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CONCEPTUAL TEMPO AND AUDITORY-VISUAL TEMPORAL-SPATIAL INTEGRATION

by

GURMAL RATTAN

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Department of Educational Psychology

The University of British Columbia
2075 Wesbrook Place
Vancouver, Canada
V6T 1W5

Date Aug. 7, 1979

ABSTRACT

This study explored variations of audio-visual information integration patterns and their relation to conceptual tempo in a sample of 93 grade four children. All subjects were given nine combinations of audio-visual integration (AVI) tasks as well as the Matching Familiar Figures Test. The resultant data was analysed to discover the extent to which the conceptual tempo dimension is related to information processing patterns. Of particular interest is the question of whether differences in reading achievement may be traced, in part, to differences in information processing practices.

A multivariate analysis indicated no significant difference between the four tempo groups (reflectives, slow inaccurates, fast accurates, and impulsives) on any of the AVI tasks. A one way ANOVA from a post-hoc analysis, however, indicated that reflectives and impulsives differentiated significantly on the reading measure used (Gates-MacGinitie) and that significant correlations existed between reading and eight of the nine AVI tasks. This indicated that while a significant relationship existed between reading (vocabulary and comprehension) and AVI tasks ($p < .01$), and that reflectives and impulsives differentiated significantly ($p < .01$) on reading, there was no differentiation on any of the AVI tasks. Reasons and implications of these findings are discussed.

Supervisor

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CHAPTER I

INTRODUCTION

Background and Rationale

In recent years psychological researchers have shown a remarkable upsurge of interest in human cognitive processes. Neisser (1967) describes these processes as the transformation, reduction, elaboration, storing, recovering, and using of sensory input. In short, these processes involved the synthesis and use of such information.

One group of researchers led by Harvard psychologist Jerome Kagan have been particularly interested in the developmental aspects of perceptual organization and cognitive processing of visual information. Specifically, Kagan, Rosman, Day, Albert, and Phillips (1964) have used the term "cognitive style" in referring to a stable and consistent mode of perceptual organization and cognitive processing. They have found that subjects respond quite differently when presented with the same visual stimulus. One group of subjects tend to be analytic and deal with the differentiated parts of a stimulus array. Others deal with information on a more global basis. The analytic person was believed to be more efficient in the processes of synthesizing, storing, and retreiving information.

Later research, however, indicated that underlying the cognitive styles dimension of analytic/non-analytic was a more fundamental dimension referred to as conceptual tempo. Slower response times on experimental tasks were indicative of subjects who differentiated the stimulus array by a systematic consideration of a solution hypothesis on a task where alternatives were simultaneously available. These subjects were called reflectives.

Their counterparts, the quick responders, did not differentiate the stimulus array when alternatives were presented simultaneously, and they were called impulsives. Thus the rubric "reflection-impulsivity" was used to define the above dimension.

Studies investigating reflection-impulsivity have indicated that impulsive children have problems in reading, math, scanning ability, attentional factors, and other intellective functions (Epstein, Hallahan & Kaufman, 1975; Messer, 1976). Researchers investigating the reading ability of impulsive children (Butler, 1972; Davey, 1971; Hood & Kendall, 1974; Readence, 1976) have noted a definite impairment. This may be linked to the visual modality, resulting from inefficient scanning and decoding of graphic symbols (Kilburg & Siegel, 1973; Nelson, 1969; Siegel, Keiasic & Kilburg, 1973; Siegelman, 1969). Although researchers have not thoroughly examined the impulsives' aural abilities, deficits in reading have also been linked to this modality (Bond, 1935; Christine & Christine, 1964; Goldent & Steiner, 1969; Wolfe, 1941).

The Problem

Impulsive children appear to have deficits in their perceptual organization of complex visual stimuli, and these deficits may be implicated in their reading problems (Butler, 1972; Davey, 1971; Hood & Kendall, 1974; Kagan, 1965b; Margolis, 1976; Readence, 1976; Shapiro, 1976). Researchers investigating the dimension of reflection-impulsivity, have given little consideration to delineating the perceptual mechanisms of impulsive children. Accordingly, this study will focus on the auditory-visual temporal-spatial integrative abilities of impulsive children since these processes appear to be related to the process of reading.

Skills required for adequate performance on auditory-visual temporal-spatial (AVI) tasks are thought to resemble those required in reading (Beery, 1967; Marshall, 1979; Muehl & Kremenak, 1966; Rudnick, Martin & Sterritt, 1972; Sterritt, Martin & Rudnick, 1971). The ability to read requires a number of subskills. Among these are: 1)the ability to discriminate between different sounds and 2)the ability to discriminate between different letters of the alphabet that are organized spatially in print (Birch & Belmont, 1964; Muehl & Kremenak, 1966; Strang, 1968). The ability to discriminate between different sounds involves an intra-modal integration of aural stimuli, that is, auditory to auditory (A-A). The ability to discriminate between different letters, involves an intra-modal integration of visual spatial information, that is, visual-spatial to visual-spatial (VS-VS); 3)prior to reading, a child must be able to identify sounds made by different graphic symbols (letters) (Muehl & Kremenak, 1966; Strang, 1968). This task is represented by an intermodal integration of auditory and visual-spatial information, that is, auditory to visual-spatial (A-VS); 4)additionally, the child must also be able to identify different graphic symbols with their appropriate sound(s). This can be represented by an intermodal integration of visual-spatial and auditory information, that is, visual-spatial to auditory (VS-A); 5)since a temporal element is involved for the visual modality [1] due to the sequential process of reading along a line of print, a visual-

1 Modality in this text refers to the sensory pathways (eg. eyes, ears, touch, etc.) through which external stimuli is received for processing.

temporal element is necessary (Rudnick et al., 1972; Sterritt et al., 1971). This task can be represented by an intramodal integration of a visual-temporal component, that is, visual-temporal to visual-temporal (VT-VT); 6)since a visual-temporal component is involved for the visual recognition of graphic symbols while moving along a line of print, an intermodal integration task is necessary. This task can be represented by a visual-temporal and visual-spatial information, that is, visual-temporal to visual-spatial (VT-VS); 7)conversely, visual recognition of graphic symbols while moving along a line of print can be represented by visual-spatial to visual-temporal (VS-VT) task; 8)when a child actually reads, the auditory patterns in speech which are temporally ordered, must be integrated with spatially organized visual patterns in print (Beery, 1967; Muehl & Kremenak, 1966; Rudnick et al., 1972; Sterritt et al., 1971). This task can be represented by an intermodal integration of auditory-temporal and visual-temporal information, that is, auditory-temporal to visual-temporal (AT-VT); and 9)the visual patterns in print which are spatially organized must be integrated with the auditory patterns of speech which are temporally ordered when reading. This task can be represented by an intermodal integration of visual-temporal and auditory-temporal information, that is, visual-temporal to auditory-temporal (VT-AT). These nine tasks then (A-A, VS-VS, A-VS, VS-A, VT-VT, VT-VS, VS-VT, AT-VT, VT-AT) are regarded as being parallel to the reading process. These tasks are used in this study to compare the perceptual mechanisms of reflective and impulsive children to discover whether differences exist which may help explain differences in their reading performance.

Research Question

The present study will attempt to explore the extent and nature of the relationship between the dimension of reflection-impulsivity and reading achievement, using the criteria measures of auditory, visual, temporal, and spatial sensory integration. Sensory integration will be assessed by intramodal and crossmodal matching ability (modality matching)[2] vis-à-vis the modalities of vision and audition. It will investigate one basic issue as reviewed in the literature:

1) What is the relationship between reflection-impulsivity and modality matching? On which (if any) tasks (eg. auditory-visual, temporal-spatial or a combination thereof) do impulsive children perform more poorly than their reflective counterparts?

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2 Modality matching involves the presentation of a stimulus or standard pattern in one modality, followed by a comparison pattern in another modality. The subject is required to judge the equivalence or match of the two patterns. Intramodal refers to the presentation of the standard and the comparison patterns in the same modality; intermodal refers to the presentation in two different modalities.

CHAPTER II

REVIEW OF RELATED LITERATURE

Reflection-Impulsivity

Development of the Construct

Kagan, Moss, and Sigel (1963) provided one of the earlier attempts to operationalize conceptual styles. They began by administering tests to 71 adults between the ages of 20-29 at the Fels Research Institute. Each subject was asked to select a group of figures that went together from a selection of 32 items. Their analysis indicated two basic orientations and three basic conceptual styles. The orientations consisted of 1)ego-centric and 2)stimulus centered, and the conceptual classes were comprised of: 1)analytic-descriptive, 2)relational, and 3)inferential-categorical. Ego-ecntric was defined as a method of grouping where an individual uses his personal reactions or his personal characteristics as a basis for organizing the stimuli while observing a series of pictures. Examples of ego-centric responses are typified by statements like: "people I like; people who scare me; people who like me; and people wearing the same type of clothes I am wearing". The stimulus centered individual, on the other hand, did not categorize according to personal feelings, but instead, based his decision upon aspects of the external environment. Examples of his responses are: "men, soldiers, active children, happy people,and women with skirts on".

The first of the three conceptual categories is the analytic-descriptive category. This response style is based upon the relative similarity of the elements within a stimulus complex. That is, the subject looks at the stimulus in order to ascertain similarities with one or more of the others in order to differentiate classes of stimuli. Examples of this are: "people holding something; people with their left arm up; people with no shoes on; and people holding weapons".

The inferential-categorical concepts are based upon an inference which is drawn from treating the stimuli or a group. It must be noted that each stimulus in a group is treated as an individual instance of a conceptual mode. Examples of this are: "people who help others; professional men; poor people; soldiers, and medical people".

The relational group categorizes the stimulus according to the functional relationship that exist between or among the stimuli. In this case, no stimulus is an independent instance of the concept, since each stimulus is dependent upon the others for membership. Examples that illustrate such a concept are: "murder scenes - he shot this man; subject's family; a married couple; people arguing with each other; stages in the life of a person; and mother cutting cake for the child" (Kagan et al., 1963, pp.76-77).

From the above, Kagan and his associates synthesized two basic response styles, the analytic and the non-analytic or relational group. The analytic group were actively involved in the conceptual analysis of the stimulus. The sub-elements of a stimulus were analysed and related to the sub-elements of the other stimuli. For example, in a descriptive concept, "people with shoes on", the crucial stimulus is the presence of shoes while the remaining aspects of the stimuli are disregarded. The analytic identified the relevant stimulus, while for the relational group, each element retained its identity and was classified as a whole. Here, using the identical stimulus, the relational responders would answer, "a family".

Based upon a number of studies, Kagan and his colleagues concluded that "... reflection over alternative-solution possibilities and visual analysis are fundamental cognitive dispositions that influence both analytic concepts on the Conceptual Styles Test and perceptual recognition errors on Design Recall Test and Matching Familiar Figures" (p.37). It appears then that one necessary antecedent for an analytic response is a tendency to delay his response. Increased response time and systematic analysis of the stimulus array suggest one mode of responding to this type of problem. Continued research into tempo variables has given rise to the dimension of reflection-impulsivity. Subjects described as reflective tend to ponder the alternatives before responding in order to eliminate incorrect answers. The most reliable instrument constructed to measure the variations in response styles or conceptual tempo is the Matching Familiar Figures Test (MFFT) which is an extension of the Delayed Recall Designs Test (Kagan, et al., 1963) with the memory component eliminated.

In this task (MFFT), the subject is presented with a picture of a familiar object (eg. tree, cat, doll) and six alternatives of this object with only one being identical to the standard (see Appendix A). The subject is instructed to select the correct alternative. Scoring is based upon the total number of errors and the mean response latency to the first selection. A maximum of six errors is permitted before the subject is shown the correct response.

Of all the measures used to assess reflection-impulsivity, Kagan (1965) found that the MFFT provided the highest degree of response uncertainty, and when this measure was correlated with external criteria variables, it was found to yield the highest coefficients (Lee, Kagan &

Robson, 1963).

There are three forms of the MFFT originally developed by Kagan and his associates, these are: Form F - which was the first to be developed and is the most widely used; Form S - which is used primarily for post-test purposes; Form K - this is the young children's version. Form F and S both have 12 test items and six variants for each item, while Form K has 12 items, but only four variants. An adult version of the MFFT has also been constructed. The only difference between this and the child's version is in the number of variants. The adults' version contains eight variants as opposed to six.

On the basis of early investigations, Kagan and his colleagues attempted to discern whether analytic response styles were prevalent across a series of other tasks. Correlations between the Conceptual Styles Test (Kagan et al., 1963) and an ink blot interpretation task revealed a correlation of .39 ($p < .10$), suggesting some degree of generality across ambiguous ink blots and pictures. In examining the detailed observations made of children's behavior in the Fels nursery school, it was noted that behavior patterns were parallel to the conceptual style of the child. The non-analytic children were observed to be "... more impulsively aggressive, less likely to withdraw from a group in order to work on a task, and more hyperkinetic than analytic children," (Kagan et al., 1963). The analytic children, on the other hand, had opposing characteristics. They were observed to have a reflective disposition, a tendency to differentiate experiences, and the ability to resist destracting stimuli. It was also observed that the average response time on the Conceptual Style Test was significantly longer for the analytic responders (5.4 seconds) than the non-analytic group (4.0 seconds).

In sum, Kagan's early work on conceptual style paved the way for the Matching Familiar Figures Test, an instrument that is currently used for the operational definition of conceptual tempo.

Reliability

Due to the lack of standardization of the MFFT, a great deal of confusion has arisen in regard to the validity of results obtained by different experimenters. It appears that one experimenter's reflectives may be another experimenter's impulsives (Egeland & Weinberg, 1976). In the last few years, the psychometric credibility of the MFFT has been the subject of controversy (Ault, Mitchell & Hartmann, 1976; Block, Block & Harrington, 1974; Cairns & Cammock, 1978; Hall & Russell, 1974). It is not unusual, however, for relatively new instruments to receive such painstaking cross-validation checks. Without such micro-analysis, the reliability and validity of such instruments would be unclear.

The initial reliability assessment done by Kagan in 1964 involved a one year test-retest study which yielded a coefficient of .65 for latency measures. Studies done by other experimenters using a test-retest for error scores, over periods ranging from three weeks to two and one-half years, yielded coefficients which ranged between .23 and .43 (Ault et al., 1976). Internal consistency measures that were synthesized by (Ault, McKinney, Messer, Rupert, and other experimenters) Ault et al. (1976), show a range of coefficient for error scores from .32 to .60, with an average coefficient of .52. Results from these studies, but more specifically from those done by Kagan (Kagan et al., 1963; Kagan, 1965a, 1965b, 1966; Kagan & Kogan, 1970), indicate the following:

(a) When investigating a group of 5-11 year olds, a noticeable increase in response latency occurs with increasing age. The associated negative correlations that exist between latency and error scores range from -.40 to -.65 ($p < .01$).

(b) In examining cross-task performances among measures of conceptual tempo, generality was quite high. Error correlations ranged from .33 to .52 and latency correlations ranged from .48 to .82. Since these intercorrelations were relatively modest, Kagan (1965b) asserts that the MFFT provides the greatest utility since, "the MFFT has the greatest response uncertainty and yields the highest correlations with external criterion variables" (p. 617).

(c) Test-retest reliability of the MFFT yields a relatively stable and consistent assessment of the reflection-impulsivity dimension. Yando (1968), in his reliability assessment, had his second grade subjects perform the test on a weekly basis over a ten-week period. Initially, Yando presented a standard and two variants to each child and then added one variant each week until a total of twelve was reached. The mean correlation was .70 for response time and errors on the MFFT. This finding is consistent with those of Kagan, Pearson, and Welch (1966a), who obtained similar results (r=.70) for test-retest after a ten-week interval on alternate forms of the MFFT. However, Messer (1968) found that after a two and one-half year interval, the reliability coefficient for the MFFT was only .31. This suggests that the stability of the MFFT is considerably reduced over long time intervals.

It seems clear then, that the tendency to respond either quickly or slowly on a match-to-sample task involving a high degree of uncertainty, may be generalized across tasks and it appears to be stable over time.

It should be emphasized here that Kagan's initial conception of reflection-impulsivity was based upon response speed, but was later modified to include response accuracy. The change resulted from two small but anomalous groups that were either fast and accurate or slow and inaccurate. The first group, those who had a relatively fast response time with few errors, were considered to be the bright children. The latter group, that is, those who had relatively slow response times and who committed large numbers of errors were considered to be greatly affected by task anxiety (rather than being dull).

These two groups created a technical problem since it was no longer true that a consistent negative correlation existed between response latency and errors, where fast responders made more errors and slow responders made fewer errors. To alleviate this problem, a scoring system was devised which used speed and accuracy scores. The impulsives then, were those who scored below the median on response latency and above the median on error scores. The reflectives on the other hand, were those who scored above the median on response latency and below the median on error scores.

Block, Block and Harrington (1974) in response to the dual criterion method of scoring note that while response time is the true measure of the R-I dimension and may be relatively stable, accuracy scores are somewhat less reliable and may reflect a host of underlying factors, eg. low intelligence, anxiety, misunderstanding of the task, poor vision, etc.. This may introduce sources of variance in subject selection different and more powerful than what is measured by response time. In addition, it would be difficult to ascertain the extent to which differences between reflectives and impulsives are attributable to their differences in either response time or accuracy. Since accuracy may be tapping into a different set of variables, the double median split may not be justified.

Antecedents of the R-I Dimension

A number of explanations have been forwarded to account for the fact that some children are slower and more accurate than others in the performance of match-to-sample tasks.

One explanation makes reference to a possible antecedent condition underlying the R-I dimension. It suggests that children in problem-solving situations respond with anxiety to a variety of situational cues (Kagan & Kogan, 1970). Children having minimal anxiety in such situations might be expected to adopt a task strategy which was neither reflective nor impulsive. Reflective subjects may equate competence with accuracy, and thus they perform slowly. Impulsives on the other hand, view competence in terms of quickness, thus giving rise to their fast performance.

In situations, then, where anxiety over competence is aroused, reflective and impulsive subjects would be expected to respond in a characteristic fashion. Studies by Ward (1968) and Reali and Hall (1970), however, obtained only partial evidence in support of the foregoing hypothesis. In both studies, feedback regarding the quality of performance was given. Both studies noted that impulsive subjects did not increase their speed of responses when given failure feedback. However, reflective subjects did increase their response latency in response to failure feedback.

A more plausible explanation of factors underlying the R-I dimension again implicates anxiety. Kagan and Kogan (1970) have suggested that there exists a direct relationship between anxiety over error and reflectivity. In this view, the performance of the impulsive child would reflect his lack of concern over making mistakes.

The above hypothesis has found support in the literature dealing with visual scanning strategies. Attentional factors of eye scanning and observation strategies was first investigated by Kagan (1965b). His initial attempt to delineate differences among reflectives and impulsives, led him into the investigation of the eye movements of his subjects. Kagan measured the head movements of his subjects as a gross measure of eye movement in order to define the differences in strategy. A correlation of .91 between the number of head-eye fixations and the mean response time was obtained. Siegelmen (1969) and Drake (1970) both attempted a micro analysis of the strategy used by focusing on frequency, duration, and target of observation. Siegelman (1969) used a mechanical version of the MFFT while Drake (1970) employed a Mackworth's eye-marker camera to record eye fixations. Both authors noted that impulsives ignored two and one-half times as many alternatives of the MFFT than do reflectives. The impulsives devoted proportionately more time to looking at the alternative observed most and their final selection. They also spent a disproportionate amount of time on one alternative and selected that alternative without considering any of the others. The reflectives on the other hand, used a strategy of differentiating all the alternatives into component parts and comparing them to the standard in order to select the appropriate alternative. In constrast, the impulsives employed a strategy of global comparisons between the alternative and the standard.

In view of this, one might speculate that the riskier strategy of the impulsive subjects is based upon an underlying lack of concern over possible errrors. Reflective subjects on the other hand, use a more cautious strategy and take longer, thereby avoiding errors.

Research on scanning strategies has also provided methods of improving the impulsive's performance. The attempts to modify the impulsive's response style typically have the subject:

(a) delay response time,

(b) imitate reflective models, or

(c) develop efficient search strategies and scanning techniques.

Studies which have employed the first method (Briggs & Weinberg, 1973; Kagan, Pearson & Welch, 1966) have not met with as much success as those employing the latter two. In employing the second method (Debus, 1970; Denny, 1972), the subjects showed a decrease in errors, but not response time. A study by Meichenbaum and Goodman (1971), however, employed modelling along with self-verbalization training techniques [3] and found that their subjects showed a decrease in errors and an increase in response latency. Studies employing the third method (McLauchlan, 1976; Siegel, 1973; Zelinker, Jeffrey, Ault & Parsons, 1972) noted that the task performance of impulsive subjects readily improved.

In view of this, one might infer that perceptual organization rather than central processing deficiencies can account for the poorer performance of impulsive subjects. In this regard, it would be of interest to investigate similar features of perceptual organization in such other modalities as audition.

Correlates of Reflection-Impulsivity

Thus far, the discussion has considered anxiety as a possible antecedent of the R-I dimension. It has also provided grounds to show that the operational definition of R-I has a certain degree of convergent reliability and validity, although differential findings have been noted disputing this. The next section further explores the construct and the nature of the R-I dimension to other aspects of human performance.

Reflection-Impulsivity and Intelligence

The contention that the MFFT is a measure of intelligence has been

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3 Self-verbalization is a cognitive training technique used to improve task performance. The procedure is as follows: first, the experimenter (model) performs a task talking aloud while the subject observes; then the subject performs the same task while the experimenter instructs aloud; then the subject performs the same task while instructing himself aloud, then whispering to himself, and finally, doing the task covertly.

discussed by Block, Block and Harrington (1974) and Mischel (1969). Mischel's position may be summed up in this way: "To the extent that conceptual tempo involves reaction time, and fast reaction time is a determinant of generalized performance I.Q., one would have to be alert to their interrelations" (Mischel, 1969, p.1013). Campbell and Fiske (1959) suggest that any new instrument that is devised and purports construct validity be subjugated to convergent and discriminant validity analysis to dispel any accusations that may be lodged against it. In a study by Hall and Russell (1974), the above suggestion was employed in a multitrait-multimethod analysis of the MFFT. In this study four instruments were used, these were: the MFFT and the Word Recognition Test (WRT); which were used to establish convergent validity as a measure of conceptual tempo. The Raven's Coloured Progressive Matrices (RCPM) and the Peabody Picture Vocabulary Test (PPVT) were used to establish discriminant validity (ie. to measure intellignece). Convergent and discriminant validity was assessed by using three criteria. These were: errors, correct responses, and latency scores for the four tests. The two I.Q. tests (RCPM and PPVT) both achieved convergent validity on all three criterion measures. The conceptual tempo group (MFFT and WRT) only achieved convergent validity on the latency measure. The MFFT and WRT only maintained discriminant validity against the PPVT on error and correct scores.

The high latency coefficients for all of the above instruments ranged from .4 to .6 and were significantly correlated with one another. Mollic and Messer (1978) explained this high latency correlations by suggesting the influence of a significant age effect ($\alpha = 4.61$, $p < .05$). This resulted in a higher positive correlation for younger children than older ones. Mollick and Messer (1978) did not specify the exact ages to which the above findings were applicable, although the 23 studies reviewed by Messer (1976) showed a median MFFT response time-I.Q. correlation of .165. Differential findings, however, have also been noted. Eska and Black (1971) and Lewis, Rausch, Godlberg, and Dodd (1968) for example, both obtained significant response time-I.Q. correlations of .45. Similarly, negative correlations averaging in the mid .40's have also been attained between MFFT errors and I.Q.

When a comparison was made between 100 reflective and impulsive subjects on the WISC-R, Brannigan and Ash (1977) noted that reflectives performed significantly better. The reflectives dimonstrated superiority on the following subtests: Information, Comprehension, Digit Span, Picture Completion, Picture Arrangements, Block Design, and Object Assembly, while no significant differences were noted on the Similarity, Vocabulary, and Coding subtests.

In addition, Plomin and Buss (1973) suggest that the experimental design be given careful consideration, since there is a significant order effect in the administration of the MFFT and I.Q. Their study consisted of splitting 52 second graders into two groups, the first group receiving the MFFT first, followed by the WISC, and the second group receiving the reverse order. They noted a significant difference on the response time for the MFFT. The subjects receiving the MFFT first, answered more impulsively than those who took the MFFT as their second treatment. This indicated that the WISC caused subjects to respond more reflectively, and the authors suggest that the MFFT therefore be administered first. They also noted that for the group receiving the WISC first, there was a very low and insignificant correlation between WISC Verbal, Performance, and

Full Scale I.Q. scores. This, however, was not true of the group performing the MFFT first.

Reflection-Impulsivity and Anxiety

The literature in this area is both scanty and inconsistent. Confusion has resulted from differences in design and instrumentation used, such as differences in age of subjects, intellective ability, anxiety of tasks, order of presentation and the operationalization of reflection-impulsivity.

Kagan's initial explanation of the impulsive's rapid response style is based upon his avoidance-of-anxiety hypothesis (Kagan, 1963). Here, the implusive is seen as responding quickly in order to avoid expected failure. Kagan (1966) later asserted that when failure and anxiety are both included in a performance task, it will lead to more reflective responding by the impulsive child. This later assertion was partially confirmed by Messer (1970), Reali and Hall (1970), Ward (1968), and Weiner and Adams (1974). They noted that when subjects received feedback on errors, both reflectives and impulsives increased their response latencies on MFFT items and on an anagram test. Messer (1970) and Weiner et al. (1974) noted that impulsives had the greater decline on MFFT errors, following failure, than did reflectives. Ward (1968) also noted that on a retest of the MFFT, after a failure experience, the fast/inaccurate group had a significant decrease in errors when compared to the slow/accurate group. Ward's (1968) fast/inaccurates, however, had significantly faster response times than the fast/accurates and slow/accurates. This appears to be a direct contradiction of Nuessle's (1972) findings. Nuessle noted while studying the focusing behavior of reflectives, that longer latencies were associated with more effective problem solving. From this, Ward (1968) suggests that the fast/inaccurates were more sensitive to evaluation cues to achieve a significant decrease in errors than were the fast or slow/accurates. On the bases of his findings, Ward rejects Kagan's (1963) avoidance-of-anxiety hypothesis.

A study by Reali and Hall (1970) investigated the effects of anxiety when feedback on performance was given. Their results indicated the following:

(a) the performance of reflective and impulsive subjects was not differentially affected by feedback about successful performance. This held true for both the response time and error variables;

(b) the effects of failure did not differentiate reflective and impulsive subjects in either response or in expectancy of failure;

(c) there appeared to be no relationship between decision time and expectancy of success.

The studies of Ward (1968) and Reali and Hall (1970) seem to cast doubt upon Kagan's avoidance-of-anxiety hypothesis. However, flaws in Ward's research design leave some open questions; the subjects for example, were 87 kindergarten children. Kagan (1966) has cautioned against the use of subjects below the age of five or six years old, since there appears to be no correlation between response time and errors for this age group. Kagan further suggests that a long response time for these subjects does not indicate reflectiveness over the task, but idleness. These subjects also appear to become distracted by the experimenter and his instruments, thereby further confounding the results.

Another area that has been overlooked in most of the studies, is the effect of anxiety on I.Q. Research has indicated that when considering the effects of anxiety on task performance both the I.Q. of the subjects and the nature of the task must be considered. For example:

(a) high anxiety facilitates the performance of high I.Q. subjects on tasks ranging in difficulty from simple to moderate;

(b) on very difficult tasks, low anxiety subjects are superior in performance to high anxiety subjects when they are of comparable ability (Gaudry & Spielberg, 1971).

It seems evident then, that I.Q. can be considered a major variable in anxiety research and thus cannot be ignored when considering the relation of anxiety to the R-I dimension.

Summary

From the literature reviewed thus far, we have noted differential findings when the variables of intelligence, anxiety, and scanning were considered.

Differential findings for the intelligence variable may be due, in part, to the order in which tasks are presented to subjects. Plomin and Buss (1973) have demonstrated that subjects responded more reflectively when the I.Q. measure was adiministered first than when it was administered second. It is suggested therefore, that the MFFT be administered first in order to avoid erroneous classification of subjects into reflectives or impulsives. Order effects then, need to be considered in future R-I/I.Q. research.

Measurements of the effects of anxiety on performance tasks have shown that both reflectives and impulsives increase their response latency when they received feedback on errors (Messer, 1970; Reali & Hall, 1970; Ward, 1968; Weiner & Adams, 1974), but it was the impulsives who had the greater decline on MFFT errors (Messer, 1970; Weiner & Adams, 1974). Reali and Hall (1970) and Ward (1968) contend, however, that a decrease in MFFT errors does not necessarily imply a modification of their tempo, since the impulsives had a faster response time than the reflectives. However, a closer examination of their experimental design, shows an inappropriate selection of subjects(Ward, 1968), and an inappropriate instrument to assess reflection-impulsivity (Reali & Hall, 1970). The inconsistent findings in this area have been further complicated by researchers' neglecting to consider the I.Q. variable in anxiety research (Gaudry & Spielberger, 1971).

Research on scanning has primarily been concerned with attentional factors of eye movement and observation strategies. Kagan's (1965b) investigation into attentional factors resulted in a correlation of .91 between head-eye fixations and the mean response time. Drake (1970) and Siegelman (1969) noted that impulsives ignored two and one-half times as many alternatives than reflectives. Research on scanning strategies has also noted that impulsives perform at par with their reflective counterparts when a search strategy has been taught (Kilburg & Siegel, 1973; Seigel, Keiasic & Kilburg, 1973). This is particularly relevant since it suggest difficiencies in perceptual organization rather than cognitive processing.

The inconsistent findings discussed in this literature review can be attributed to a variety of factors. Perhaps the most important factor is the questionable validity of the R-I construct, while lesser factors include selection of subjects, instruments, experimental design, and analysis. In sum, results from the R-I research need to be interpreted cautiously.

The R-I literature reviewed in this section is related to the research question in the following manner:

1) the literature on scanning strategies has formed the basis of our research question. Since impulsive children were inefficient in scanning and decoding of graphic symbols (Kilburg & Siegel, 1973; Nelson, 1969; Siegel et al., 1973; Sigelman, 1969), it was hypothesized that inefficiencies in scanning of complex visual stimuli may be a factor contributing to reading deficiencies in impulsive children (Butler, 1972; Davey, 1972; Hood & Kendall, 1974; Readence, 1976; Shapiro, 1976).

2) the literature on intelligence indicates that reflectives perform significantly better than impulsives on an intelligence measure (eg. WISC-R) (Brannigan & Ash, 1977). This suggest that we need to control for the effects that intelligence might have on AVI task performance. By controlling for the intelligence variable, we may be expected to get a less biased assessment of the perceptual organization mechanisms of impulsive children.

3) the literature on anxiety indicates thatone antecedent condition underlying the impulsives' response style is the factor of anxiety (Kagan, 1963). Althought the factor of anxiety will not be considered in this study (in assessing the perceptual organization mechanisms of impulsive children), it is presented in this section to give the reader a broader perspective of the probable constituents of the R-I dimension.

Crossmodal Processing

A Definition

Crossmodal processing refers to an individual's capacity to assimilate, integrate, and organize multimodal information as related to academic performance (Derevensky, 1977). Topics that are usually categorized under the rubric of crossmodal processing are: intersensory integration, intersensory transfer, and modality matching[4].

The two basic models which have been proposed for exploring crossmodal processing are modal specific and nonmodal (Jones & Connolly, 1970; Pick, 1970). The modal specific model views each modality as an independent entity, with its distinct patterns of transduction and its specific sites of neural transmission and processing. Vision is a good example of this, although it has often been treated as comprising the entire perceptual field. In the nonmodal model, each modality loses its specific qualities and becomes pooled into a single perceptual modality, which now acts as

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[4] Intersensory integration involves the assimilation and integration of multimodal information. The method used to assess intersensory integration is modality matching (see footnote 2). Intersensory transfer as differentiated from intersensory integration, involves the translation of a learned principle from one modality to another modality on concurrent or subsequent tasks. Additionally, intersensory transfer (unlike intersensory integration) does not assume that the translated information to the other modality is equivalent.

the instrument of perceptual processing.

Both the modal specific and nonmodal models have not received much support from the literature which deals with crossmodal processing (see Friedes, 1974).

An alternate hypothesis to the modal specific and nonmodal models is the intersensory integration hypothesis (Friedes, 1974). Here, information received in one sense modality is available via translation to another modality. Reading, for example, is a task requiring translation from a visual to an auditory code and vice versa. Reading impairment was viewed as a failure to integrate visual and aural stimuli. This notion has found support in the literature dealing with intersensory integration and reading (Birch & Belmont, 1964, 1965; Beery, 1967; Kahn & Birch, 1967; Sterritt & Rudnick, 1966). Since the research question posed in this thesis deals only with intersensory integration of aural and visual stimuli, intersensory integration of tactile, haptic or other sense modalities along with intersensory transfer will not be dealt with here.

Developmental Trends of Intersensory Integration

Auditory-Visual Integration and Reading

Birch and Belmont (1964) were the first to propose that auditory-visual integration was essential to the reading process. The procedure used by Birch and Belmont (1964) to study integrative ability was a match-to-sample method. Here, the experimenter struck a series of taps with a pencil or pen according to a planned sequence, such as; .., ·., ·:·., . The child's task was to listen to the taps and then pick the appropriate sequence from a series of three that were presented visually (see Figure 1).

The results of studies that have investigated audio-visual integration (AVI) and reading can be summarized as follows:

(1) Better readers performed significantly better than poorer readers on the AVI task (Birch & Belmont, 1964, 1965; Beery, 1967; Kahn & Birch, 1967; Sterritt & Rudnick, 1966). This relationship existed from K to grade 6.

(2) The relationship between AVI and intelligence is ambiguous. Birch and Belmont (1964) noted that children with a low AVI score also had lower mean I.Q., regardless of their reading ability. Sterritt and Rudnick (1966) obtained a significant correlation of .53 for AVI and I.Q.; Rae (1977) noted a significant relationship between AVI with nonverbal I.Q. and reading achievement of .68 and .56 respectively. However, studies by Ford (1967), Jorgensen and Hyde (1974), and Kahn and Birch (1967) found no significant correlation between AVI ability and I.Q. It must be noted, however, that the same I.Q. measure was not used for the above studies. This could explain differences in findings.

	AUDITORY TAP PATTERNS	VISUAL STIMULI		
		EXAMPLES		
A	• •	••	• •	•••
B	• ••	•••	• ••	•• •
C	•• •	•••	• ••	•• •
		TEST ITEMS		
1	•• ••	• •••	• •• •	•• ••
2	• •••	••••	• •••	••• •
3	••• ••	•••••	•• •••	••• ••
4	• •• •	• •• •	•••••	•• ••
5	••• •• •	••• •• •	•• ••• •	• ••• ••
6	•• •••	••• ••	•• •••	•••• •
7	•• •• ••	•• •• ••	•••• ••	••• • ••
8	••• ••• •	•• ••• ••	••• •• ••	••• ••• •
9	•• • •••	•• •• ••	•• • •••	•• ••• •
10	• ••• ••	• •• •••	• ••• ••	•• • •••

Figure 1. Auditory and visual test stimuli. Large and small spaces represent approximate time intervals of 1 sec. and 0.5 sec., respectively. Correct choices were not underlined on the test forms.

Reliability

Kahn and Birch (1967), using a modified extension of the Birch and Belmont (1964) procedure, when 20 items were employed as opposed to the original 10, obtained a test-retest reliability after 10 days of .76 and .90 for third and fifth grade boys respectively. Becker and Sabatino (1971) obtained test-retest reliability coefficients ranging from .34 to .92 for ages 5 through 8. Rae (1977) obtained a coefficient of .82, using the Kuder-Richardson formula 20, for ages 9 and 10.

Although the reliability coefficients of .8 or above meet psychometric acceptability (Magnusson, 1967), the inconsistency of the findings give cause for concern. As with other discrepant findings (e.g. between AVI and reading), one must examine the experimental designs. Weaknesses that have been noted in methodological design and instrumentation are as follows:

(a) different versions of the Birch and Belmont test have been used, some administered individually, others in groups (Rae, 1977; Reilly, 1971; Rudnick, Sterritt & Flax, 1967);

(b) low ceiling effect resulting from too few and and too easy items (Birch & Belmont, 1965; Klapper & Birch, 1971);

(c) low reliability with the small number of items used (6 to 10 items) (Beery, 1967; Birch & Belmont, 1965; Rudnick et al., 1964; Sterritt & Rudnick, 1967).

It can be seen, therefore, that this lack of rigorous empiricism is partially due to non-standardized instrumentation and haphazard methodological procedures. Future researchers need to isolate the variables of investigation, and maintain consistency in their methods of examination.

Auditory-Visual Temporal-Spatial Integration

The original Birch and Belmont (1964) procedure has come under a great deal of scrutiny and has been challenged on the grounds that no consideration was given to the subject's intramodal ability. For example, is poor performance on an AVI task due to an impairment in integrative abilities or to an inability to discriminate the relevant stimulus in either of the modalities concerned? Sterritt and Rudnick (1966) first made this distinction and also commented that the AVI task may be nothing more than a test of temporal-spatial integration. Thus, it may have no relevance to the modalities of audition or vision.

In using these nine combinations, Rudnick et al. (1972) and Sterritt et al. (1971) noted the visual spatial matching (VS-VS) to be the least difficult, the combined visual spatial and temporal matchings (VS-A, A-VS, VS-VT, VT-VS) to be moderately difficult, and the purely temporal matchings (AT-VT, VT-AT,VT-VT, A-A) to be the most difficult. These findings indicate the contention of the above authors that differences on the AVI were due to the temporal-spatial dimension rather than to the modalities of vision and audition. Further support of the above was noted by Goodnow (1971), Jarman (1977b), Klapper and Birch (1971), and Muehl and Kremenak (1966).

R-I And Crossmodal Processing

R-I and Reading

It has been suggested that impulsive children as operationalized by the MFFT have deficits in reading when compared to their reflective counterparts (Butler, 1972; Davey, 1971; Hood & Kendall, 1974; Kagan, 1965b; Margolis, 1976; Readence, 1977; Shapiro, 1976; Stennet & Smythe, 1972). In Kagan's (1965b) study, a card with five words was shown to the child, and his task was to point to the one word that was read out by the examiner. Even when verbal ability was held constant, results clearly showed that implusive children had more reading recognition errors. Shapiro (1976) administered the Gates-MacGinitie Readiness Skills Test along with the MFFT to his 67 first grade subjects, and noted that with chronological age and intelligence held constant, the reflectives performed significantly better on six of the eight subtests. Davey (1971) used 38 fourth grade boys and divided them into an analytic and non-analytic response style which Kagan et al. (1964) found to be closely associated with the R-I dimension. Davey's results indicated that the non-analytic under-achievers were more unsuccessful and inefficient in their cue selection and hypothesis testing strategies. Butler's (1972) study involved 30 second grade boys. Their results were relatively similar, with the reflectives correcting a greater number of their miscues than the impulsives. Hood and Kendall (1974) and Readence (1977) noted results similar to the above. Readence's multivariate analysis indicated that differences for the two response styles were due to their use of graphic and sound cues.

The above findings indicate a consistent pattern of poorer performance in reading by the impulsive responders. As suggested earlier, a possible avenue for further investigation would be to examine impulsives' perceptual organizational abilities.

R-I And Auditory-Visual Integration

Studies investigating the relationship between the dimension of reflection-impulsivity and AVI are very sparse. One such study was by Margolis (1976). He attempted to ascertain the relationship between AVI, reading readiness, and conceptual tempo, using a sample of 82 middleclass kindergarten children. By employing a modified version of the Birch and Belmont (1964) procedure, the Metropolitian Total Readiness, the Weschler Preschool and Primary Scale of Intelligence (WPPSI), and the MFFT, he noted the following results:

(a) no significant main effect;

(b) impulsives performed significantly more poorly on the AVI ($p < .01$) and readiness ($p < .05$);

(c) the impulsives were significantly faster in response time than the reflectives on the MFFT and were significantly faster in response time than the reflectives on AVI ($p < .01$); and

(d) no significant difference was found between tempo groups and WPPSI verbal I.Q. or sex ($p < .05$).

Although the Margolis (1976) study was one of the first to incorporate the variable of reflection-impulsivity in assessing AVI ability, the results were confounded because the sample used was inappropriate.

Kagan et al. (1964) has cautioned against the use of subjects below the age of five or six years old, since there appears to be no correlation between response time and errors for this age group. The results were further confounded by using the Birch and Belmont procedure (Rudnick et al., 1972; Sterritt et al., 1971).

Summary

Studies that have employed the Birch and Belmont (1964) procedure as a means of investigating AVI abilities, have noted that deficiencies in integrative ability have been associated with poor reading (Birch & Belmont, 1964, 1965; Beery, 1967; Kahn & Birch, 1967; Sterritt & Rudnick, 1966). The relationship between AVI and intelligence is ambiguous, possibly because the same I.Q. measure was not used in all the studies. However, Birch and Belmont (1964), Rae (1977), and Sterritt and Rudnick (1966) noted a significant relationship between these two variables, while Ford (1967), Jorgensen and Hyde (1974), and Kahn and Birch (1968) did not.

The Birch and Belmont (1964) procedure, however, has been criticized on the grounds of its inability to assess intramodal impairment. Sterritt and Rudnick (1966) argued that the child may not be deficient in his ability to integrate stimuli, but may be unable to discern the relevant stimulus in a performance task due to a deficient modality. They further suggest that an AVI task may be nothing more than a test of temporal-spatial integration. In light of this, tasks involving nine combinations of auditory-visual and temporal-spatial were employed. By employing these combinations, it could be ascertained whether deficiencies in reading impairment were due to an intra or intermodal integration of auditory-temporal, visual-temporal or visual-spatial information. Studies by Rudnick et al. (1972) and Sterritt et al. (1971), noted that the visual spatial matching was the easiest, the combined visual and temporal matchings to be of moderate difficulty, and the purely temporal matchings to be the most difficult.

By noting the difficulty levels of the 9 AVI tasks, one may infer the types of skills (i.e. auditory-temporal, visual-temporal or visual-spatial integration tasks) which contribute to reading difficulties for impulsive children. Since the purely temporal matching tasks (AT-VT, VT-AT, VT-VT, A-A) were noted to have the highest difficulty level, one may speculate that such tasks may be the source of reading difficulties for impulsive children.

Some studies investigating the relationship between the dimension of R-I and reading, noted that impulsive children were deficient in reading performance when compared to their reflective counterparts (Butler, 1972; Davey, 1971; Hood & Kendall, 1974; Kagan, 1965b; Margolis, 1976; Readence, 1976; Shapiro, 1976). When the relationship between the dimension of R-I and AVI was assessed, Margolis (1976) noted that impulsive children performed significantly poorer in integrating aural and visual stimuli. It should be noted, however, that Margolis's results may have been confounded by the sample group and the AVI instrument used (see Kagan et al., 1964; Rudnick et al., 1972; Sterritt et al., 1971).

The literature on intersensory integration indicates that poor performance on AVI tasks is significantly correlated with reading impairment (Birch & Belmont, 1964, 1965; Beery, 1967; Kahn & Birch, 1967; Sterritt & Rudnick, 1966). A task analysis on the 9 AVI tasks (see pp. 3-4 in text) indicates that adequate performances on auditory-visual temporal-spatial tasks appear to resemble those skills required in reading (Birch & Belmont, 1964; Beery, 1967; Muehl & Kremenak, 1966; Rudnick et al., 1972; Sterritt et al., 1971; Strang, 1968). By employing these 9 AVI tasks then, we may be able to dilenate the perceptual mechanisms of impulsive children in order to account for their reading deficiencies.

CHAPTER III

METHOD

Subjects

The subjects were 100 boys and girls (males=51, females=49) in grade 4 from the Delta school system. They ranged in age from 8.6 to 10.9 years ($\bar{X}$=9.414, SD=.514). These subjects were taken from a larger group (144 subjects) that comprised the sample for the Marshall (1979) study.[5] These 100 subjects were selected on the basis of their availability. The subjects from the Marshall group were selected from a population of approximately 550. Students having emotional or uncorrected visual or auditory deficits were not considered.

The final selection of 144 subjects from the Marshall group was based on their reading ability. The Gates-MacGinitie Reading Test and the Canadian Lorg-Thorndike Intelligence Test (CLT) were used as selection instruments. One group of 72 boys and one group of 72 girls were selected to represent able and disabled readers. Able readers were considered to be reading at grade level or one year above according to the scores on the Gates-MacGinitie Reading Test. Disabled readers were considered to be those who were reading one year or more below grade level according to scores on the Gates-MacGinitie Reading Test. Of the 72 boys, 36 were classified as abe readers and 36 as disabled readers. The 72 girls were

5 The 100 subjects used in this study were a subset of a larger group (144) used in the Marshall (1979) study. Marshall collected data on these subjects from the following instruments: Gates-MacGinitie Reading Test (level C, form 2), Canadian Lorge-Thorndike Intelligence Test (nonverbal battery), and the 9 AVI tasks. Since the experimental design of this study necessitates a measure of reading ability and intelligence in addition to the MFFT and AVI tasks, it was decided to use the data made available by Marshall. For a complete description of subject selection, instrument administration and construction of the AVI tasks, the reader is referred to the Marshall study. A brief description, however, will be given here.

separated likewise. Scores from the CLT were used to match students on intelligence.

The rationale for using a reading and I.Q. measure (in this study), is to control for the effects that reading ability and intelligence may have on integration of AVI task performance. The literature suggests that better readers perform significantly better than poorer readers on AVI tasks (Birch & Belmont, 1964, 1965; Beery, 1967; Kahn & Birch, 1967; Sterritt & Rudnick, 1966). While the relationship between AVI and intelligence is ambiguous, some researchers have noted that children with low AVI scores also had lower mean I.Q. (Birch & Belmont, 1965; Rae, 1977; Sterritt & Rudnick, 1966) while other researchers did not (Ford, 1967; Jorgensen & Hyde, 1979; Kahn & Birch, 1967). From the conflicting results, it would be expedient to control for the possible effects that the I.Q. variable has on AVI performance. Additionally, gender and chronological age also appear to be variables effecting AVI performance. Studies by Reilly (1971,1972) and Jorgensen and Hyde (1974) noted that girls performed significantly better than boys on AVI tasks, and studies by Abravanel (1968) and Birch and Belmont (1965) noted that AVI performance increases with age.

From the discussion above, it seems necessary to control (by matching subjects on the above variables) or to statistically partial out the effects that reading ability, intelligence, sex, and chronological age might have on AVI performance. In this way, a less biased assessment can be made of AVI performance of reflective and impulsive children.

The final sample in this study included 93 subjects of whom 45 were girls and 48 were boys. Seven subjects whose scores placed them at the median of the double median split, were discarded.[6] Of the 93 subjects in this sample, 41 were classified as disabled readers (21 boys and 20 girls) and 52 as abled readers (27 boys and 25 girls). Further descriptive and performance statistics of the sample are presented in Tables 1 and 2.

Instruments

Gates-MacGinitie Reading Test - Level C, Form 2

This instrument measures reading achievement. The test is divided into three subtest: A)Speed and Accuracy, B)Vocabulary, and C)Comprehension. The Speed and Accuracy subtest contains 36 short paragraphs of relative difficulty. Each paragraph ends in a question or incomplete statement and is followed by four words,of which one is to be selected. Criterion is based upon number attempted minus number correct.

The Vocabulary subtest contains 50 items. A stimulus word is presented along with five alternates. The subject is to select the word that is similar in meaning to the stimulus.

The Comprehension subtest contains 21 passages with 52 questions. Each question is presented in a modified cloze technique, with five alternates to chose from.

For a review of the psychometric characteristics, the reader is referred to Buros (1972, pp.1080-1083).

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6 In performing a double median split, median scores form MFFT response error and response latency are used as the point of origin from which a horizontal and a vertical axis are constructed. This leads to the formation of four quadrants. Students whose score falls on the vertical or horizontal axis are discarded since they cannot be categorized as: fast/accurates, impulsives, slow/inaccurates or reflectives.

Table 1

Descriptive Statistics for the Characteristics and Performance Measures of the Sample

	Boys [a]			Girls [b]		
	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range
Age (mos)	104.34	4.05	26.3	104.06	3.70	13.10
Non-Verbal I.Q.	93.40	10.03	46.0	94.51	8.17	36.0
Reading (raw scores)						
Vocabulary	40.13	7.17	24.0	37.71	9.76	32.0
Comprehension	34.85	10.20	36.0	34.36	9.48	37.0
Total Reading	74.98	16.53	57.0	72.04	18.72	67.0

[a] n=48

[b] n=45

Table 2

Descriptive Statistics for the Characteristics and Performance

Measures for the Four Conceptual Tempo Groups

	Impulsives [a]			Fast Accurates [b]			Slow Inaccurates [c]			Reflectives [d]		
	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range
Age (mos)	103.96	4.80	26.3	105.27	2.75	9.14	103.42	3.52	10.80	104.31	3.36	13.10
Non-Verbal I.Q.	93.85	9.57	46.0	93.29	6.77	21.0	92.69	9.81	37.0	94.79	9.61	40.0
Reading (raw scores)												
Vocabulary	34.64	10.13	32.0	40.36	7.12	21.0	41.62	6.33	23.0	41.63	6.49	25.0
Comprehension	28.97	10.88	37.0	36.64	8.01	27.0	37.15	6.95	19.0	38.39	7.88	32.0
Total Reading	63.61	19.87	69.0	77.0	14.46	44.0	78.77	12.96	40.0	80.0	13.62	52.0

[a] *n*=33
[b] *n*=14
[c] *n*=13
[d] *n*=33

Canadian Lorge-Thorndike Intelligence Test (CLT) - Nonverbal Battery

The CLT are a series of tests designed to assess intelligence, and are comprised of a Verbal and Nonverbal Battery. Only the Nonverbal Battery was administered in this study. It is comprised of three subtests: A)pictorial classification, B)pictorial analogy, and C)numerical relationships. This battery yields an estimate of scholastic aptitude.

For a review of it's psychometric characteristics, refer to Buros (1972, p.637).

Auditory-Visual Integration Test

This task involves 9 combinations of auditory-visual and temporal-spatial patterns:

VS-VS	VT-VT	A-A
VS-VT	VT-VS	A-VS
VS-A	VT-AT	AT-VT

This test was constructed by Marshall (1979) according to the specifications set out by Jarman (1977a). The test contains 30 test items and 5 practice items for each task (see Appendix D).

Each of the 30 test items for every one of the 9 tasks was scored for correct choices, with no correction for guessing. During the 5 practice trials, the subjects were informed about the correctness of their choice.

The reliability of the 9 AVI tasks using internal consistency was .875 (Marshall, Note 1). When each task was taken separately, the reliability ranged from .56 to .82, with mean reliability coefficient of .68. These reliability data were derived from a sample of 144 grade 3 children.

The AVI tasks have three basic components: visual spatial (VS), auditory temporal (AT), and visual temporal (VT) elements. Each component was presented in two patterns, one in the initial or standard position and one in the final or comparison position. Each component was then presented three times as the standard and three times as the comparison.

The visual spatial stimulus pattern consisted of a series of dots ranging in number from three to seven. They were arranged in varying sized groups with short and long gaps between them (eg. ... ..). The standard and comparison pairs of stimuli had the same number of dots but varied only in arrangement (see Appendix D).

These visual-spatial dot patterns were prepared on two series of slides, one for the VS standard and one for the VS comparison. There was a 2 second gap between the presentation of the standard stimulus and the comparison stimulus. The slides were projected on a screen by an auto-focus Kodak 76 OH carousel projector. The subject's task was to state whether the comparison stimulus in the pair was the same or different to the standard stimulus (see Appendix E).

The auditory temporal stimulus pattern consisted of a series of beeps that were recorded on cassette tapes. They were similar in arrangement to the dot patterns with regard to standard and comparison conditions.

The tapes (auditory temporal) were orignally made by Jarman (1977) but modified for the Marshall (1979) study. The beeps were recorded on cassette tapes and played on a Wollensak 3M tape recorder.

The visual temporal stimulus patterns consisted of a series of flashes of light. They were similar in patterning to the visual spatial stimulus in both standard and comparison conditions. The beeps from the the auditory temporal patterns were used as the triggering mechanism to produce the visual temporal patterns of flashes of light. The flashes of light were produced from a small incandescent lamp. The subject's task in all 9 tasks was to state whether the comparison stimulus was the same or different in patterning to the standard.

Matching Familiar Figures Test - Form F

The MFFT is a nonstandarized match-to-sample task. It was constructed by Kagan and his associates (Kagan et al., 1964) to discern reflective and impulsive responding styles based upon tasks involving a high degree of response uncertainty. It is operationalized by response time to the first selection on each stimulus card and the number of errors.

This instrument is comprised of 12 items (10 test items and 2 practice items). The items are line drawings of familiar figures (see Appendix A). Each item contains one standard and six variants. The child is asked to select by pointing to the one variant that is identical to the standard.

Materials

The materials for the AVI tasks are:

(a) a Wollensak 3M tape recorder, model 2520

(b) a Kodak 76 OH carousel slide projector

(c) scoring sheets (see Appendix E)

(d) syn-cued projector and manual switching system used during the instructional phase of each matching session. (these were constructed at the U.B.C. Instructional Media Centre).

The materials for the MFFT administration are:

(a) stopwatch (Heurer trackmaster, model 8042) or one similar in calibration

(b) scoring sheets (see Appendix B).

Procedure

Marshall (1979) met with the teachers involved in his study. He gave them guidelines along with the administration manual for the Gates-MacGinitie Reading Test. The classroom teachers administered this test and scoring was double checked by Marshall. Marshall both administered and scored the Canadian Lorge-Thorndike Intelligence Test.

The 144 subjects in the Marshall study were separated (according to scores on the Gates-MacGinitie), into two reading groups, able and disabled readers. Each group consisted of 72 subjects, 36 girls and 36 boys. The 144 subjects were then matched on intelligence (based on CLT scores) and chronological age. Ex post facto analysis showed that groups did not differ significantly in I.Q. and chronological age.

Each child that participated in the study was then randomly assigned a number from one to nine. That number determined the order of presentation they would participate in according to the tables of complete sets of orthogonal Latin Squares (see Fisher & Yates, 1973, p.72). These tables gave an approximated counterbalanced order of presentations.

Each matching task administered by Marshall took about 20 minutes. Testing was carried out in isolated rooms with groups of one to six students. There were five testing sessions with each session (except the fifth) involving the administration of two matching tasks. The testing procedure involved introducing the AVI tasks to the participating students, giving them examples, and finally, adiministering the test items using a prepared script (see Marshall, 1979, pp.135-136). Testing was started in February and completed in early June of 1978.

Marshall (1979) forwarded the data collected on the Gates-MacGinitie Reading Test, CLT, and the 9 AVI tasks to this writer in October, 1978.

Schools paricipating in the Marshall study were contacted for permission to do a continuation study. Seven schools responded favourably. From these schools, 100 children were made available.

The MFFT was administered by this writer and one University of British Columbia student. The student was thoroughly trained in test administration by this examiner before testing of the actual subjects began.

The MFFT is an individually administered test requiring 10-20 minutes. Test administration was in accordance with those set out by Kagan (see Appendix C). The administration setting required two chairs and a small table (4' X 6')set in an isolated area. Testing began in early November and was completed by late November of 1978.

CHAPTER IV

RESULTS AND DISCUSSION

The concluding chapter is divided into three major parts: (1) results, 2) discussion, and 3) summary and implications for future research. The results section is further subdivided into two units—the first presenting a multiple regression analysis followed by a multivariate analysis of conceptual tempo. The multiple regression analysis was performed to control for the effects that reading ability, intelligence, sex, and chronological age may have exerted on task performance (i.e., 9 AVI tasks). This was done by statistically "partialling out" their effects in order to get a less biased assessment of AVI task performance for reflective and impulsive children. The multivariate analysis was performed to assess the significance of the findings. The second analysis consisted of a one way analysis of variance (ANOVA) on the Gates-MacGinitie Reading Test and a Pearson product-moment correlation between the dependent measures and the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test. Part two was a post-hoc analysis.

Results

Part One: Data Analysis and Evaluation of Hypothesis.

The focus of the present study was an attempt to discern what relationship (if any) existed between the dimension of reflection-impulsivity and modality matching. On which task(s) did impulsives perform more poorly than their reflective counterparts? The dependent measures used were comprised of the following intra and intermodal matching tasks: 1) auditory-auditory (A-A), 2) auditory visual-spatial (A-VS), 3) visual-spatial auditory (VS-A), 4) visual-temporal visual-temporal (VT-VT), 5) visual-spatial visual-temporal (VS-VT), 6) visual-temporal visual-spatial (VT-VS), 7) auditory-temporal visual-temporal (AT-VT), 8) visual-temporal auditory-temporal (VT-AT), 9) visual-spatial visual-spatial (VS-VS). These tasks were considered to parallel the reading process (Marshall, 1979; Muehl & Kremenak, 1966; Rudnick et al., 1972; Sterritt et al., 1971). By noting the types of tasks (eg. visual-spatial, visual-temporal or auditory-temporal) that impulsives performed more poorly than reflectives, one might get an indication of the types of tasks that lead to reading difficulties for impulsive children.

The multiple regression analysis (see Appendix F) was computed using the 9 AVI tasks as dependent measures. The percentage of variance which was contributed by the subject variables was calculated for each dependent measure. It was found that the total variance so contributed by all subject variables to 9 AVI tasks was 13%. Results from the multiple regression analysis seemed to indicate that AVI task performance was not significantly affected by the reading ability, intelligence, sex or chronological age of the subjects involved in this study. The findings noted from the multiple regression analysis are not too surprising since Marshall (1979) controlled for the possible effects of these subject variables on AVI task performance by matching his subjects on each of these variable. That is, there were an equal number of subjects who were above and below the mean on reading ability, intelligence, and chronological age as well as an equal number of boys and girls who participated in Marshall's (1979) study. The multiple regression analysis was performed in this study because information about the subjects' background was not available to determine whether they had been completely matched on all the subject variables.

The reading measure used in this study (Gates-MacGinitie) yielded two sub-measures of reading - vocabulary and comprehension. Of all subject variables, it was found that the vocabulary variable affected AVI task performance the most (5%), so it was used as a covariate in a multivariate analysis of conceptual tempo. The gender of the subject or sex variable was used as a factor in a multivariate analysis of conceptual tempo to check for possible interaction effects. The multivariate analysis then, was a 2 (sex) x 4 (conceptual tempo) multivariate analysis, with vocabulary used as a covariate.

Table 3 presents the results of the 2 x 4 multivariate analysis. As indicated, the main effects for sex and conceptual tempo were insignificant ($p > .05$). In addition, there was no significant interaction effect. Results clearly indicated that the four tempo groups (reflectives, slow inaccurates, fast accurates, and impulsives) did not differentiate significantly on any of the 9 AVI tasks. The research hypothesis then, was not supported by this finding, that is, impulsives and reflectives did not appear to have any differences in their perceptual organization of complex visual stimuli.

Table 3

Multivariate Analysis of Conceptual Tempo

Source	F	df	Probability
Sex	1.158	1,84	.334
Conceptual Tempo	1.146	3,84	.290
SXCT	1.359	3,84	.119

MS within Adjusted for Covariate[a]

Variable[b]	Variance	Standard Deviation
1. A-A	14.693	3.833
2. A-VT	19.455	4.411
3. A-VS	17.717	4.210
4. VT-A	16.284	4.035
5. VT-VT	14.338	3.787
6. VT-VS	15.528	3.941
7. VS-A	14.876	3.857
8. VS-VT	11.134	3.337
9. VS-VS	5.025	2.242

[a] *df* = 84

[b] A-A auditory-auditory
A-VT auditory-visual temporal
A-VS auditory-visual spatial
VT-A visual temporal-auditory
VT-VT visual temporal-visual temporal
VT-VS visual temporal-visual spatial
VS-A visual spatial-auditory
VS-VT visual spatial-visual temporal
VS-VS visual spatial-visual spatial

Part Two: Post-hoc Analysis

In order to verify the results obtained from the multivariate analysis, a one way ANOVA was performed on the Gates-MacGinite Reading Test. Results (Tables 4 and 5) indicate that of the four tempo groups, the reflectives performed significantly better than the impulsives ($p < .01$) on both measures of the Gates-MacGinitie (vocabulary and comprehension). The two other tempo groups, the fast accurates and slow inaccurates did not differentiate significantly in reading performance from the reflectives or impulsives. Nor were significant differences noted between the four tempo groups on non-verbal I.Q. and chronological age (see Tables 6 and 7).

A Pearson product-moment correlation was then computed to determine what relationship existed between AVI and reading. Results (presented in Appendix G) indicate that a significant relationship ($p < .01$) existed between the two sub-measures of the Gates-MacGinitie Reading Test (vocabulary and comprehension) and 8 of the 9 AVI tasks. This seems to indicate that reading and AVI tasks are measuring something similar, possibly reading ability. The visual-spatial visual-spatial (VS-VS) task did not correlate significantly with the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test. The VS-VS is an intramodal integration task requiring a subject to discriminate between different graphic symbols. Judging from the subjects' raw scores, which indicated very few errors on the VS-VS task, discriminating graphic symbols did not seem to be difficult task for these subjects. That is, these subjects seemed to have already mastered the skill of discriminating between

Table 4

Analysis of Variance Summary for Conceptual Tempo on the Vocabulary Subtest of the Gates-MacGinitie Reading Test

Source	df	SS	MS	F	P
Conceptual Tempo					
between	3	972.226	324.079	4.998	0.003
within	89	5771.477	64.849		
total	92	6743.742			

Table 5

Analysis of Variance Summary for Conceptual Tempo on the Comprehension Subtest of the Gates-MacGinitie Reading Test

Source	df	SS	MS	F	P
Conceptual Tempo					
between	3	1664.313	544.770	6.871	0.000
within	89	7185.652	80.738		
total	92	8849.965			

Note. Scheffe's test indicated that significant differences existed only between reflectives and impulsives and not for the other two groups (fast accurates and slow inaccurates) on the Vocabulary and Comprehension subtests of the Gates-MacGinitie Reading Test.

Table 6

Analysis of Variance Summary for Conceptual Tempo on the Non-Verbal I.Q. Measure

Source	df	SS	MS	F	P
Conceptual Tempo					
between	3	50.230	16.743	0.195	0.899
within	89	7635.293	85.790		
total	92	7685.523			

Table 7

Analysis of Variance Summary for Conceptual Tempo on Chronological Age

Source	df	SS	MS	F	P
Conceptual Tempo					
between	3	26.473	8.824	0.584	0.627
within	89	1345.097	15.113		
total	92	1371.570			

graphic symbols (as based upon low error scores on VS-VS task). The discrimination of graphic symbols (VS-VS) is a basic skill necessary only for beginning reading (Birch & Belmont, 1964; Muehl & Kremenak, 1966; Strang, 1968). It seemed this skill no longer played an important role for these subjects in the reading process. The relative simplicity of the VS-VS task was also noted by Marshall (1979), Rudnick et al. (1972), and Sterritt et al. (1971).

A summary of the results indicate the following: 1) the variables of sex and conceptual tempo did not significantly affect performance on any of the 9 audio-visual integration tasks. Nor was there a significant interaction among these variables; 2) reflective subjects scored significantly better than impulsives on the vocabulary and comprehension subtests of the Gates-MacGinitie Reading Test; 3) significant correlations were found to exist between vocabulary and comprehension on 8 of the 9 audio-visual integration tasks.

Discussion

Research findings have implicated the dimension of reflection-impulsivity in a variety of "learning problems". Impulsives have been noted to perform more poorly than reflectives in reading (Butler, 1972; Davey, 1971; Hood & Kendall, 1974; Readence, 1976; Shapiro, 1976), in math (Cathcart & Liedthke, 1969), and in scanning and decoding of graphic symbols (Kilburg et al., 1973; Nelson, 1969; Siegel et al., 1973; Siegelman, 1969). Impulsives were also noted to manifest behaviours characteristic of hyperactivity, have attentional deficits, emotional problems and an assortment of other problems that hinder learning (see Epstein et al., 1975).

When scanning strategies were analysed, it was noted that impulsives ignored two and one-half times as many alternatives on the MFFT than reflectives (Drake, 1970; Siegelman, 1969). They also devoted proportionately more time looking at alternatives observed most and their final selection. When scanning strategies were taught (McLauchlan, 1976; Siegel et al., 1973; Zelniker et al., 1972) along with modelling and self-verbalization techniques (Meichanbaum & Goodman, 1971), it was noted that task performance improved rapidly. Considering that a variety of factors (eg. perceptual organization, anxiety, attention, scanning strategies, etc.) may have been factors contributing to reading impairment, this study only focused on the factor of perceptual organization.

The current research then, began with the proposal that deficits in reading ability of impulsive children might be traced to inadequate perceptual organization of complex visual stimuli. To test this, nine combinations of auditory-visual temporal-spatial sensory integration tasks were used, since they were considered to parallel the reading process (Marshall, 1979; Meuhl & Kremenak, 1966; Rudnick et al., 1972; Sterritt et al., 1971). Research on reading and AVI have noted that better readers perform significantly better than poorer readers on AVI tasks (Birch & Belmont, 1964, 1965; Beery, 1967; Marshall, 1979; Sterritt & Rudnick, 1966). They noted that the visual spatial matchings to be the least difficult; the combined visual spatial and and temporal matchings (VS-A, A-VS, VS-VT, VT-VS) to be moderately difficult. The visual spatial and temporal matchings are tasks requiring the child to identify sounds made by different graphic symbols (A-VS) and its converse procedure (VS-A). Additionally, the temporal matching tasks require the visual recognition of graphic symbols while moving along a line of print (VS-VT) and its converse procedure (VT-VS). Studies by Byrden (1972), Marshall (1979), Rudnick et al. (1972) and Sterritt et al. (1971) noted that the tempral matchings (AT-VT, VT-AT, VT-VT, A-A) seem to be the most difficult. These latter tasks require associating the auditory patterns in speech to the appropriate graphic symbols in print (which are spatially organized) as one is moving along a line of print (AT-VT), and its converse procedure (VT-AT). The VT-VT is simply a task which requires moving along a line of print.

From the above discussion, one could speculate that the temporal matchings (AT-VT, VT-AT, VT-VT, A-A) would be the tasks which best differentiate good and poor readers, while the combined visual spatial and temporal matchings (VS-A, A-VS, VS-VT, VT-VT) would be tasks which probably differentiate good and poor readers the least (except for the VS-VS task).

Results from the multivariate analysis indicated that the four tempo groups did not differentiate on any of the 9 AVI tasks. Since AVI tasks are supposed to differentiate good and poor readers (Marshall, 1979, Rudnick et al., Sterritt et al., 1971) results from the above analysis indicates the 4 tempo groups did not differentiate in reading ability. A post-hoc analysis, however, indicated that reflectives performed significantly better than impulsives on the vocabulary and comprehension subtests of the

Gates-MacGinitie Reading Test. One possible explanation for discrepant findings noted above is that the Gates-MacGinitie and the AVI tasks may be measuring different skills. A Pearson product-moment correlation, however, indicated that the vocabulary and comprehension subtests of the Gates-MacGinitie and 8 of the 9 AVI tasks were significantly related.

Results from the above analyses then, seem to indicate the following: 1) Gates-MacGinitie Reading Test and AVI tasks are significantly related and 2) reflective and impulsives differentiated on the Gates-MacGinitie but not on the AVI tasks. As noted earlier, AVI task performance differentiated good and poor readers (Birch & Belmont, 1964, 1965; Beery, 1967; Kahn & Birch, 1967; Marshall, 1979; Sterritt & Rudnick, 1966).

Similarly, the R-I dimension differentiated good and poor readers (Butler, 1972; Davey, 1971; Hood & Kendall, 1974; Kagan, 1965b; Readence, 1976; Shapiro, 1976).

Since these results indicate that AVI tasks and the R-I dimension can both differentiate good and poor readers but do not seem to be related to one another, (i.e. there was no differentiation of reflectives or impulsives on any AVI tasks), the following explanations can be put forth: 1) AVI tasks are related to reading, 2) the R-I dimension is related to reading, but, 3) there appears to be no relationship between performance on AVI tasks and performance on the MFFT.

The R-I dimension and the AVI tasks both possess skills that are similar to those required in reading, but they do seem to possess skills common with each other. If the AVI tasks are assessing the perceptual organization mechanisms that are involved in the process of reading, then the results from this study indicate that reading deficiencies in impulsive children are not based in their perceptual organization of complex visual stimuli. If the AVI tasks are not assessing perceptual organization mechanisms involved in the process of reading, deficiencies in impulsive children may be due to their deficiencies in perceptual organization of complex visual stimuli. The latter interpretation seems possible based on the assumption that even though AVI tasks differentiate good and poor readers, these tasks may do so on factors other than perceptual organization. If the basis of the above interpretation is correct, then it is difficult to speculate what the nature of the AVI tasks are, that is, what they are actually assessing.

If AVI tasks are assessing perceptual organization, then reading deficiencies in impulsive children may be due to factors other than perceptual organization of complex visual stimuli. While there may be many such factors (eg. motivation, memory, anxiety, etc.), one factor worth investigating is attention. The literature on scanning strategies has noted that impulsives ignored two and one-half times as many alternates on the MFFT than reflectives (Drake, 1970; Sigelman, 1969). Epstein et al. (1975) attribute the inefficient scanning strategies of impulsive children noted by Drake (1970) and Sigelman (1969) to impulsives' inability to sustain attention. Zelniker et al. (1972) found support for this hypothesis by nothing that when impulsives were given longer time to respond to a task, their performance decreased. Zelniker et al. (1972) in a further study, measured visual scanning strategies on the MFFT using a video-tape recorder. They noted that reflectives had a significantly higher frequency and duration of observation. Zelniker et al. (1972) concluded that "...the inability to sustain attention is one of a number of behaviors that would be appropriate in a denotative definition of impulsivity" (p.335).

Investigating attentional deficits in impulsive children as one source of variation effecting reading performance may be a possible avenue of future research in exploring reading problems.

Summary and Implications for Future Research

This study attempted to assess whether deficiencies in reading ability of impulsive children might be traced to inadequate perceptual organization of complex visual stimuli. The rationale was derived from the literature on scanning strategies. It was noted that impulsive children were inefficient in scanning and decoding of graphic symbols (Kilburg & Siegel, 1973; Nelson, 1969; Siegel, Keiasic & Kilburg, 1973; Sigelman, 1969). It was hypothesized that the inefficient scanning strategies employed by impulsive children on complex visual stimuli might be factors which contributed to their reading deficiencies (Butler, 1972; Davey, 1972; Hood & Kendall, 1974; Readence, 1976; Shapiro, 1976). To test this, nine combinations of auditory-visual temporal-spatial integration tasks were employed. These 9 tasks were devised by Jarman (1977) and constructed by Marshall (1979). The 9 AVI tasks were thought to parallel the process of reading (Beery, 1967; Marshall, 1979; Muehl & Kremenak, 1966; Rudnick et al., 1972; Sterritt et al., 1971) and as such, they were assumed to assess the perceptual mechanisms entailed in reading. In this way, we might be able to trace differences in reading performance of reflective and impulsive children to their differences in perceptual organization of complex visual stimuli.

Results from the multivariate analysis of conceptual tempo indicated no significant main effect. That is, the four tempo groups (reflectives, slow accurates, fast accurates, and impulsives) did not differentiate significantly on any of the 9 AVI tasks. That is, deficiencies in reading performance of impulsive children could not be traced to their perceptual organization of complex visual stimuli as operationalized by the 9 AVI tasks. An alternative possibility is that if the 9 AVI tasks were not assessing perceptual organization of complex visual stimuli, then researchers may wish to pursue the perceptual organization hypothesis using other sets of tasks which purport to assess perceptual organization.

If the 9 AVI tasks were assessing the perceptual organization of complex visual stimuli as related to the reading process, then factor(s) other than perceptual organization need to be considered in explaining deficiencies in reading performance of impulsive children. One such factor might be attentional deficits. A review by Epstein et al. (1975) cites studies (eg. Drake, 1970; Sigelman, 1969; Zelniker et al., 1972) which lend support to the notion that attentional deficits in impulsive children may be sources of variation effecting task performance. Further investigation exploring the attentional deficits hypothesis may be fruitful.

The results from the multivariate analysis of conceptual tempo seem surprising in view of the fact that performance on the MFFT and performance on the AVI tasks can both differentiate good and poor readers, but reflectives and impulsives did not differentiate on any of the 9 AVI tasks. This seems to indicate that the AVI tasks and the MFFT are both related to reading in some manner, but there seems to be no relationship between them. It would seem more expedient for researchers then, to use the MFFT as opposed to the 9 AVI tasks if they wished to differentiate good and poor readers. This could save them an invaluable amount of time since the MFFT takes about 15 minutes to administer in comparison to 4 hours for the 9 AVI tasks. However, if diagnostic information were required about sources of reading difficulties (i.e. inadequate integration of auditory-temporal, visual-temporal or visual-spatial tasks), then the 9 AVI tasks may be more suitable. It is assumed here that information received from AVI task performance is infact diagnostic and not just spurious information.

Finally, researchers may wish to employ a more reliable form of the MFFT. The low reliability of the MFFT, although not investigated in this study, is of concern to this writer. It is the opinion of this writer that future researchers consider employing a more reliable form of the MFFT. The current MFFT used (form F) has a test-retest reliability of .52 (Ault et al., 1976; Egeland & Weinberg, 1976). More recently, Cairns and Cammock (1978) have developed a more reliable form of the MFFT. This instrument contains 20 items, with a two week split-half reliability of .91 for latency and .89 for errors. A test-retest reliability over a five week period yielded a coefficient of .85 for latency and .77 for errors. Using such an instrument would make the dicotomization of subjects into reflectives and impulsives more reliable.

In summary, the relationship between the R-I dimension and AVI needs to be investigated further. By dilenating the above relationship we may be able to make some comment regarding the validity of the perceptual organization hypothesis. In this way, we will be one step closer in knowing the factor(s) contributing or not contributing to reading deficiencies in impulsive children.

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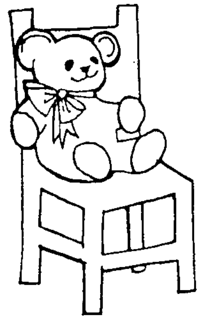
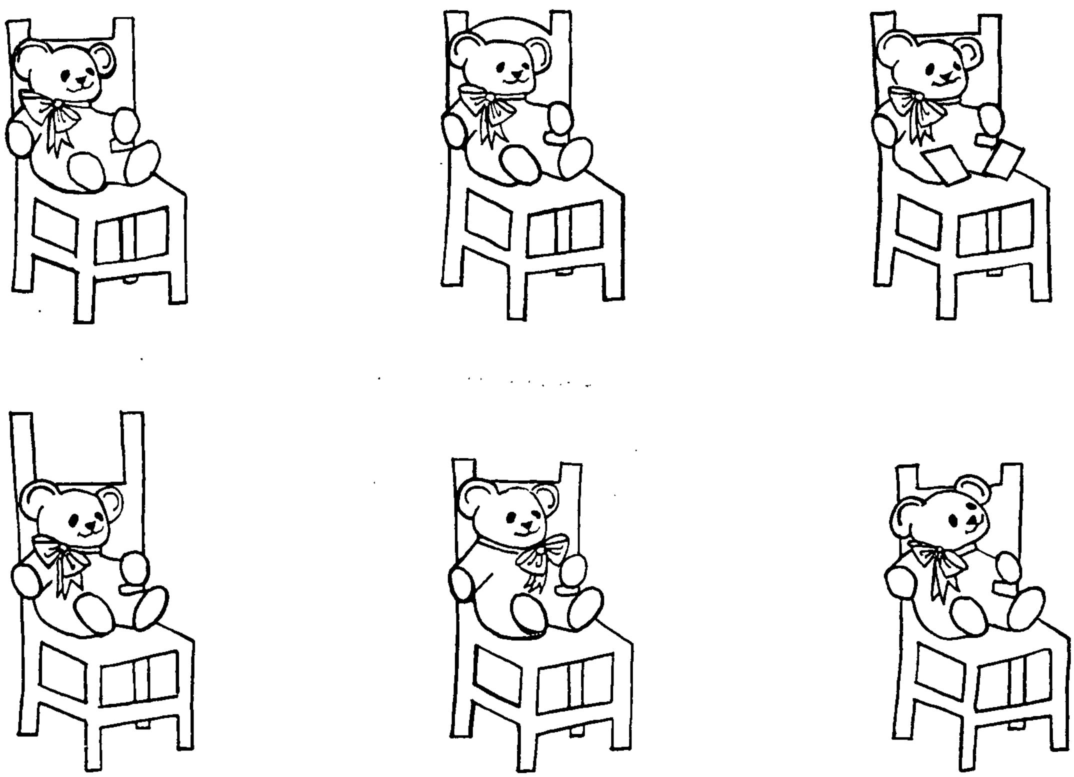
APPENDIX A

Sample item from MFFT

APPENDIX A





APPENDIX B

Scoring sheet for MFFT

MATCHING FAMILIAR FIGURES TEST

Examiner:____________________ Examinee:__________________________

Sex: M________ F ____________ School:___________ Grade:____________

	Year	Month	Day
Date of Test:	______	______	______
Birthday:	______	______	______
Age:	______	______	______

Item:

1)House (1) Time:____ Choice:1)____2)____3)____4)____5)____6)____

2)Scissor (2) Time:____ Choice:1)____2)____3)____4)____5)____6)____

3)Phone (3) Time:____ Choice:1)____2)____3)____4)____5)____6)____

4)Bear (4) Time:____ Choice:1)____2)____3)____4)____5)____6)____

5)Tree (2) Time:____ Choice:1)____2)____3)____4)____5)____6)____

6)Leaf (6) Time:____ Choice:1)____2)____3)____4)____5)____6)____

7)Cat (3) Time:_____Choice:1)____2)____3)____4)____5)____6)____

8)Dress (5) Time:____Choice:1)____2)____3)____4)____5)____6)____

9)Giraffe (4) Time:____Choice:1)____2)____3)____4)____5)____6)____

10)Lamp (5) Time:_____ Choice:1)____2)____3)____4)____5)____6)____

11)Boat (2) Time:____ Choice:1)____2)____3)____4)____5)____6)____

12)Cowboy (4) Time:____Choice:1)____2)____3)____4)____5)____6)____

Total Time:_________ Total Correct:_______ Total Error:_______

APPENDIX C

Directions for administering

the MFFT

APPENDIX C

DIRECTIONS FOR MATCHING FAMILIAR FIGURES

"I am going to show you a picture of something you know and then some pictures that look like it. You will have to point to the picture on this bottom page (point) that is just like the one on this top page (point). Let's do some for practice." E shows practice items and helps the child to find the correct answer. "Now we are going to do some that are a little bit harder. You will see a picture on top and six pictures on the bottom. Find the one that is just like the one on top and point to it."

E will record latency to first response to the half-second, total number of errors for each item and the order in which the errors are made. If S is correct, E will praise. If wrong, E will say, "No, that is not the right one. Find the one that is just like this one (point)." Continue to code responses (not times) until child makes a maximum of six errors or gets the item correct. If incorrect, E will show the right answer.

It is necessary to have a stand to place the test booklet on so that both the stimulus and the alternatives are clearly visible to the S at the same time. The two pages should be practically at right angles to one another.
Note: It is desirable to enclose each page in clear plastic in order to keep the pages clean.

APPENDIX D

Matching task stimulus patterns

in AVI tasks

APPENDIX D

ITEM NUMBER	STIMULUS	COMPARISON	SAME (S)/ DIFFERENT (D)
EXAMPLES			
1	●●●	●●●	S
2	●●●	● ●●	D
3	●● ●	● ●●	D
4	● ● ●	● ● ●	S
5	● ● ●	● ●●	D
TEST ITEMS			
6	●●●●	●●●●	S
7	●●●●	● ●●●	D
8	● ●●●	●● ●●	D
9	●●● ●	●●● ●	S
10	● ● ●●	● ●● ●	D
11	● ●● ●	● ●● ●	S
12	●● ● ●	●● ● ●	S
13	● ● ●●	● ● ● ●	D
14	● ●●●●	● ●●●●	S
15	●● ●●●	●● ●●●	S
	REST	REST	
16	● ●●●●	● ●●● ●	D
17	●●● ●●	●●●● ●	D
18	●● ●● ●	●● ●● ●	S
19	● ● ● ●●	● ● ●● ●	D
20	● ●● ● ●	● ●● ● ●	S

ITEM NUMBER	STIMULUS	COMPARISON	SAME (S)/ DIFFERENT(D)
21	●● ● ● ●	● ●● ● ●	D
22	●● ●●●●	●●● ●●●	D
23	●●●● ● ●	●●●● ● ●	S
24	● ●● ●●●	● ●●● ●●	D
25	●● ● ●●●	●● ●● ●●	D
	REST	REST	
26	● ● ● ●●●	● ● ●● ●●	D
27	●● ● ● ●●	●● ● ●● ●	D
28	● ● ●● ● ●	● ●● ● ● ●	D
29	●● ● ● ● ●	●● ● ● ● ●	S
30	●●●● ●●●	●●●● ●●●	S
31	●●● ●● ●●	●●● ●●● ●	D
32	● ●●●● ●●	●● ●●● ●●	D
33	● ●●● ● ●●	● ●● ●● ●●	D
34	●● ● ●● ● ●	● ●● ●● ● ●	D
35	● ● ●● ● ● ●	● ● ●● ● ● ●	S

APPENDIX E

Scoring sheet for AVI matching

task stimulus patterns

APPENDIX E

Name: ____________________

1. same different ....
2. same different ....
3. same different ....
4. same different ....
5. same different ....
6. same different ....
7. same different ....
8. same different ....
9. same different ....
10. same different ....
11. same different ....
12. same different ....
13. same different ....
14. same different ....
15. same different ....

REST

16. same different ....
17. same different ....
18. same different ....
19. same different ....
20. same different ....
21. same different ....
22. same different ....
23. same different ....
24. same different ....
25. same different ....

REST

26. same different ....

.

.

.

35. same different ....

APPENDIX F

Multiple Regression

Analysis

APPENDIX F

The Amount of Variance Accounted for by Subject Variables

for each Dependent Measure

Dependent Measures	Subject Variables					
	Sex	I.Q.	Vocabulary	Comprehension	Chronological Age	Total
1. A-A			.0940			.0940
2. A-VT	.0459	.0293	.0867			.1618
3. A-VS				.1132		.1132
4. VT-A			.1278		.0241	.1519
5. VT-VT	.0726			.1511		.2237
6. VT-VS		.0444		.1541		.1985
7. VS-A			.1039			.1039
8. VS-VT	.0309	.0305	.0861			.1475
9. VS-VS		.0319				.0319
Total	.1494	.1361	.4985	.4184	.0241	1.2264
Percentage	.016	.015	.05	.04	.0026	.13

APPENDIX G

Intercorrelation of AVI Tasks and Reading Measures

APPENDIX G

Intercorrelations of AVI Tasks and Reading Measures[a]

	1	2	3	4	5	6	7	8	9	10	11
1. A-A	-	.553**	.610**	.568**	.612**	.605**	.485**	.625**	.430**	-.307**	-.283*
2. A-VT		-	.620**	.668**	.601**	.434**	.446**	.416**	.413**	-.295*	-2.68*
3. A-VS			-	.587**	.501**	.561**	.547**	.480**	.268*	-.317**	-.337**
4. VT-A				-	.580**	.476**	.418**	.353**	.354**	-.358**	-.355**
5. VT-VT					-	.515**	.480**	.487**	.383**	-.354**	-.389**
6. VT-VS						-	.597**	.539**	.355**	-.359**	-.393**
7. VS-A							-	.443**	.517**	-.322**	-.314**
8. VS-VT								-	.424**	-.294*	-.278*
9. VS-VS									-	-.105	-.130
10. Vocabulary										-	.834**
11. Comprehension											-

[a] n=93   * $p < .05$ ** $p < .001$