. (Presented at Council for Exceptional Children Convention, Miami Beach, April, 1971).

69. M. Thurlow & J. Turnure. Mental elaboration and the extension of mediational research: List length of verbal phenomena in the mentally retarded. Research Report #19. June 1971. (Journal of Experimental Child Psychology, 1972, 14, 184-195.

70. G. Siegel. Three approaches to speech retardation. Occasional Paper #8. May 1971.

71. D. Moores. An investigation of the psycholinguistic functioning of deaf adolescents. Research Report #18. May 1971. (Exceptional Children, May 1970, 36, 645-652).

72. D. Moores. Recent research on manual communication. Occasional Paper #7. April 1971. (Keynote Address, Division of Communication Disorders, Council for Exceptional Children Annual Convention, Miami Beach, April 1971).

73. J. Turnure, S. Larsen, & M. Thurlow. Two studies on verbal elaboration in special populations. 1. The effects of brain injury; II.Evidence of transfer of training. Research Report #17. April 1971. (Study I: American Journal of Mental Deficiency, in press).

74. R. Bruininks & J. Rynders. Alternatives to special class placement for educable mentally retarded children. Occasional Paper #6. March 1971. (Focus on Exceptional Children, 1971, 3, 1-12).

75. D. Moores. Neo-oralism and the education of the deaf in the Soviet Union. Occasional Paper #5. February 1971. (Exceptional Children, January 1972, 39, 377-384).

76. D. Feldman, B. Marrinan, & S. Hartfeldt. Unusualness, appropriateness, transformation and condensation as criteria for creativity. Research Report #16. February 1971. (American Educational Research Association Annual Conference, New York, February 1971).

77. P. Broen & G. Siegel. Variations in normal speech disfluencies. Research Report #15. January 1971. (Language & Speech, in press).

78. D. Feldman. Map understanding as a possible crystallizer of cognitive structures. Occasional Paper #4. January 1971. (American Educational Research Journal, 1971, 3, 484-502).

79. J. Rynders. Industrial arts for elementary mentally retarded children: An attempt to redefine and clarify goals. Occasional Paper #3. January 1971.

80. D. Moores. Education of the deaf in the United States. Occasional Paper #2. November 1970. (Moscow Institute of Defectology, 1971, published in Russian).

81. R. Bruininks & C. Clark. Auditory and learning in first-, third-, and fifth-grade children. Research Report #14. November 1970.

82. R. Bruininks & C. Clark. Auditory and visual learning in first grade educable mentally retarded normal children. Research Report #13. November 1970. (American Journal of Mental Deficiency, 1972, 76, No. 5, 561-567).

83. R. Bruininks. Teaching word recognition to disadvantaged boys with variations in auditory and visual perceptual abilties. Research Report #12. November 1970. (Journal of Learning Disabilities, 1970, 3, 30-39).

84. R. Bruininks & W. Lucker. Change and stability in correlations between intelligence and reading test scores among disadvantaged children. Research Report #11. October 1970. (Journal of Reading Behavior, 1970, 2, 295-305).

85. R. Rubin. Sex differences in effects of kindergarten attendance on development of school readiness and language skills. Research Report #10. October 1970. (Elementary School Journal, 72, No. 5, February 1972).

86. R. Rubin & B. Balow. Prevalence of school learning & behavior disorders in a longitudinal study population. Research Report #9. October 1970. (Exceptional Children, 1971, 38, 293-299).

87. D. Feldman & J. Bratton. On the relativity of giftedness: An empirical study. Research Report #8. August 1970. (American Educational Research Annual Conference, New York, February 1971).

88. J. Turnure, M. Thurlow, & S. Larsen. Syntactic elaboration in the learning & reversal of paired-associates by young children. Research Report #7. January 1971.

89. R. Martin & L. Berndt. The effects of time-out on stuttering in a 12 year-old boy. Research Report #6. July 1970. (Exceptional Children, 1970, 37, 303-304).

90. J. Turnure & M. Walsh. The effects of varied levels of verbal mediation on the learning and reversal of paired associates by educable mentally retarded children. Research Report #5. June 1970. (Study I: American Journal of Mental Deficiency, 1971, 76, 60-67. Study II: American Journal of Mental Deficiency, 1971, 76, 306-312).

91. J. Turnure, J. Rynders, & N. Jones. Effectiveness of manual guidance, modeling & trial & error learning for inducing instrumental behavior in institutionalized retardates. Research Report #4. June 1970. (Merrill-Palmer Quarterly, 1973, 19, 49-65).

92. J. Turnure. Reactions to physical and social distractors by moderately retarded institutionalized children. Research Report #3. June 1970. (Journal of Special Education, 1970, 4, 283-294).

93. D. Moores. Evaluation of preschool programs: An interaction analysis model. Occasional Paper #1. April 1970. (Keynote Address, Diagnostic Pedagogy, International Congress on Deafness. Stockholm, August 1970; also presented at American Instructors of the Deaf Annual Convention, St. Augustine, Florida, April, 1970).

94. D. Feldman & W. Markwalder. Systematic scoring of ranked distractors for the assessment of Piagetian reasoning levels. Research Report #2. March 1970. (Educational and Psychological Measurement, 1971, 31, 347-362).

95. D. Feldman. The fixed-sequence hypothesis: Individual differences in the development of school related spatial reasoning. Research Report #1. March 1970.