# DIFFERENCES ASSOCIATED WITH CONCEPTUAL TEMPO ON ACADEMIC ACHIEVEMENT, IQ, AND INTERNAL-EXTERNAL CONTROL MEASURES

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ABSTRACT

DIFFERENCES ASSOCIATED WITH CONCEPTUAL TEMPO ON ACADEMIC ACHIEVEMENT, IQ, AND INTERNAL-EXTERNAL CONTROL MEASURES

By

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Research findings suggest that conceptual tempo is highly associated with academic success. Conceptual tempo refers to the disposition of an individual as related to response time and accuracy in making a choice between two or more difficult alternatives. It has been described as a hypothesis testing process. The majority of past investigations concentrated only on the reflective (slow and accurate) and the impulsive (fast and inaccurate) dimensions of conceptual tempo while ignoring the other two dimensions--fast-accuracy and slow-inaccuracy. One objective of this study was to examine not only reflection and impulsivity but fast-accuracy and slow-inaccuracy as well.

Socioeconomic status (SES) is another variable that has been reported to be closely related to academic achievement. The purpose of this study was to examine differences amont the four dimensions

of conceptual tempo and also between high and low SES along measures of academic achievement, IQ, and internal-external control. The major hypotheses were (a) conceptual tempo is associated with measures of academic achievement, IQ, and internal-external control to the extent that reflectives and fast accurates will display higher mean scores on all measures and (b) SES is also related to academic achievement, IQ, and internal-external control measures to the degree that high SES Ss will demonstrate higher mean scores across all employed measures. Eight dependent variables were employed. Differences in performances on the Metropolitan Achievement Math Test (MAMT), the Minimal Performance Objective Reading Test (MPORT), an IQ test, teacher ratings, the Intellectual Achievement Responsibility Questionnaire, and the Sense of Control Scale were investigated. The Matching Familiar Figures Test was used to determine the conceptual tempo of subjects and the McGuire-White Scale provided a measure to classify subjects within SES levels. The subjects were 180 fourth grade children from seven different elementary schools in a midwestern city.

The results showed that high SES subjects had significantly higher mean scores on each dependent variable, thus indicating that SES was associated with the dependent measures as predicted. Within the two SES groups, conceptual tempo was shown to be strongly associated with academic achievement only among low SES children.

Although this was only to the extent that fast accurate youngsters were the high performers. There were no significant differences among the other three low SES groups. Overall, however, when disregarding SES reflectives and fast-accurate displayed higher performances on the dependent measures than impulsives and slow-inaccurates. Significant differences were found when reflectives and impulsives were compared on the MPORT and teacher rating, also significant differences were found between reflectives and slow-inaccurates on the MAMT. Fast accurates scored significantly higher on the MPORT, the MART, the MAMT, IQ, and teacher ratings than impulsives, and also performed significantly higher on the MART, the MAMT, IQ, and teacher ratings than slow-inaccurates. No significant differences between fast-accurate and reflectives nor between slow-inaccurate and impulsives were found. Also no significant differences on the internal-external measures of control were found that indicated any association with conceptual tempo.

In relation to academic achievement, the results indicated that of the two components (response time and accuracy) that make up conceptual tempo, the most important is accuracy. However, for the low SES child, speed as well as accuracy appears to be the most conducive in relation to school success. The results suggested that if there is continued future attempts to modify conceptual tempo, the concentration

should not be on response time but upon cognitive strategies that will improve the individual's accuracy.

# DIFFERENCES ASSOCIATED WITH CONCEPTUAL TEMPO ON ACADEMIC ACHIEVEMENT, IQ, AND INTERNAL-EXTERNAL CONTROL MEASURES

By

Henry Taylor Frierson, Jr.

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## DEDICATION

Dedicated to my loving wife Wendolyn and to those who offered me faith and spiritual support.

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Acknowledgement is presented to all of the beautiful children who acted as subjects in this study and also to a good Brother who provided me with the opportunity to collect the data, and finally to those who aided me during the data collection.

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# INTRODUCTION

The structure of this dissertation is a departure from the traditional format of five chapters (introduction, procedures, results, summary, and conclusion) that is common at Michigan State University. Instead, it will be in two sections plus the appendices. The first section is an extensive overall review of the literature. The objective is to provide the reader with a background pertaining to the central topic of the study. The second section is the study itself which is presented in American Psychological Association journal style. The aim of the second section is not only to demonstrate research and writing capabilities that would satisfy a major requirement for completing a doctoral program at Michigan State University, but also to provide the reader a study that can easily be read without expending a great deal of time in the procedure. The third section is the appendices which contain the proposal, a method section, the hypotheses, the tests of hypotheses, graphs, a more extensive results section, and the instruments used in the study. The appendices will serve to provide the reader with added information and materials that are not presented in sections one and two.

# SECTION I

# INTRODUCTION

Conceptual tempo is a cognitive style subset that appears to have widespread educational implications for all individuals. However, conceptual tempo is just one of several reported subsets of cognitive style. Although conceptual tempo is the focal point, other cognitive style subsets such as "constricted-flexible control," "conceptual versus perceptual-motor dominance," "strong versus weak automatization," analytical field approach, global approach, and selection strategies will also be discussed. The objective is to present at least a brief explanation and description of the other subordinates of cognitive style. Special attention will be paid to the concept of selection strategies which appear to be closely related to conceptual tempo. An extensive review of related research involving conceptual tempo is presented to emphasize the educational implications of conceptual tempo and to point out the possible relationship that it has with socioeconomic status. Also, a discussion of the rationale for the close examination of two dimensions of conceptual tempo that are largely ignored in studies in the area is presented.

## Definition of Cognitive Style

The contemporary definition of the cognitive style construct presented by Kagan, Moss, and Sigel (1963) was that cognitive style is a measure of the stability of individual preference in perceptually organizing and conceptually categorizing the external environment. In the same vein, Hervey (1966) stated that cognitive style is the mode in which an individual organizes his experiences and perceives and understands his environment. At this point the term cognitive style is used widely to refer to a variety of behavioral consistencies in the processing of information (Stanes, 1973).

## A Brief Historical Perspective of Cognitive Style

The construct of cognitive style has its roots in psychoanalytic theory under the rubric of cognitive control. The concept was first described as the distinctive manner by which individuals face reality (Klein, 1951). In the psychoanalytic theoretical structure, the emphasis was on the relationship between cognitive controls and ego defense mechanisms, and also mediations of perceptual processes along the cognitive control principle of "constricted-flexible control" (Kagan and Kogan, 1970). "Constricted-flexible control" refers to the capability of responding correctly in a task while

facing a field of conflicting cues (Klein, 1954). Naming the color word, for example, that is printed by a set of incongruent colored letters, such as the word "blue" printed in green letters. Flexibility is exhibited when the individual can successfully perform the task. If the individual, on the other hand, states the color word as being the same as the incongruent colored letters, then this characterizes the constricted mode.

Klein (1958) gave cognitive control the label of cognitive style. Cognitive Control or style as perceived by Gardner and others (1959) of ego psychology orientations, was defined as the presence of stabilized ego structures that integrate specific adaptive intentions with specific environmental situations. Kagan and Kogan, however, pointed out that the definition provided very little insight in examining individual differences in the functioning of cognitive controls because of the use of "intentions" as a variable. The term "intentions" had a very vague meaning, and therefore it was difficult to employ the ego psychology definition of cognitive style to explain differing modes of cognitive functioning between individuals. This was especially true when assumptions had to be made about "intentions" (for example, in experimental research studies). On an experimental basis, the "intentions" of the subjects should be assumed to be more alike than different. Therefore, one must assume that all the subjects intend to perform to the best of their ability, unless there is independent evidence that indicates otherwise. "Intentions," unfortunately because of its vague meaning, did not readily lend itself to such an assumption. The restrictions of the psychoanalytic theoretical

framework became evident among researchers in cognitive processes. Those who studied cognitive styles were finally constrained to work out of a conceptual structure that was cognitively rather than psychoanalytically oriented.

Broverman (1960a, 1960b) stated that although cognitive style is theoretically thought to be a function of common response strengths within particular classes of behavior, it can be viewed as the relationship between abilities within individuals. Broverman confirmed the existence of what he interpreted as two cognitive styles: "Conceptual versus perceptional-motor dominance" and "strong versus weak automatization". "Conceptual versus perceptual-motor dominance," refers to specialization in novel, difficulty or concentration demanding conceptual behaviors, while at the same time displaying a deficit in skills of novel or difficult perceptual tasks, or vice versa; "strong versus weak automatization," refers to high or low ability in performing simple highly practiced tasks (Broverman, 1964). Broverman, Broverman, and Klaiber (1966) described automatized behaviors that are so highly practiced and overlearned that only a minimum of conscious effort is necessary for carrying out their execution efficiently. Examples are walking, maintaining one's balance, reading, maintaining perceptual constancies, and talking.

When various controls (or later, styles) were recognized by researchers, they were held to be organized as superordinate structures. Witkin et al (1962) were among the first to look at specific subsumers of cognitive styles when they described individuals using an analytical field approach or a global approach.

Their work dealt with field dependence-independence. The field independent or analytical field individual tends to experience objects analytically and discrete from their backgrounds. The field dependent or global fashion while passively conforming to the influences of his environment. Witkin and associates indicated that an individual's predisposition toward global or analytical inclinations characterized not only his perceptual activity but his problem solving activities as well.

## Description of Conceptual Tempo

Conceptual tempo, as defined by Kagan, is divided into two dimensions: reflection and impulsivity (or more concretely, slow accurate). Kagan, Pearson, and Welch (1966) described the reflection impulsivity disposition as:

> Some children impulsively report the first hypothesis that occurs to them, and this response is often incorrect. The reflective child, on the other hand, delays a long time before reporting a solution and is correct. The reflective child considers the differential validity of alternative answers, makes fewer errors in readprose or in recalling serially learned material, and persists longer with difficult tasks. The reflective child wants to avoid making an error and and inhibits potentially incorrect hypotheses. The impulsive child seems minimally concerned about mistakes and makes his decisions quickly.

Response time or latency and rate of errors are the indices of the reflection-impulsivity dimension. Reflective (slow accurate)

individuals have longer response times and lower error rates than those who are classified as impulsive (fast inaccurate).

The reflection-impulsivity disposition was found to be very stable--for a psychological attribute--across problem solving tasks with different levels of difficulty. Kagan et al (1964) were the first to report conceptual tempo's unusual stability over time and generality across tasks. Because of its stability, conceptual tempo is believed to be an important characteristic of an individual's psychological organization (Yando and Kagan, 1970). As was previously mentioned, the dimensions of "fast accurate" and "slow inaccurate" will be incorporated in the study. The disposition of fast accuracy-slow inaccuracy is assumed to be just as stable as the reflection-impulsivity disposition and also is an equally valid subordinate of conceptual tempo.

## Relationship of Selection Strategies to Conceptual Tempo

Closely related to conceptual tempo is Bruner, Goodnow, and Austin's (1956) concept of selection strategies. Conceptual tempo and selection strategies both can serve to indicate how a pupil will perform intellectually in the classroom, for both involve cognitive processes that are school related. Selection strategies are also subsets of cognitive style and appear to be of great potential value in explaining the manner in which reflectives and impulsives process information.

Selection strategies describe various ways by which the learning of concepts is attained by controlling the order in which examples and non-examples appear. Bruner and associates described three objectives of selection strategies: 1) to ensure that encountered instances will contain appropriate information, 2) to make the assimilation of the information less cognitively strainful and 3) to control the amount of risk in the attainment of a correct solution. Bruner et al depicted four selection strategies. Briefly they are: conservative focusing--the use of an example of a particular concept as a focal point while systematically changing one attribute of the example at a time in order to discover those attributes which are essential; focus gambling--similar to conservative focusing except more than one attribute is changed during a single period of time; simultaneous scanning--the formulation of several hypotheses about the attributes of a concept followed by a search for appropriate examples; successive scanning--similar to simultaneous scanning but only one hypothesis is formulated and tested. Conservative focusing almost always ensures success; it meets all the objectives of a selection strategy. Focus gambling, on the other hand, produces cognitive strain in that more information must be assimilated and it is a high risk strategy may obtain the correct solution quickly or conversely, be totally incorrect. Simultaneous scanning, also a high risk procedure, produces a great deal of cognitive strain in that more information must be assimilated and it is also a high risk strategy. Simultaneous scanning, also a high risk procedure, produces a great deal of cognitive strain within

the individual because of the need to keep track of all the information in the formulated hypotheses. Successive scanning, a low risk strategy, reduces the liklihood of the encounter of instances embedded with relevant information. Focusers have been described as systematic attention deployers and scanners as unsystematic attention deployers (Santostefano and Paley, 1964).

Laughlin (1973) discussed a relatively new concept in the area of selection strategies known as tactical strategies. The existence of tactical strategies was actually proposed by Johnson (1971). However, Laughlin stated that tactical strategies are a set of procedures for testing hypotheses by partitioning the total set of hypotheses into subsets of defensible or strong hypotheses and indefensible or weak hypotheses. Given that description, tactical strategies are theoretically less efficient than either conservative focusing or focus gambling primarily because the involved processes are more demanding in terms of memory and inference requirements.

Selection strategies with high risks should prove attractive to the impulsive child; the low risk processes , particularly conservative focusing, should be attractive to the reflective youngster (DeCeddo, 1969). Travers (1963) proposed that adjustments in teaching be made to coincide with a pupil's selection strategy. Similarly, Kagan stated that adjustments be made by the educational system to meet the cognitive needs of pupils, especially in the area of conceptual tempo.

Although selection strategies and conceptual tempo appear very similar, they are conceptually different. Selection strategies are ways in which a concept is learned--by either a focusing or scanning procedure. This occurs through a cognitive process of monitoring the sequence in which examples and non-examples of concept attributes appear. Conceptual tempo, on the other hand, refers to speed and accuracy in making a response to two or more difficult alternatives. Correct response, as associated with conceptual tempo, indicates that a concept has been learned, rather than how it is learned, as is the case of selection strategies. The two constructs are related in that an individual with a certain conceptual tempo is inclined to use a selection strategy that is congruent with his personality. As an illustration, a reflective individual would not be inclined to use either focus gambling or simultaneous scanning, because of the greater chance for error and the rapid response time inherent in the two strategies.

## REVIEW OF RELATED RESEARCH

### Conceptual Tempo and School Success

After studying a sample of children over a 2 1/2 year period, Messer (1970a) observed that youngsters who failed a grade were significantly more impulsive than those who were promoted. Those youngsters were more impulsive at the start and the end of the 2 1/2 year period. Of interest was Messer's report that the impulsive pupils who had experienced failure were comparable in verbal intelligence to their more successful and reflective peers. Therefore, impulsivity appears to be a determinant in school failure. This is in agreement with Kagan's contention that conceptual tempo is related to academic successful.

Kagan (1965b), a strong advocate of training impulsive youngsters to be more reflective, found that reading ability was negatively associated with impulsivity. With the use of a word recognition test, Kagan made and confirmed the prediction that reflective children would be more accurate in reporting words than their impulsive counterparts. Of great importance, however, was Kagan's acknowledgement that mastery of the basic reading skills had a greater influence on reading achievement than either reflection or impulsivity. Although Kagan prescribed the training of children who display reading difficulties to be more

reflective, it appears that the crucial focus should be upon the mastery of the basic components of reading. Reflection will be of little use unless the basic skills are mastered.

Inductive reasoning, like reading ability, is a necessary skill required for academic achievement; it was also discovered to be negatively correlated with impulsivity (Kagan, Pearson, and Welch, 1966a). Probabilistic inferences can be defined as the process of transiting from one proposition or statement that is considered to be true to another whose truth is believed to have followed from that of the former and whose evidence when confirming one truth also confirms, to some extent, the other. Mathematics, science, and the discovery method of instruction all demand the making of inferences for successful learning. Kagan et al. (1966a) reported that impulsive children made more errors in inductive reasoning problems. The errors were attributed to the following reasons: a) impulsives tend to respond quickly in situations where inferences are required, and b) they seem to report the first idea that occurs as in his suggestion of remedying reading problems by training for reflection, Kagan indicated that positive benefits may also be gained in the area of inductive reasoning by instructing impulsive youngsters to be reflective.

The capacity for recall is another factor that is related to academic success. Kagan (1966) reported that reflective children demonstrated superior recall. However, their superior recall did not

appear to be a function of longer response times, rather a persistance in attempts to produce a better cognitive product. This suggests that the reflective children were more highly motivated on recall tasks. It was observed, in an earlier study, that reflective youngsters display more perserverance on difficult tasks than impulsives with the same verbal ability (Kagan, 1965a). Perserverance, particularly when a difficult task is involved, is also another variable that appears to be related to academic success, and it has been shown to be more characteristic for reflective individuals.

Attentiveness is also held to be an important component associated with school success. The attention span of a child is looked upon as being an indicator of his capacity to learn the presented subject matter and to perform the related intellectual tasks. Interestingly, the inability to sustain attention was observed as a characteristic of impulsive children, however, the type of task employed was the more important variable in determining attentiveness in impulsive children (Zelniker, Jeffrey, Ault, and Parsons, 1972). Jeffrey et al noted that the ability to sustain attention interacted with the type of task presented to impulsive children.

Ault, Crawford, and Jeffrey (1972) observed reflective, impulsive, "fast accurate, and "slow inaccurate" pupils. Using in-class teacher ratings, they found that only reflective pupils were perceived as being highly attentive. It was also reported that pupil sex was not a differentiating factor--both reflective girls and boys were rated as highly attentive.

One study reported that teachers have a tendency to assign higher ratings to girls who display long response times and to boys who make few errors (Yando and Kagan, 1968). Consequently, it appears that teachers are inclined to respond positively to girls who delay and to boys who do not make mistakes. These findings reveal some of the factors behind the higher failure rate for impulsive pupils. The impulsive child, it seems, exhibits certain traits which adversely affect pupil-teacher relations in the present-day school setting, such as quickly blurting out an answer even though the child may be unsure of his/her correctness. This may be due to difficulties in placing effective restraints on tendencies toward action. Kagan et al (1966) reported that there are indications that most impulsives do not appear to be as apprehensive or anxious about making a mistake as does the majority of reflective children.

Ault et al (1972) found that reflective and fast accurate pupils were rated significantly less hyperactive than impulsive and slow inaccurate children by teachers on the Hyperactivity Scale. In an investigation concerning the effects of the drug methylphenidate on the cognitive styles of hyperactive children. Campbell, Douglas, and Morganstern (1971) reported that hyperactive children were not only more field dependent, more constricted in their ability to control attention, and slower on measures of automatization, but as expected, also more impulsive than the normal control subjects. Campbell et al (1971) discovered that methylphenidate had the effect on the conceptual tempo of hyperactive subjects resulting in less impulsive responding and an improved ability to inhibit incorrect responses. In a later

study, Cohen, Weiss, and Minde (1972) found results similar to Campbell et al (1971) concerning the cognitive styles of hyperactive adolescents. They observed that hyperactive adolescents were inclined to be impulsive rather than reflective.

As was demonstrated by the findings of the above studies, reflective pupils were reported to be more successful in the areas of grade promotion, reading ability, inductive reasoning, teacher ratings, and attentiveness. However it was noted that the type of task employed had a bearing on attentiveness as it was related to impulsivity.

## Modification of Impulsivity

In an earlier effort to train first grade children to be reflective, it was observed that the only significant effect of training was the increased response latency, and at the same time, only a minimal effect on performance quality was indicated (Kagan, Pearson, and Welch, 1966b). The focus of the training was on delaying fast responses rather than improving strategies of increased performance quality.

Another investigation indicated that conceptual tempos of teachers, through the concept of modeling, had an effect on pupils. Over a one school year period, children who were placed with experienced reflective teachers became more reflective than those placed with experienced impulsive teachers (Yando and Kagan, 1968).

Again the difference was observed in terms of response time. Quality of performance--on the Matching Familiar Figures Task (MFF)--was not affected.

Debus (1970) observed the effects on the conceptual tempo of third grade impulsive children under a control and four treatment conditions: (1) reflective model, (2) impulsive model, (3) change model--the model responded on the MFF in an impulsive manner for the first half of the session and in a reflective mode for the second half, and (4) dual models--reflective and impulsive models were observed during the same session. The models displaying impulsive performances were shown to experience no success or reward; the reflective models received reward through praise for being successful. Debus also looked at changes in response latency and error scores over a pretest, and immediate posttest, and a delayed posttest. He reported increases in response latencies on the immediate posttest for the experimental treatments under the reflective, change, and dual models. However, the change model condition provided the only significant lasting effect that was shown by the delayed posttest, and this effect was observed only in female subjects. Another significant and also highly important finding by Debus was the lack of significant effects on error scores by any of the subjects in the experimental conditions. Again it was demonstrated that an increase in response time has very little, if any, significant relation with quality of performance as measured by the MFF.

Denney (1972) also looked at the modeling effect on conceptual tempo, and he employed the Conceptual Style Test as the measure. His

sample was second grade boys. Using an adult female model displayed on videotape, Denny reported results similar to those of Debus. Response latencies were affected but error scores remained unchanged. Subjects who observed the impulsive modeling condition, shortened their response time; those who observed the reflective modeling condition, increased their response latency. In addition, Denney indicated that the effects of the conceptual tempo employed in the modeling conditions were generalizable to the subjects' performance on an independent task--the MFF.

From a totally different direction, Zelniker et al (1972) reported that the modification of tasks produced an effective modification of impulsive subjects' scanning strategy. The new strategy was not only retained but was observed to have a positive effect on MFF performances, even though the response latencies were not lengthened. Zelniker et al introduced the notion of modifying task variables to improve the effectiveness of cognitive strategies and problem solving skills.

The above studies indicated that cognitive behaviors may be successfully modified, specifically that of response latency, but such modification amy have very little effect on the quality of performance. Contrary to those studies, the Zelniker et al (1969) investigation focused on the change to a more efficacious strategy. They reported that the quality of performance improved with the use of more efficient cognitive strategies.

## Observing Behavior and Conceptual Tempo

In examining observing behavioral patterns of reflective and impulsive fourth grade boys, Siegelman (1969) found that the impulsives ignored two and one half as many alternatives per item as the reflectives on the MFF. Nelson (1969) supported Siegelman's findings when he reported that reflective boys, when performing on the MFF, devoted less time examining the standard figure while allocating more time to the variants than did impulsive boys. Other studies, however, in the area of observing behavior produced different findings. Drake (1970), for example, found results similar to those of Siegelman (1969) and Nelson (1969), but the results only held true for adults and were just the opposite for third grade children. Zelniker, Jeffrey, Ault, and Parsons (1972), on the other hand, failed to find any differences in observing responses on the MFF between impulsive and reflective third graders. Ault et al (1972) agreed with the basic observations of the Zelniker et al (1972) study that indicated a lack of difference in the basic scanning strategies of impulsive and reflective middle elementary grade children on the MFF; all of the subjects relied heavily on the strategy of comparing variants with the standard rather than systematically seeking one feature from each variant at a time. However, in looking at the amount of visual scanning employed and eye movement scores (the number of eye movements recorded) of third graders during the performance on the MFF, Zelniker et al (1972) reported that reflectives had significantly more eye fixations and had also scanned significantly more variants than impulsives.

It is interesting to note the dissimilar findings on the observing behaviors of reflective and impulsive youngsters. One reason why dissimilar findings were evident may be because precise instruments that measure the observing behaviors of individuals in relationship to their conceptual tempo have not yet been developed. Since selection strategies often incorporate observing behavior, and if selection strategies and conceptual tempo are related, it also appears that the lack of differences between impulsives and reflectives would be evident in the area of observation strategies, but as was reported that was not the case.

## The Association of Conceptual Tempo and Information Processing

Nuessle (1972) reported that reflective subjects were more efficient at processing information. He posited that the reflective cognitive style facilitated information processing because it provided for more effective retrieval and recoding of information. Nuessle suggested that reflection-impulsivity differences are strongly related to developmental differences in information processing. He observed that the reflection periods of older subjects (9th graders) were longer than those younger (5th graders). The older subjects were significantly more proficient at processing information. Nuessle found, however, that when reflective younger subjects and impulsive older ones were specifically studied, they did not differ significantly on information processing. The lack of developmental

differences between younger reflective and older impulsive sjbjects implies that the reflection-impulsivity dimension is stable: reflective subjects maintain their more efficacious information processing capabilities through periods of development, and impulsives continue to lag. In a study on problem solving strategies, Ault (1973) also found that younger (mean age 6.7 years) reflective children were more reflective than older (mean age 10.9 years) impulsive youngsters on the MFF.

McKinney (1973) observed that reflective children were more likely to use a conservative focusing strategy, and impulsives tended to employ a random trail and error procedure when processing information. McKinney also noted that only a small proportion of his subjects employed a scanning strategy; however, the impulsives were observed to use the scanning strategy more frequently. McKinney implied that the impulsive child may benefit more, if there is a desire to modify his impulsive tempo, by being instructed to use conceptual strategies more efficiently, instead of requiring him to delay his response time. McKinney indicated that the random or hypothesis scanning strategy employed by impulsive children is an inefficient conceptual strategy that increases one's memory load of the amount of information that is retained, by the same token, forcing impulsives to delay their responses may actually impair their performances on tasks where the memory load is great.

McKinney (1973) also questioned the wisdom of those who believe that the conceptual tempo of an impulsive child should be modified to be more reflective in the area of response latency. He cited that

performance quality appeared to be ignored by proponents of the delaying of response times. McKinney posited that modifying an impulsive child's response time is not a solution, but a more efficacious mode of processing information may be the answer for a more effective and productive modification. In other words, through effective training in conceptual strategies, the impulsive child's response latence may not increase, which should actually be of little or no concern, but his quality of performance across problems should increase, and that should be the major objective.

In an investigation of information processing and the modification of impulsivity in middle and lower class boys, Hieder (1971) reported that task strategy instruction produced a significant decrease in errors for both groups on the MFF and sentence construction. Task strategy instruction was compared with the effects of forced delay of response latency, increased motivation through the offering of rewards for correctiveness, and a control condition in which the subjects were instructed on the MFF in the standard manner suggested by Kagan. Task strategy of instruction was found to be the superior method. Hieder's findings reinforce the position that the learning of effective cognitive strategies is more effective in decreasing errors and improving performance quality than just delaying response times.

## The Relation of Conceptual Tempo and Problem Solving

Yando and Kagan (1970) stated that a child's conceptual tempo was a highly stable feature of his problem solving behavior; also, conceptual tempo is a good predictor of errors. In other words, an individual who is disposed toward impulsivity tends to produce more errors than one who is reflective.

It was reported that under memory support conditions, impulsive children solved significantly more problems than under the no-memory support condition; however, only a slight, nonsignificant increase was observed for reflectives under memory support conditions (McKinney and Banerjee, 1973). McKinney and Banerjee (1973) noted that both reflectives and impulsives solved the same number of problems when memory aids such as a constant source of feedback of a correct response in a problem solving task was provided. They also observed that memory aids during concept attainment were significantly more beneficial for impulsive children.

Ault (1973) suggested that from evidence presented in other reports that emphasized training techniques in scanning strategies that has significantly decreased errors, the focal point should not be on response speed but on the problem strategy employed. She observed that impulsive children exhibited less mature cognitive strategies than those classified as reflective. Siegelmann (1969) was one of the first to present the argument that Ault postulated. She proposed that the focus should be on attempts to train algorithms or attention deployment strategies in an effort to modify the negative

effects of impulsivity. Furthermore, Siegelman stated that although a long response time may be necessary, it is not a sufficient condition for reflective (slow and accurate) responding. One may observe an example of this when various subjects on the MFF display long response latencies but also a high rate of errors. In order to be classified as reflective, one must not only display a long response latency but a low error rate as well.

The tenor of individuals such as Ault, McKinney, and Siegelman is contrary to the earlier solutions for impulsivity advanced by Kagan and his associates. The newer theme is an emphasis on the cognitive strategies employed by impulsives in an attempt not to increase response times, but to decrease the amount of errors across problem solving tasks through more effective cognitive strategy training methods.

## Conceptual Tempo and Decision Making

In a recent study that looked at differences in reflective and impulsive children in the area of decision making, Mann (1973) reported that the reflection-impulsivity dimension was associated with caution-haste in decision making. Not surprisingly, Mann found that reflective subjects took significantly more time in making decision on ego-involving tasks. However, no substantial differences were reported between reflectives and impulsives in the content and quality of the decisions observed.

Upon studying the risk factor involved in decision making, Kopfstein (1973) reported that conceptual tempo was not related to risk taking behavior. He stated that such findings were totally unexpected, for the hypothesis was that impulsives would be more inclined toward taking risks in the decision making process.

The findings of Mann (1973) did not show a deficiency in the impulsive style in terms of decision making quality, even though the impulsives made decisions in a shorter time frame. It appears that the greatest consideration should be given to the quality of decision making rather than the time required to make a response as having serious implications concerning cognitive strategies in problem solving.

Kopfstein indicated that caution was just as prevalent in impulsives, contrary to previous assumptions, as in reflectives. Both Kopfstein (1973) and Mann (1973) added further strength to the position that strategy, not the speed of response, should be the primary focus in the teaching of individuals.

## Conceptual Tempo and Anxiety

In earlier reports concerning conceptual tempo, it was strongly held that the impulsive child displayed more anxiety because of his own expectations of failure, and therefore, he answered quickly in order to reduce tension; on the other hand, the child who does not expect to fail is less anxious about his ability and so tends to

exhibit more reflection (Kagan, Rosman, Day, Albert, and Phillips, 1964). Later a gradual shift toward viewing the reflective individual as being more anxious about failure became more prevalent. Kagan (1966) reported that the belief that reflective children display more inclination toward anxiety received only marginal support in his study of the generality and dynamics of conceptual tempo. Kagan suggested a curvilinear relationship that demonstrated that if a child is more anxious about possible errors than quick success, he will be reflective, but if his anxiety over gaining quick success is greater than committing errors, then he will be impulsive. Kagan (1966) further postulated, under the assumption that impulsives are less successful, that an individual may become so accustomed to failure that he no longer protects himself and as a result is less anxious about the prospects of failure.

When anxiety was induced, longer decision times were observed for both impulsive and reflective children, and also fewer errors for impulsives who displayed increased response latencies (Messer, 1970b). Such findings provided support for the position that anxiety over intellectual performance is an antecedent of a reflective conceptual tempo.

Presently, there is strong evidence that suggests that the reflective individual is more anxious over making a mistake and as a result is more cautious; but for the impulsive person, there is minimal anxiety over a potential error (Kagan and Kogan, 1970). From previous observations concerning conceptual tempo and anxiety, Kagan

and Kogan deduced that in being cautious and highly concerned with committing an error, the reflective individual is consequently going to take longer in responding or reporting an answer in his attempt to avoid errors; on the other hand, impulsives are only minimally concerned with errors and as a result are more likely to respond quickly in tasks that involve the choosing of the correct answer from similar and difficult alternatives.

## Sex Differences in Conceptual Tempo

Earlier studies provided indications that no significant sex differences were found to be associated with conceptual tempo (Kagan 1965a and 1956b). A recent study by Kopfstein (1973) also indicated that there was no significant differences between fourth grade boys and girls on conceptual tempo. An earlier investigation by Ault et al (1972) also reported no significant sex differences on th MFF test. Lewis, Rausch, Goldberg, and Dodd (1968) also reported the lack of significant sex differences on conceptual tempo. However, they observed that the rate of errors were more strongly related to IQ in boys.

The reports of no sex differences were of interest primarily because the belief that boys would be more inclined toward impulsivity, especially in view of the contention that impulsives were more aggressive, less inhibited, and less anxious about success (Kagan and Kogan, 1970). The socialization of girls is normally thought to be away from

those characteristics mentioned, while boys would have less social conditioning of young boys and girls have little effect on creating sex differences in conceptual tempo.

## A Rationale For Observing Four Dimensions of Conceptual Tempo

Kagan and others who studied conceptual tempo, categorized subjects along the reflection-impulsivity dimension on the criteria of response latency and rate of errors. The median response latency and error-rate of the observed sample was always incorporated in the classification of conceptual tempo. A subject whose response time was above the median and whose error rate was below, was classified as reflective. The subject whose response latency fell below the median and whose error rate was above, was categorized as impulsive. The reflection-impulsivity dimension model of conceptual tempo is depicted in Figure 1. There was always a fairly large group of individuals--approximately one-third--who fit neither the defined reflective nor impulsive modes. Upon reviewing studies of conceptual tempo, it was apparent that those subjects who did not fit into dichotomous reflection-impulsivity dimension were ignored.

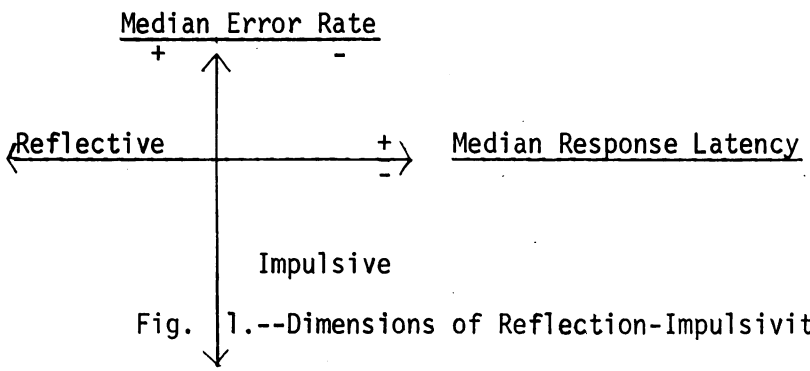


Fig. 1.--Dimensions of Reflection-Impulsivity

Shulman, Loupe, and Piper (1968), in a study of aduls subjects, reported that conceptual tempo and inquiry competence were related. Reflectives generally proved to more effective inquiries than impulsives. It should be adknowledged. however, that Shulman and assotiates found that the error rate component was significantly more important in predicting inquiry behavior than the amount of reflection time. In essence, an individual may fall in either category of reflectivity nor impulsivity because of an observed tendency toward a low error rate coupled with a short reflection time, but because of his low error rate, the individual is nevertheless an effective inquirer. On the other hand, the converse can be observed in an individual with a long reflection time as well as a high error rate. That particular individual's ability as an effective inquirer should be lower. Such observations indicate a need to look at individuals who do not fit into Kagan's reflective-impulsive dichotomy. Fig. 2 is an illustration of the conceptual tempo model which incorporates the "fast accurate" and "slow inaccurate" dimensions. Shulman et al noted that by focusing upon only reflectivity and

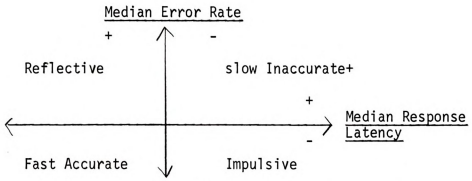


Fig. 2.--Dimensions of Four Levels of Conceptual Tempo: Reflection, Impulsivity, Slow Inaccuracy and Fast Accuracy

impulsivity and throwing out those subjects who do not fit either mode, one may be consistently confounding reflection and accuracy. Variables such as reading ability or inductive reasoning that correlate consistently with reflection time, may actually highly correlate with the aspect of reflection which involves one's capability for discrimination accuracy.

## Socioeconomic Status and Conceptual Tempo

Socioeconomic status (SES) is another factor that is by and large accepted as an important component that is associated with a child's academic success (Battle and Rotter, 1963). SES is actually overwhelmingly acknowledged as having considerable influence on whether or not a child succeeds in school, and the evidence has been

abundant (Havighurst and Janke, 1944; Havighurst and Breese, 1947; Pierce-Jones, 1959; Wilson, 1963). Kagan (1966) posited that high SES children tend to be more reflective than those from a low SES background. He stated, "Investigators working with 'culturally deprived' children believe that one reason for their poor intellectual performance is their impulsive orientations." In a study of middle and lower class boys (ages 9 to 12), Schwebel (1966) reported differences and also effects of impulsivity on the performance of verbal tasks: the middle class subjects performed higher on the verbal tasks, and the lower class subjects had higher inclinations toward impulsivity. Schwebel stated that social class differences in verbal performance were attributable to language-speech competence and to reflection-impulsivity. It appears that the lower SES child has the factors of low verbal performance (vis-a-vis the academic environment) and his predisposition toward impulsivity as impingements working against his achieving school related success. This, in all probability, is a cumulative process--the further the low SES child advances in school, the more stifling or debilitating his school experiences.

According to Rist (1970), a child is labeled by the time he leaves the first grade as to whether or not he is to experience overall success or failure in the classroom. The primary basis for his labelling is the child's appearance (essentially whether or not he/she is clean, neat, and somewhat fashionably dressed as perceived by significant others such as teachers and school administrators). Since

appearance is highly related to SES, it is assumed that a child who has a more "desired" appearance is more likely to come from a family with a higher SES than a child who is depicted as having a less "desired" appearance.

A child perceived as having a high SES familiar background, enjoys a higher probability of experiencing a more receptive and positive attitude (conscious or unconscious) than those viewed as being less economically fortunate. Moreover, a greater amount of benign attention from teachers and other school related personnel might be granted to those seen as being of a higher SES as opposed to those classified as economically disadvantaged or of a lower SES. Such occurrences; which are related to teacher-expectations-of-pupils, are also closely associated with academic and other school oriented success.

Pupils who are either reflective or quick ("fast accurate") and of high SES backgrounds may be viewed more favorably by their teachers and as a consequence will experience more academic success than impulsive youngsters of low SES backgrounds. Clustered between these groups might be the children who are reflective and low SES, slow ("Slow inaccurate") and high SES, quick and low SES, impulsive and high SES, and slow and low SES in that respective order.

If such aforementioned differences are observed, the implications then suggest that a child's conceptual tempo along with his SES background predicts whether or not he is more prone to experience success, failure, or even mediocrity in the schools by the time he has completed the early elementary grades. A further implication is

that children <u>are</u> channeled into academic or intellectual categories--based upon SES and conceptual tempo--as early as age seven or eight.

## SUMMARY

In summary, it was emphasized that conceptual tempo was one of several cognitive style subsets and it is closely related to selection strategies, another cognitive style subset, which describes the learning of concepts by either a focusing or scanning procedure. Conceptual tempo was defined as a hypothesis testing procedure that refers to speed and accuracy in making a response to two or more difficult alternatives. Two dimensions of conceptual tempo initially described were reflection and impulsivity. Reflective individuals were depicted as those who demonstrated a slow response time but a low error rate, and impulsives were illustrated as individuals with short response times and high error scores.

Various investigations of conceptual tempo reported that reflective pupils were more successful in the areas of grade promotion, reading ability, inductive reasoning, teacher ratings, attentive, and they were also more anxious than their impulsive counterparts. Modification of conceptual tempo appears to have shifted away from the stress on altering response latency for impulsives to an emphasis on developing more efficient cognitive strategies.

A rationale was presented for examining the fast-accurate and slow-inaccurate dimensions of conceptual tempo. It was posited that the possible confounding of reflection time and accuracy exists because of the exclusion of those individuals who do not fit the reflection-impulsivity mode. Also, accuracy rather than reflection time might be the component more highly correlated with variables such as reading and inductive reasoning.

Socioeconomic status (SES) was also reported to be related to conceptual tempo to the extent that reflectives were more likely to be from high SES backgrounds and impulsives from lower socioeconomic levels. It was suggested that a child's SES and conceptual tempo had considerable effects on school achievement.

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# SECTION II

JOURNAL ABSTRACT

# DIFFERENCES ASSOCIATED WITH CONCEPTUAL TEMPO AND SOCIOECONOMIC STATUS ON ACADEMIC ACHIEVEMENT, IQ, AND INTERNAL-EXTERNAL MEASURES

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One hundred eighty fourth grade Ss were examined to determine differences on academic achievement, IQ, and internal-external control measures in relationship to conceptual tempo and socioeconomic status (SES). Each S was categorized as either reflective, impulsive, slow-inaccurate, or fast-accurate. Also, each S was classified as high or low SES. High SES Ss demonstrated higher mean scores on each dependent variable. This indicated that SES was associated with the dependent variables as predicted. Within the two SES groups, conceptual tempo demonstrated a strong relationship with academic achievement only among low SES children, and for low SES youngsters the fast-accurate dimension had the strongest association with school success. For the high SES child the major factor for school success was his high socioeconomic level. Overall, when SES is ignored, reflectives and fast-accurates had higher performances on the dependent variables, thus suggesting that accuracy not response time is the more important component in conceptual tempo in relation to

school success. The results also indicated that the measures of internal-external control were not significantly associated with conceptual tempo.

JOURNAL ARTICLE

*DIFFERENCES ASSOCIATED WITH CONCEPTUAL TEMPO AND SOCIOECONOMIC STATUS ON ACADEMIC ACHIEVEMENT, IQ, AND INTERNAL-EXTERNAL MEASURES*

Conceptual tempo is reported to be highly associated with a child's academic success or failure (Kagan 1965a). As measured by the Matching Familiar Figures (MFF) test (developed by Kagan, 1965), conceptual tempo is divided into two dimensions; reflection and impulsivity. The MFF is composed of a series of six pictures of familiar objects of which only one is identical to a presented standard. Ss who display long response times (latencies) and low error scores on the MFF are classified as reflective, and those who demonstrate short response times and high error scores are categorized as impulsives. Kagan (1965b) reported that conceptual tempo manifests pervasive generality across varied task situations and importantly, it is linked to some fundamental aspects of an individual's personality structure. The reflective disposition is generally believed to be the one most closely related to academic success. Messer (1970) observed that youngsters who failed a grade were significantly more impulsive, although all Ss were comparable in verbal intelligence. Kagan (1965b) reported that reading ability was negatively associated with impulsivity. Inductive reasoning, perceived

as being a requisite for academic success, was also discovered to be negatively correlated with impulsivity (Kagan, Pearson, & Welch, 1966). The inability to sustain attention was observed as a characteristic of impulsive children (Zelniker, Jeffrey, Ault, & Parsons, 1972). Another investigation reported that teachers tended to assign higher ratings to girls who displayed long response times and to boys who made few errors (Yando & Kagan, 1968). On the basis of this evidence it appears that teachers are inclined to respond positively to girls who delay and to boys who do not make mistakes. Finally, it was reported that most impulsive individuals do not appear to be as apprehensive or anxious about making a mistake as do those who are reflective (Kagan et al., 1966).

While there is considerable research on the reflection-impulsivity dimensions, there has been very little published research involving the two groups that do not fit the reflection-impulsivity dichotomy. Those Ss who were characterized by short response latencies and low error scores (fast-accurates) or long response latencies and high error scores (slow-inaccurates), as demonstrated on the MFF, were usually excluded from the research sample. The excluded Ss make up two groups who usually constitute approximately a third of the population when conceptual tempo is studied. Shulman, Loupe, & Piper (1958) contended that the two "extreme" groups possessed qualities that were certainly worth investigating. They argued that by focusing only upon reflectivity and impulsivity, researchers may be consistently confounding reflection and accuracy. They also noted that variables

such as reading ability or inductive reasoning that correlate consistently with reflection time, may actually be related to the aspect of reflection that actually involves the capability for discrimination accuracy. Such a hypothesis cannot be validly examined by excluding the two "extreme" groups. Among the first studies that examined the two "extreme" groups were those by Ault, Crawford, & Jeffrey (1972) and Ault (1973). In the Ault et al (1972) investigation, it was reported that of the four groups (reflective, impulsive, slow-inaccurate, and fast-accurate), only reflective pupils were perceived by their teachers as being highly attentive. They also found that reflective and fast-accurate pupils were rated significantly less hyperactive than impulsive and slow-inaccurate youngsters by teachers on the Hyperactivity Scale. Ault (1973) reported that reflective and fast-accurate Ss employed more mature cognitive strategies than impulsive and slow-inaccurate Ss in problem solving tasks. A major aim of this study was to further examine the two "extreme" groups with respect to the relative importance of accuracy and response latency.

Socioeconomic status (SES) is also a factor that is associated with a child's academic success (Battle & Rotter, 1963). According to Rist (1970), a child is labeled by the time he leaves the first grade as to whether or not he is to experience overall success or failure in the classroom. Rist postulated that the criteria for such labeling are strongly related to SES; those pupils who are positively perceived by significant others such as teachers and school administrators would more likely be of a higher SES than those not as positively viewed.

Specifically, the purpose of the present study was to examine differences among reflective, impulsive, fast-accurate, and slow-inaccurate fourth grade children who were also either in the high or low SES category. The major hypotheses were (a) conceptual tempo is associated with measures of academic achievement, school related intelligence, and internal-external control to the extent that reflective Ss and fast-accurate Ss will demonstrate higher mean scores on all measures, and (b) SES is also related to academic achievement, school related intelligence, and internal-external control measures to the degree that high SES Ss will produce higher mean scores across all dependent measures employed in the study. Eight dependent variables were investigated: scores on the Intellectual Achievement Responsibility Questionaire (IAR), the Sense of Control Scale, teacher ratings, the standardized Metropolitan Achievement Reading Test (MART), the standardized Metropolitan Achievement Math Test (MAMT), the criterion-referenced Minimal Performance Objective Math Test (MPOMT) also from the MEAP, and IQ.

## Method

### Subjects

The Ss were 180 fourth grade children (99 males and 81 females) from seven different elementary schools in a city of approximately 200,000 in the midwest. The data were collected during the midpoint

of the school year. Two schools were located in low socioeconomic regions and the remaining five were situated in middle to high socioeconomic areas. Ss were categorized by the criteria of reflection-impulsivity on the basis of the MFF test. SES classification of the areas where the schools were located were made through the use of the Michigan Educational Assessment Program's index of SES. Each S was then individually assigned to high SES or low SES categories on the basis of the McGuire-White Scale. Therefore, the actual sample was specifically high SES youngsters from high SES schools and low SES youngsters from low SES schools who were either reflective, impulsive, slow-inaccurate, or fast-accurate.

## Instruments and Procedure

MFF. The MFF was made up of 12 items containing pictures of familiar objects. For each item there were six variants arranged in two rows of three pictures on the bottom card of two attached 8 1/2" X 11" cards. On the top card was a picture of the standard. Only one variant per item was identical with the standard. The objective was to choose the one variant that was identical to the standard. A stopwatch was used to record the latency to the first response for each item.

Previous studies indicated that the mean cut-off for categorizing reflective and impulsive fourth grade Ss was approximately 10 secs. for the mean response latency and 10 total errors for the error score (Kagan, 1966; Kopfstein, 1973). Those values were used in this

study for classifying reflectives (10 secs. or above and 9 errors or below), impulsives (below 10 secs. and 10 errors or above), fast-accurates (below 10 secs. and 9 errors or below), and slow-inaccurates (10 secs. or above and 10 errors or above). On the MFF test, the mean response latency and error score was 15.84 secs. and 5.71 for reflectives, 7.05 secs. and 13.41 for impulsives, 14.85 secs. and 12.67 for slow-inaccurates, and 7.82 secs. and 6.87 for fast-accurates.

The MFF test was administered according to the prescribed standard procedure. For all 12 items of the MFF test, each S was asked to select the one figure from six variants that was identical to the standard. Each S was also asked to vocalize as well as point, with his finger, to the picture of his choice. The latency of each S's first response to each variant was recorded in half seconds. The stopwatch was kept from the S's view. Errors for each item were also recorded. A maximum of six errors per item was allowed. Whenever six errors were recorded, the S was shown the correct figure and E then proceeded to the next item. A score sheet for errors was also kept out of the S's view.

McGuire-White. The McGuire-White Scale (Kennedy, 1969) was used to identify and categorize high and low SES Ss. This was done by examining Ss' parental educational attainment and occupational status. Those Ss whose parents were at the upper level of the scale were classified as high SES, and those whose parents were at the lower level were designated as low SES. For instance, high SES parents were in the top two levels (1 and 2) for occupational status which included

professionals, high status businessmen, large scale proprietors, and high level white collar positions, also the top two levels (1 and 2) for educational attainment which included completion of a graduate school, a professional school, or a four year college or university. Low SES Ss' parents, on the other hand, were on the bottom two levels (6 and 7) for occupational status and the bottom three levels (5,6, and 7) for educational attainment. The various levels on the scale were used as values in assigning SES classification Ss. The values from the levels for occupational status and educational attainment were added together thus getting a total value that served as an index of SES. For example, values of 2 to 4 indicated high SES and values of 11 to 14 indicated low SES.

IAR. The Intellectual Achievement Responsibility Questionaire (IAR), developed by Crandall, Katkovsky, & Crandall (1965), was designed to measure the degree of control and individual perceives regarding his own reinforcement responsibility in academic situations. In essence, the IAR assesses whether or not an individual perceives himself as his own controlling agent of reinforcements and therefore views himself as responsible for successes as well as failures. The test-retest correlation for the IAR, after a 2-month interval between the administration of the first and second tests, was .69. The following are two examples of positive and negative event items from the 34 forced choice item IAR scale.

If a teacher passes you to the next grade, would it probably be

____a. because she liked you, or

I+ ____b. because of the work you did?

When you have trouble understanding something in school, is it usually

____a. because the teacher didn't explain it clearly, or

I- ____A. because the teacher didn't listen carefully.

Sense of Control. The Sense of Control Scale, developed by Brookover, Gigliotti, Henderson, & Schneider (1973), is based upon the work of Coleman and others (1966). Brookover and his associates described the scale as a measure of a child's feeling of personal efficacy over his environment in relationship to his school performance. The Sense of Control Scale is a five item Likert-type multiple choice scale. Hoyt's Analysis of Variance reliability coefficient for the scale was .65.

The two internal-external measures, the IAR and the Sense of Control Scale, were administered to Ss in groups. A tape recorded voice of an adult female reading the complete IAR questionnaire and Sense of Control Scale was provided for the Ss so that they might follow along at the recorded pace if desired. The primary objective for the recording, however, was to control for the possibility of any reading difficulties that might have been encountered by the Ss.

Teacher Ratings. Teacher ratings were gathered from the teachers of each S. The teacher ratings served as indices of classroom success as perceived by the teacher. E transformed the ratings, which were in evaluation terms, into numerical values (1 to 4). An example of the evaluation terms used by the teachers were "poor," "unsatisfactory," and "needs improvement." Those terms had values of 1, as compared to "excellent" and "outstanding" which had values of 4. The values of 2 and 3 were generally interpreted as fair or average or good or above average respectively. The ratings were a cumulative evaluation of each S's academic achievement and social habits.

MART. Scores from the standardized Metropolitan Achievement Reading Test (MART) were Compiled for each S. The MART served as one of the measures of the Ss' academic achievement.

MAMT. Scores from the standardized Metropolitan Achievement Math Test (MAMT) were also gathered. The MAMT was another measure of the Ss' academic achievement.

MPORT. Scores from the Minimal Performance Objective Reading Test (MPORT) were obtained as another measure of academic achievement. The MPORT was a criterion-referenced test that contained 23 "minimal performance objective" items.

MPOMT. Scores from the Minimal Performance Objective Math Test (MPOMT) were also compiled. Like the MPORT, the MPOMT was a criterion-referenced instrument that served as a measure of academic achievement. The MPOMT contained 35 "minimal performance objective" items.

Design

The design was a 2 X 4 analysis with eight dependent variables. Because of the number of dependent variables, multivariate analysis of variance (MANOVA) was the statistical technique employed.

A total of 37 Ss were eliminated for various reasons such as missing data and absenteeism. All observations except IQ scores were obtained for each S. However, because of the necessary computer programming constraints for MANOVA, it was necessary to supply substitute IQ values for any missing IQ values for any missing IQ data encountered. Since each S was categorized on the criteria of conceptual tempo and SES, a group mean of each dependent variable could be calculated. The cell mean for obtained IQ scores was used as the value for those Ss (42) who had missing IQ data. This procedure, however, does not alter the group mean differences on IQ scores, although there will be a reduction of within group variability, especially for the low SES category which had the largest number of missing IQ Data. Table 1 illustrates the number of Ss in each full cell as opposed to the cells containing missing IQ data.

Table 1.--The Number of Ss Per Full Cell for Each Category Except IQ. Numerals in Parentheses Represent the Number of Ss Whose IQ Data was Collected.

| | High SES | Low SES |
|---|---|---|
| Reflective | 29 (27) | 26 (16) |
| Impulsive | 35 (32) | 36 (23) |
| Slow-Inaccurate | 9 ( 8) | 15 ( 7) |
| Fast-Accurate | 17 (16) | 13 (10) |
| Total | 90 (83) | 90 (56) |

## Results

The test for interaction (SES X conceptual tempo) indicated no significant interaction (multivariate $F = 1.25$, $df = 3/172$, $p<.20$). The cell means are presented in Tables 2 and 3 for high and low SES Ss classified as reflective, impulsive, slow-inaccurate, or fast-accurate.

Although there was no significant interaction, of interest was whether or not any significant contrasts existed within SES groups among reflective, impulsive, slow-inaccurate, and fast-accurate Ss on any of the eight dependent variables. Through the use of the Scheffe' post hoc comparison test, it was shown that differences between low SES fast-accurate and slow-inaccurate Ss on MPOMT scores and teacher ratings were significant ($p<.05$ for MPOMT and $p<.01$ for

teacher ratings). Also, significant teacher ratings differences ($p<.05$) were found between low SES fast-accurate and impulsive Ss. All differences favored fast-accurate Ss. For high SES Ss, the post hoc procedure showed that reflective Ss had significantly ($p<.05$) higher teacher ratings than impulsive Ss.

The hypothesis that significant differences on the eight dependent variables were related to SES was supported (multivariate $F = 21.65$, $df = 1/172$, $p<.0001$). When univariate F tests were applied, differences on all eight observations resulted in probability values ranging from<.001 to<.0007. The SES cell means for each dependent variable, as shown in Table 4, indicated that the high SES Ss performed significantly better on all eight measures.

Table 2.--Cell Means for High SES Reflective, Impulsive, Slow-Inaccurate, and Fast Accurate Ss. Standard Deviations are in Parentheses.

| | High SES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
| Reflective | 17.76 (5.77) | 31.14 (5.27) | 4.65 (1.46) | 4.76 (1.07) | 115.24 (10.82) | 3.09 (.90) | 24.97 (3.77) | 16.07 (2.59) |
| Impulsive | 14.29 (7.24) | 29.60 (6.58) | 4.43 (1.70) | 4.40 (1.08) | 113.43 (21.98) | 2.49 (.83) | 22.77 (3.79) | 15.43 (2.91) |
| Slo-Inacc | 16.22 (7.40) | 32.00 (2.40) | 4.49 (1.77) | 4.38 (1.52) | 110.44 (11.14) | 3.22 (.83) | 24.11 (4.11) | 14.67 (2.35) |
| Fast-Acc | 16.35 (7.89) | 30.53 (5.92) | 5.06 (1.93) | 4.75 (1.05) | 115.82 (15.71) | 3.00 (.90) | 24.06 (3.77) | 15.71 (2.39) |

Table 3.--Cell Means for Low SES Reflective, Impulsive, Slow-Inaccurate, and Fast-Accurate Ss. Standard Deviations are in Parentheses.

| | Low SES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
| Reflective | 8.88 (7.67) | 23.31 (9.34) | 2.91 (1.09) | 3.34 (1.05) | 92.00 ( 7.56) | 2.54 (.84) | 21.50 (3.50) | 13.46 (2.83) |
| Impulsive | 5.97 (6.10) | 21.94 (8.45) | 2.65 ( .66) | 3.02 ( .61) | 85.86 ( 8.21) | 2.28 (.69) | 21.86 (3.15) | 13.69 (2.59) |
| Slo-Inacc | 6.87 (7.96) | 19.27 (8.03) | 2.47 ( .93) | 2.64 ( .84) | 90.73 ( 5.98) | 2.03 (.81) | 24.11 (4.11) | 14.67 (2.39) |
| Fast-Acc | 11.47 (7.62) | 27.77 (7.35) | 3.59 (1.62) | 3.76 (1.08) | 102.23 (12.06) | 3.08 (.70) | 23.92 (5.01) | 14.31 (3.12) |

Table 4.--The Means for High and Low SES Ss on the Eight Observation Measures. Standard Deviations are in Parentheses

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| High SES | 15.99 (6.78) | 30.51 (5.62) | 4.62 (1.67) | 4.58 (1.20) | 114.20 (17.34) | 2.85 (.86) | 23.86 (3.92) | 15.61 (2.65) |
| Low SES | 7.76 (7.08) | 22.73 (8.48) | 2.83 ( .97) | 3.15 ( .84) | 90.81 ( 8.21) | 2.43 (.78) | 21.79 (3.66) | 13.64 (2.66) |

Table 5.--The Means for Reflective, Impulsive, Slow-Inaccurate, and Fast-Accurate Ss on the Eight Observation Measures. Standard Deviations are in Parentheses.

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Reflective | 13.56 (6.67) | 27.44 (7.19) | 3.83 (1.28) | 4.09 (1.06) | 104.30 ( 9.28) | 2.83 (.87) | 23.33 (3.64) | 14.84 (2.70) |
| Impulsive | 10.07 (6.66) | 25.72 (7.53) | 3.53 (1.17) | 3.70 ( .84) | 99.45 (15.00) | 2.38 (.76) | 22.31 (3.46) | 14.55 (2.75) |
| Slo-Inacc | 10.37 (7.75 | 24.04 (5.92) | 3.23 (1.31) | 3.29 (1.09) | 98.12 ( 7.91) | 2.48 (.82) | 21.71 (4.02) | 13.79 (2.20) |
| Fast-Acc | 14.23 (7.77) | 29.33 (6.53) | 4.42 (1.80) | 4.32 (1.30) | 109.90 (14.13) | 3.03 (.81) | 24.00 (4.25) | 15.10 (2.71) |

Conceptual tempo cell means on each dependent variable are shown in Table 5. The hypothesis that conceptual tempo was associated with the eight observation variables at the traditional levels of significance was not supported (multivariate F = 1.42, df = 3/172, p<.09). Although traditional levels of significance were not attained, such findings as above should not be disregarded. The interpretations and inferences at such a level, however, should be carried out with caution. One way of proceeding cautiously is to insure control by using the Bonferroni Inequality Index. The purpose of this index is to hold the experimentwise error rate at a conservative level of confidence such as .05. In using the Bonferroni Inequality Index, the level of significance for each univariate F was maintained at .05 by dividing the number of dependent variables into .05, thereby yielding a confidence level of .006 per variable. Of the univariate F tests, as displayed in Table 6, only teacher ratings were significant at the .006 level.

Table 6.--Univariate Analysis of Variance for Each Dependent Variable as Associated with Conceptual Tempo.

| Variable | Mean Square Between | Univariate | p Less Than |
|---|---|---|---|
| IQ | 584.88 | 3.28 | .02 |
| MART | 4.85 | 2.52 | .06 |
| MAMT | 3.79 | 3.44 | .02 |
| MPORT | 146.50 | 2.96 | .03 |
| PMOMT | 93.31 | 1.77 | .15 |
| TR | 3.57 | 5.40 | .002 |
| IAR | 26.46 | 1.88 | .13 |
| SC | 4.55 | .64 | .59 |

Because of differences found among Ss on the factor of conceptual tempo, a conservative post hoc comparison technique using the least square estimates of effects and the standard error of least squares was applied to examine contrasts among reflective, impulsive, slow-inaccurate, and fast-accurate Ss on the dependent variables. That post hoc procedure is an estimate of the group mean differences by using the standard error comparisons were not made on the variables of IAR and sense of control in view of the small univariate F ratios ($F = 1.88$, $p<.14$ and $F = .64$, $p<.59$ respectively). The post hoc analysis on the remaining six variables showed that reflective Ss had higher MPORT scores ($p<.05$) and higher teacher ratings ($p<.01$) than impulsive Ss. Reflective Ss also had higher MAMT scores ($p<.05$) than slow-inaccurate Ss. Fast-accurate Ss, it was found, had higher MPOMT scores ($p<.05$), MART scores ($p<.05$), MAMT scores ($p<.05$), IQ scores ($p<.01$, and teacher ratings ($p<.001$) than impulsive Ss. Fast-accurate Ss also compiled higher MART scores ($p<.05$), MAMT scores ($p<.01$), OQ scpres ($p<.05$), and teacher ratings ($p<.05$) than slow-inaccurate Ss. No significant differences on any measures were found between reflectives and fast-accurates nor between impulsives and slow-inaccurates.

## Discussion

Since previous studies suggested that low SES children were more inclined toward impulsivity than high SES youngsters (Kagan, 1966; Schwebel, 1966), it was predicted that children characterized as both low SES and impulsive would have the lowest scores on measures of academic achievement. No SES X conceptual tempo interaction, however, was found in the present study. Furthermore, Kagan (1966) did not actually test his assumption that impulsivity is related to low SES youngsters, and Schwebel (1966) based his conclusions upon scores from verbal tasks which high SES pupils traditionally perform better on than those from low SES backgrounds. Eska and Black (1971) also stated that fast response times were indicative of low SES children. In the present study, however, Ss were placed in the four conceptual tempo categories on apriori criteria instead of employing the Ss' median response latency and error scores for classification purposes. It was observed that there were 49 fast responding low SES Ss and 51 fast responding high SES Ss out of the total sample of 180 which was divided exactly in half on the basis of SES. Such results were counter to those who contended that short response latency was a disposition more common to low SES children.

The data supported the hypothesis that SES would be strongly associated with the dependent variables to the extent that high SES Ss would exhibit higher mean scores across all dependent measures. The findings of strong associations for SES with academic achievement and the greater school related success of the high SES Ss were consistent

with earlier studies in the area (Havighurst and Janke, 1944; Havighurst and Breese, 1947; Pierce-Jones, 1959; Wilson, 1963). High SES Ss also displayed higher feelings of control over their school environment as shown on the IAR and Sense of Control Scale. This appears to coincide with the greater success in academic achievement that was demonstrated by the high SES Ss. The indications are that if one group experiences more school related success than another, then it follows that they should also have higher feelings of control over their school environment.

Another view of conceptual tempo was gained by including fast-accurate and slow-inaccurate Ss in the sample. The overall contention resulting from previous research was that reflective pupils, for the most part, demonstrated higher levels of academic achievement (Kagan, 1965a, 1965b, and 1966; Kagan, Pearson, & Welch, 1966a and 1966b; Schwebel, 1966; Yando & Kagan, 1968; Messer, 1970). However, the results of the present study indicated that the relective Ss were not the consistent high performers. The high SES slow-inaccurate Ss achieved highest mean teacher ratings and MPOMT scores, and the high SES fast-accurates displayed the highest mean scores on the MART, IQ, and equalled the mean score of the high SES reflective Ss' on the MAMT. For low SES Ss, the fast-accurates were the consistent high performers within that group on each of the dependent measures.

One of the more surprising findings was in the area of teacher ratings. Although the high SES slow-inaccurate Ss compiled the highest mean teacher rating for the entire sample, the opposite was observed

for the low SES slow-inaccurate Ss who compiled the lowest mean teacher rating. The differences found between high SES slow-inaccurates and low SES slow-inaccurates might be explained in terms of teacher expectations (Rist, 1970). The teacher may perceive the high SES slow-inaccurate youngster as trying his hardest to succeed and hence rewards him for his efforts. The high SES slow-inaccurate child may also be perceived as non-threatening, for he does not display traits of high activity that is attributed to impulsive children, nor does he quickly provide the correct answer to a question or problem as might a fast-accurate child. He might appear to be more dependent upon the teacher than either fast-accurate or reflective children, and this might also work in his favor in a relationship with the teacher. On the other hand, the low SES slow-inaccurate child may be perceived in terms of just being "slow" i.e. a slow learner in most instances, and therefore, is evaluated accordingly. The low SES fast-accurate child, as opposed to his slow-inaccurate counter part, is probably perceived as the "beacon of light" in a disadvantaged setting who is going to be successful and overcome the possible detrimental effects of a low socioeconomic background, and therefore he attains high teacher evaluations that far surpass the other Ss within the low SES group.

The results suggested that of the two components that comprise conceptual tempo, response time and accuracy, that accuracy is the more important factor in relation to academic achievement. In earlier studies, the primary suggestion was to modify the response latency of impulsive children by increasing their response latency, therefore

making them reflective (Kagan, Pearson & Welch, 1966b; Yando & Kagan, 1968). However, the present study is in accord with more recent research which shows that slowing down response speed has little or no effect on performance (Zelniker, Jeffrey, Ault & Parsons, 1972).

In order to further examine the importance of accuracy, a Scheffe' post hoc comparison procedure was used to contrast accurate Ss (reflectives and fast-accurates) with inaccurate Ss (impulsives and slow-inaccurates). A comparison was then made between fast Ss (impulsives and fast-accurates) and slow Ss (reflective and slow-inaccurate). Significant differences ($p<.05$) were attained on every dependent measure except the MART when accurate and inaccurate Ss were contrasted, but no significant differences were found when fast and slow Ss were compared. The results from the post hoc procedure suggested that accuracy was by far the more significant factor and that response latency was of little importance when related to measures of academic achievement.

The data indicated that overall, the high SES child met with relative success regardless of his speed in responding or accuracy as determined by the MFF test. The single exception was teacher ratings, which favored accurate Ss. The important factor for the high SES child was his high socioeconomic level, not the accuracy or response latency components of conceptual tempo. For the low SES child, on the other hand, the accuracy component of conceptual tempo appeared to be highly related to academic achievement. Therefore, it seems that not only is it to the low SES child's advantage to be accurate, but it would be best if he was fast as well. Of the high SES group, the only Ss who

demonstrated consistently lower performances were the impulsives, as predicted, and in that respect a slower response time may be related to academic achievement in a high SES setting. Nevertheless, it should be noted that only on teacher ratings were there significant differences within the high SES group.

Differences associated with conceptual tempo on the two internal-external control measures were not significant. The results suggested that an individual's conceptual tempo has little or no effect on how he perceives the control he has over his school environment. However, the data indicated that low SES fast-accurates displayed IAR scores ($\bar{X}$ = 23.92) that were in the same range ($\bar{X}$ = 22.77 to $\bar{X}$ = 24.97) as the high SES Ss. Such results obtained from low SES fast-accurates might be expected. Since they have the highest attained standards across all measures for the low SES group, it was not surprising that the low SES fast-accurates would demonstrate relatively high feelings of control over their school environment.

In future investigations of conceptual tempo, prior to the administration of instruments, standards should be established such as the MFF test, that serve to categorize the conceptual tempo of subjects. Efforts should be made to set up norms for conceptual tempo dimensions at various developmental stages that would act as guidelines of conceptual tempo regardless of age. This should provide consistency established for classifying conceptual tempo, situations may and have probably already occurred where one study classifies certain Ss as impulsive, whereupon another study categorizes the same Ss as reflective. This may occur because the median response latency and

error scores (which in all liklihood varies across samples) for each specific sample serves as the cut-off point in designating conceptual tempo dimensions. With such occurrences, valid replications would be difficult to accomplish. For further research, past studies that had been carried out with only reflective and impulsive subjects in the sample should be replicated but with the addition of fast-accurates and slow-inaccurates as subjects. Moreover, it is suggested that all future research on conceptual tempo include fast-accurate and slow-inaccurate subjects in the research sample. Examining and determining the cognitive strategies used by subjects in the four conceptual tempo groups in relation to problem solving and information processing should also prove valuable. Stringent efforts should be made to reveal whether or not various modes of instruction when paired with an individual's conceptual tempo, do in fact have any beneficial effects on the individual's learning capabilities. Finally, if attempts to modify conceptual tempo are continued, the primary focus should be upon improving the accuracy component as opposed to increasing response latency.

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# APPENDICES

# APPENDIX A

## Ph.D. DISSERTATION PROPOSAL

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## Introduction

A child's cognitive style is most important in affecting his learning and his adaptations to varying methods of instructions as well as instructors. For instance, when a pupil's cognitive style is congruent with the instructions he receives and also the cognitive style of his teachers, the chances for academic success are enhanced. On the other hand, when the converse is evident, the child's chances for academic success are minimized. Depending on the circumstances, whether or not a child's cognitive style is congruent or incongruent with that of his teachers, such a situation may serve to help a child achieve a high academic self concept, or relegate his academic self-concept along with his total self-esteem to the lowest level.

A cognitive style such as conceptual tempo--the major focus of this study--and selection strategies can serve to indicate how a pupil will perform intellectually in the classroom. Both are concerned with cognitive processes and products that are school related. Conceptual tempo refers to response speed and accuracy in tasks such as those that involve problem solving. Selection strategies, on the other hand, refer to the way in which concepts are learned. For example, an individual either scans or focuses on various attributes that enable him to either accept or reject a presented concept that is to be learned or one that is a false representation of the "correct" concept.

Conceptual tempo and selection strategies are related. As an illustration, an individual who uses a particular selection strategy will be predisposed toward a conceptual tempo disposition that matches the selection strategy. For instance, if an individual employs a conservative focusing strategy (systematically examining attributes of a concept in order to discover those that are essential), his conceptual tempo is likely to be of a reflective nature (long response time but few errors). Conservative focusing ensures success in learning a concept; reflectivity enhances the probability of choosing the correct concept from similar alternatives.

The purpose of this study is to look at conceptual tempo--a subset of cognitive styles--and socioeconomic status in identifying differences in IQ reading achievement, arithmetic achievement, teacher ratings, intellectual achievement responsibility, and sense of control in middle grade elementary school children.

## Definition of Cognitive Style

The contemporary definition of the cognitive style construct presented by Kagan, Moss, and Sigel (1963), was defined as the stability of individual preference in perceptually organizing and conceptually categorizing the external environment. In the same vein, Hervey (1966) stated that cognitive style is the mode in which an individual organizes his experiences and perceives and understands his environment. At this point the term cognitive style is used widely to refer to a variety of behavioral consistencies in the processing of information (Stanes, 1973).

A Brief Historical Perspective of Cognitive Styles

The construct of cognitive styles has its roots in psychoanalytic theory under the rubric of cognitive control. In the psychoanalytic theoretical structure, the emphasis was on the relationship between cognitive control and ego defense mechanisms, and also mediations of perceptual processes along the cognitive control principle of "constricted-flexible control" (Kagan and Kogan, 1970). "Constricted-flexible control" refers to the capability of responding correctly in a task while facing a field of conflicting cues (Klein, 1954). Naming the color word, for example, that is printed by a set of incongruent colored letters, such as the word "blue" printed in green. Flexibility is exhibited when the individual can successfully perform the task. If the individual, on the other hand, states the color word as being the same as the incongruent colored letters, then this characterizes the constricted mode.

Klein (1958) gave cognitive controls the label of cognitive styles. Cognitive control or style as perceived by Gardner and others (1959) of ego psychology orientations, was defined as the presence of stabilized ego structures that integrate specific adaptive intentions with specific environmental situations. Kagan and Kogan, however, pointed out that the definition provided very little insight in examining individual differences in the functioning of cognitive controls because of the use of "intentions" as a variable. The term "intentions" had a very vague meaning, and therefore it was difficult to employ the ego psychology definition of cognitive style to explain differing modes of cognitive functioning between individuals. This was especially true when assumptions had to be about "intentions" (for example, in experimental research studies). On an experimental basis, the "intentions" of the subjects should be assumed to be more alike than different. Therefore, one must assume that all the subjects intend to perform to the best of their ability, unless there is independent evidence that indicates otherwise. "Intentions," unfortunately because of its vague meaning, did not readily lend itself to such an assumption. The restrictions of the psychoanalytic theoretical framework became evident among researchers in cognitive processes. Those who studied cognitive styles were finally constrained to work out of a conceptual structure that was cognitively rather than psychoanalytically oriented.

When various controls (or later, styles) were recognized by researchers, they were held to be organized as superordinate structures. Witkin et al (1962) were among the first to look at specific subsumers of cognitive styles when they described individuals using an analytical field approach or a global approach. Their work dealt with field dependence-independence. The field independent or analytical field individual tends to experience objects analytically and discrete from their backgrounds. The field dependent or global individual, on the other hand, is inclined to perceive his environment in a global fashion while passively conforming to the influences of his environment. Witkin and associates indicated that an individual's predisposition toward global or analytical inclinations

characterized not only his perceptual activity but his problem solving activities as well.

Problem

The construct of conceptual tempo, a subsumer of cognitive style, is the major concern and primary focus of this study. Through a multivariate analysis approach, the study is designed to examine differences in IQ, reading achievement, arithmetic achievement, teacher ratings, intellectual achievement responsibility and sense of control in middle grade elementary pupils.

Kagan (1965a) posited that conceptual tempo plays a very important role in a child's academic success or failure. In most instances a child is initially responsible for the types of school experiences he undergoes only to the extent that certain inherent interacting dispositions serve to affect his tendency toward "motivational zeal" or a display of apathy whenever he is to express products of intellectual quality. Of the interacting dispositions, conceptual tempo is one of the most important.

Kagan reported that conceptual tempo points out a child's predisposition to "reflect" upon the quality of a cognitive product or, in contrast, to make an "impulsive" and unconsidered response. Kagan (1956b) also reported that conceptual tempo manifests pervasive generality across varied task situations and, importantly, it is linked to some fundamental aspects of a child's personality structure. Thus, conceptual tempo appears to be an integral part of a child's personality. If such is the case, then implications can be made concerning the teaching of individuals in a manner that is clearly related to their conceptual tempo.

It should be explicitly noted that Kagan, the initiator of conceptual tempo research, identified and was only concerned with two dimensions of conceptual tempo--reflection and impulsivity. Since a large number of individuals do not fall in either of the two dimensions, the present study is structured to incorporate four dimensions of conceptual tempo instead of the usual two dimensions. The two new dimensions, "fast accurate," and "slow inaccurate," should be as much an influencing factor on the aforementioned dependent variables as reflection and impulsivity. In order to maintain a proper perspective concerning the four dimensions, one should view the reflection-impulsivity dimension as "slow accurate" and "fast inaccurate" dispositions, even though the terms reflective and impulsive will be used for traits indicating slow accuracy and fast inaccuracy.

Description of Conceptual Tempo

Conceptual tempo, as defined by Kagan, is divided into two dimensions: reflection and impulsivity ("slow accurate" and "fast inaccurate"). Kagan, Pearson, and Welch (1966) described the reflection-impulsivity disposition as:

> Some children impulsively report the first hypothesis that occurs to them, and this response is often incorrect. The reflective child, on the other hand, delays a

> long time before reporting a solution and is correct. The reflective child considers the differential validity of alternative answers, makes fewer errors in reading prose or in recalling serially learned material, and persists longer with difficult tasks. The reflective child wants to avoid making an error and inhibits potentially incorrect hypotheses. The impulsive child seems minimally concerned about mistakes and makes his decisions quickly.

Response time or latency and rate of errors are the indices of the reflection--impulsivity dimension. Reflective ("slow accurate") individuals have longer response times and lower error rates than those who are classified as impulsive ("fast inaccurate").

The reflection-impulsivity disposition was found to be very stable across problem solving tasks with different levels of difficulty. Therefore, conceptual tempo is believed to be an important characteristic of an individual's psychological organization (Yando and Kagan, 1970). As was previously mentioned, the dimensions of "fast accurate" and "slow inaccurate" will be incorporated in the study. "Fast accurate" and "slow inaccurate" will be incorporated in the study. "Fast accurate" individuals have long response times and high error rates. The disposition of fast accuracy-slow inaccuracy is assumed to be just as stable as the reflection-impulsivity disposition and also equally valid subordinates of conceptual tempo.

Relationship of Selection Strategies to Conceptual Tempo

Closely related to conceptual tempo is Bruner, Goodnow, and Austin's (1956) conceptualization of selection strategies. Selection strategies are also subsets of cognitive style and appear to be of great value in explaining the manner in which reflectives and impulsives process information.

Selection strategies describe various ways by which the learning of concepts is attained by controlling the order that examples and non-examples appear. Bruner and associates described three objectives of selection strategies: (1) to ensure that encountered instances will contain appropriate information, (2) to make the assimilation of the information less cognitively straining, and (3) to control the amount of risk in the attainment of a correct solution. Bruner et al depicted four selection strategies. Briefly they are: conservative focusing--the use of an example of a particular concept as a focal point while systematically changing one attribute of the example at a time in order to discover those attributes which are essential; focus gambling--similar to conservative focusing except more than one attribute is changed during a single period of time; simultaneous scanning--the formulation of several hypotheses about the attributes of a concept followed by a search for appropriate examples; successive scanning--similar to simultaneous scanning but only one hypothesis is formulated and tested. Conservative focusing

almost ensures success; it meets all the objectives of a selection strategy. Focus gambling, on the other hand, produces cognitive strain in that more information must be assimilated and it is a high risk strategy--one may obtain the correct solution quickly or conversely, be totally incorrect. Simultaneous scanning, also a high risk procedure, produces a great deal of cognitive strain in that more information must be assimilated and it is a high risk strategy--one may obtain the correct solution quickly or conversely, be totally incorrect. Simultaneous scanning, also a high risk procedure, produces a great deal of cognitive strain within the individual because of the need to keep track of all the information in the formulated hypotheses. Successive scanning, a low risk strategy, reduces the likilihood of the encounter of instances embedded with relevant information. Focusers have been described as systematic attention deployers and scanners as unsystematic attention deployers (Santostefano and Paley, 1964).

Selection strategies with high risk should prove attractive to the impulsive child; the low risk processes, particularly conservative focusing, should be attractive to the reflective youngster. (DeCeddo, 1969). Travers (1963) proposed that adjustments in teaching made to coincide with a pupil's selection strategy. Similarly, Kagan stated that adjustments be made by the educational system to meet the cognitive needs of pupils

Although selection strategies and conceptual tempo appear very similar, they are conceptually different. Selection strategies are ways in which a concept is learned. This occurs through a cognitive process of monitoring the sequence in which examples and non-examples of concept attributes appear. Conceptual tempo, on the other hand, refers to speed and accuracy in making a response to two or more difficult alternatives. Correct response, as associated with conceptual tempo, indicates that a concept has been learned, rather than how it is learned as is the case for selection strategies. The two constructs are related in that an individual with a certain conceptual tempo is inclined to use a selection strategy that is congruent with his personality. As an illustration, a reflective individual would not be inclined to use either focus gambling or simultaneous scanning, because of the greater chance for error and the rapid response time inherent in the two strategies.

Review of Related Research

Messer (1970) observed that children who failed a grade were significantly more impulsive, although they were comparable in verbal intelligence to their peers who had not failed. This was in agreement with Kagan's contention that conceptual tempo is related to academic success. Earlier, Kagan (1965b) found that reading ability was negatively associated with impulsivity. Impulsivity was also discovered to be negatively correlated with inductive reasoning (Kagan, Pearson, and Welch, 1966). Both reading ability and inductive reasoning are perceived as being necessary skills needed for academic achievement.

It was reported that teachers have a tendency to assign higher ratings to girls who display long response times and to boys who make few errors (Yando and Kagan, 1968). Consequently, it appears that teachers are inclined to respond positively to girls who delay and to boys who do not make mistakes. These findings reveal some of the factors behind the higher failure rate for impulsive pupils. It seems that the impulsive child exhibits certain traits which adversely affect pupil-teacher relations in the present-day school setting, such as quickly blurting out an answer even though the child may be unsure of its correctness. This may be due to difficulties in placing effective restraints on the tendencies toward action. Kagan et al (1966) reported that there are indications that most impulsives do not appear to be as apprehensive or anxious about making a mistake as does the majority of reflective children

Ault, Crawford, and Jeffrey (1972) observed reflective, impulsive, "fast accurate," and "slow inaccurate" pupils. Using in-class teacher ratings, they found that only reflective pupils were perceived as being highly attentive. It was also reported that pupil sex was not a differentiating factor--both reflective girls and boys were rated as highly attentive.

Siegelman (1969) found that impulsive boys ignored two and one-half times as many alternatives per item on Kagan's Matching Familiar Figures task. She also noted that reflectives took significantly longer looks at the alternatives In a related study, Mann (1973) reported that the reflection-impulsivity dimension was associated with caution-haste in higher ratings to girls who display long response times and to boys who make few errors (Yando and Kagan, 1968). Consequently, it appears that teachers are inclined to respond positively to girls who delay and to boys who do not make mistakes. These findings reveal some of the factors behind the higher failure rate for impulsive pupils. It seems that the impulsive child exhibits certain traits which adversely affect pupil-teacher relations in the present-day school setting, such as quickly blurting out an answer even though the child may be unsure of its correctness. This may be due to difficulties in placing effective restraints on the tendencies toward action. Kagan et al (1966) reported that there are indications that most impulsives do not appear to be as apprehensive or anxious about making a mistake as does the majority of reflective children.

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Not surprisingly, he found that reflective subjects took significantly more time in making decisions on ego-involving tasks.

Nuessle (1972) reported that reflective subjects were more efficient at processing information. He posited that the reflective cognitive style facilitated information processing because it provided for more effective retrieval and recoding of information. Nuessle suggested that reflection-impulsivity differences are strongly related to developmental differences in information processing. He observed that the reflection periods of older subjects (9th graders) were longer than those younger (5th graders). The older subjects were significantly more proficient at processing information. This observation would appear to suggest that the reflective dimension increases with age and differences between individuals decreases. Nuessle found, however, that when reflective younger subjects and impulsive older ones were specifically studied, they did not differ significantly on information processing. The lack of developmental differences between younger reflective and older impulsive subjects implies that the reflection-impulsivity dimension is stable: reflective subjects maintain their more efficacious information processing capabilities through periods of development, while impulsives continue to lag. In a study on problem solving strategies, A ult (1973) also found that younger reflective children were more reflective than older impulsive youngsters on the Matching Familiar Figures Task.

Rationale for Observing Four Dimensions of Conceptual Tempo

Kagan and others who studied conceptual tempo, categorized subjects along the reflection-impulsivity dimension on the criteria of response latency and rate of errors. The median response latency and error-rate of the observed sample was always incorporated in the classification of conseptual tempo. A subject whose response time is above the median and whose error rate is below, is classified as reflective. The subject whose response latency falls below the median and whose error rate is above, is categorized as impulsive. The reflection-impulsivity dimension model of conceptual tempo is depicted in fig. 1. There is always

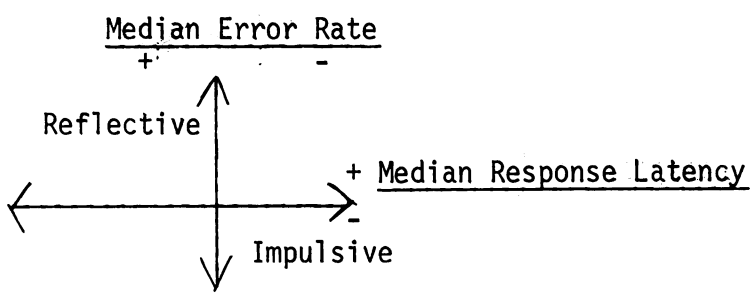


Fig. 1

a fairly large group of individuals--approximately one-third--who fit neither the defined reflective nor impulsive modes. Upon reviewing studies of conceptual tempo, it is apparent that those subjects who did not fit into the dichotomous reflection-impulsivity dimension were ignored.

Shulman, Loupe, and Piper (1968), in a study of adult subjects, reported that conceptual tempo and inquiry competence were related. Reflectives generally proved to be more effective inquirers than impulsives. It should be acknowledged, however, that Shulman and associ- found that the error rate component was significantly more important in predicting inquiry behavior than the amount of reflection time. In essence, and individual may fall in either category of reflectivity nor impulsivity because of an observed tendency toward a low error rate coupled with a short reflection time, but because of his low error rate, the individual is nevertheless and effective inquirer. On the other hand, the converse can be observed in an individual with a long reflection time as well as a high error rate. That particular individual's ability as an effective inquirer should be lower. Such observations indicate a need to look at individuals who do not fit into Kagan's reflective-impulsive dichotomy. Fig. 2 is an illustration of the conceptual tempo model which incorporates the "fast accurate" and "slow inaccurate" dimensions. Shulman et al

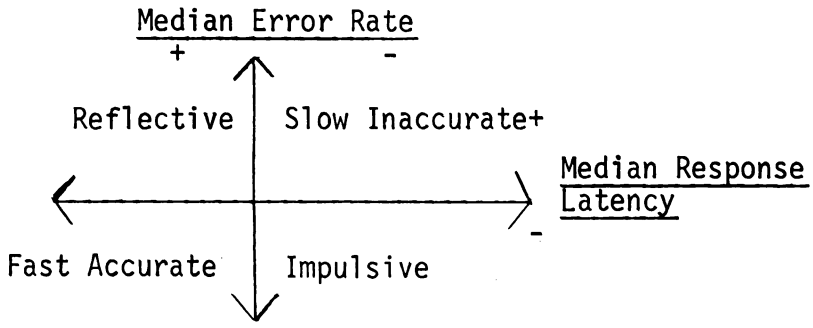


Fig. 2

noted that by focusing upon only reflectivity and impulsivity, throwing out those subjects who do not fit either mode, one may be consistently confounding reflection and accuracy. Variables such as reading ability or inductive reasoning that correlate consistently with reflection time, may actually highly correlate with the aspect of reflection which involves one's capability for discrimination accuracy.

Relationship Between Socioeconomic Status and Conceptual Tempo

Socioeconomic status SES is another factor that is by and large accepted as an important determinant in a child's academic success (Battle and Rotter, 1963).

Kagan (1966) posited that high SES children tend to be more reflective than those from a low SES background: "investigators

working with 'culturally deprived' children believe that one reason for their poor intellectual performance is their impulsive orientations". In a study of middle and lower class boys (ages 9 to 12), Schwebel (1966) reported differences and also effects of impulsivity on the performance of verbal tasks: the middle class subjects performed higher on the verbal tasks, and the lower class subjects had higher inclinations toward impulsivity. Schwebel stated that social class differences in verbal performance were attributable to language-speech competence and to reflection-impulsivity. It appears that the lower SES child has the factors of low verbal performance (vis-a-vis the academic environment) and his predisposition toward impulsivity as impingements working against his achieving school related success. This, in all probability, is a cumulative process--the further the low SES child advances in school, the more stifling or debilitating his school experiences.

According to Rist (1970), a child is labeled by the time he leaves the first grade as to whether or not he is to experience overall success or failure in the classroom. The primary basis for his labelling is the child's appearance (essentially whether or not he/she is clean, neat, and somewhat fashionably dressed as perceived by significant others such as teachers and school administrators). Since appearance is highly related to SES, it is assumed that a child who has a more "desired" appearance is more likely to come from a family with a higher SES than a child who is depicted as having a less "desired" appearance.

A child perceived as having a high SES familial background, enjoys a higher probability of experiencing a more receptive and positive attitude (conscious or unconscious) than those viewed as being less economically fortunate. Moreover, a greater amount of benign attention from teachers and other school related personnel might be granted to those seen as being of a higher SES as opposed to those classified as economically disadvantaged of of a lower SES. Such occurrences; which are related to teacher-expectations-of pupils, are also closely associated with academic and other school oriented success.

Pupils who are either reflective or quick ("fast accurate") and of high SES backgrounds may be viewed more favorably by their teachers and as a consequence will experience more academic success than impulsive youngsters of low SES backgrounds. Clustered between these groups might be the children who are reflective and low SES, slow ("slow inaccurate") and high SES, quick and low SES, impusive and high SES, and slow and low SES in that respective order.

If such aforementioned differences are observed, the implications then suggest that a child's conceptual tempo along with his SES background predicts whether or not he is more prone to experience success, failure, or even mediocrity in the schools by the time he has completed the early elementary grades. A further implication is that children <u>are</u> channeled into academic or intellectual categories--based upon SES and conceptual tempo--as early as age seven or eight.

# METHOD

## Purpose

One objective of this study is to examine existing differences between impulsive, "fast accurate," reflective and "slow inaccurate" middle grade elementary school children on six criteria variables: (1) IQ, (2) arithmetic achievement, (3) reading achievement, (4) teacher rating, (5) intellectual achievement responsibility, and (6) sense of control. Another objective is to examine the interactions of conceptual tempo and SES with the six dependent variables.

In the design of the study, conceptual tempo and SES are the independent variables. Arithmetic achievement test scores, reading achievement test scores, IQ scores, teacher ratings intellectual achievement responsibility, and sense of control are the dependent variables. Differences within the dependent variables associated with conceptual tempo and SES will be examined, as well as the interactions that the two independent variables may have with the six observations. The design of the study is illustrated in Fig. 3. Multivariate analysis will be the statistical analysis technique employed in the study.

Fig. 3

| | High SES | | | | | | Low SES | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rdg.A. | Arith.A. | IQ | T.R. | IAR | S.C. | Rdg.A. | Arith.A. | IQ | T.R. | IAR | S.C. |
| Reflectives | | | | | | | | | | | | |
| Fast Accurates | | | | | | | | | | | | |
| Impulsives | | | | | | | | | | | | |
| Slow Inaccurates | | | | | | | | | | | | |

Rdg. A. -- Reading Achievement
Arith. A. -- Arithmetic Achievement
T.R. -- Teacher Rating
IAR -- Intellectual Achievement Responsibility
S.C. -- Sense of Control

Reading and Arithmetic Achievement

Reading and arithmetic are two areas that command great amounts of attention in the elementary school grades. These two subjects are largely looked upon as measures of academic success. Pupil performances in the two areas as assessed by an achievement test such as the Metropolitan Achievement Test, will be viewed as indices of academic Achievement Test, will be viewed as indices of academic achievement. The test will provide a standardized measure of pupil academic achievement in the classroom.

Teacher Rating and IQ

Another measure will involve teacher-perception of pupils. Teacher ratings of each subject will be gathered for observation and analysis. Also pupil IQ scores will be incorporated as a standardized measure of school-related intelligence. Eska and Black (1971) found significant differences between reflective and impulsive children on the variables of IQ, the Otis-Lennon Mental Ability Test--sections 1 and 2 (figural and symbolic content), and mental age, with all levels higher for reflective youngsters (the subjects were all third grade pupils). However, Kagan--in his studies--indicated a rejection of the notion that conceptual tempo has significant effects upon IQ.

Intellectual Achievement Responsibility

The Intellectual Achievement Responsibility Questionnaire (IAR) created by Crandall, Katkovsky, and Crandall (1965), is designed to measure the degree to which a child perceives his own control in regards to reinforcement responsibility exclusively in intellectual-academic situations. In essence, IAR assesses whether or not a child perceives himself as his own controlling agent of reinforcements and therefore views himself as responsible for successes and failures.

Although the IAR is an internal-external scale (internal or self control versus external or environmental control), it is unlike other internal-external scales that describes external forces such as luck, fate, impersonal social forces, and more personal significant others. The IAR is concerned with a child's face to face contacts--his parents, teachers, and peers. The focus is upon the child's belief in the importance of his own actions compared with those of others in his immediate environment. The test-retest correlation for the IAR is .69, which indicates high reliability.

Sense of Control

Sense of control is defined as a child's feeling of control over his own destiny (Coleman et al, 1966). Coleman and associates in describing sense of control stated: "If a child feels that his environment is capricious, or beyond his ability to alter, then he may conclude that attempts to affect it are not worthwhile and stop trying."

Coleman et al indicated that sense of control correlated strongly with educational achievement. In the same study, they report reported that middle class youngsters had a greater sense of control over their environment than lower class youngsters. They also found that those who had a higher sense of control over the environment performed better, academically, than those whose sense of control was low. Mosteller and Moynihan (1972) stated that such findings might

indicate the displaying of feedback from reality; children who do well in school, for instance might feel good about themselves as well as possissing a perception of control over their environment than lower class youngsters. They also found that those who had a higher sense of control over the environment performed better, academically, than those whose sense of control was low. Mosteller and Moynihan (1972) stated that such findings might indicate the displaying of feedback from reality; children who do well in school, for instance might feel good about themselves as well as possessing a perception of control over their environment. Although sense of control has not been extensively studied in early elementary school children, a general belief is that differences are not evident until the later grades (Bartel, 1971). The sample for this study, however, will be drawn from a middle elementary grade, and it is hypothesized that differences will be found.

The sense of control scale, derived by Brookover et al (1973), is based upon the work of Coleman and others. Brookover and associates described the scale as a measure of a child's feeling of personal efficacy over his environment in relationship to his school performance. The Hoyt's Analysis of Variance reliability coefficient for the scale is .65.

Procedure

The sample will consist of approximately 180 fourth grade boys and girls from at least four elementary schools located in the same school district. Two schools will be located in high SES regions, and two schools will be situated in low SES areas. Ninety high SES pupils and ninety low SES pupils will be obtained from the four schools. Approximately 30 high SES pupils will be designated as reflective, 30 as impulsive, 15 as "fast accurate," and 15 as "slow inaccurate." The same procedure will be repeated for the low SES children. The rationale for the 2 to 1 ratio of reflectives and impulsives to "fast accurates" and "slow inaccurates" is that the 2 to 1 ratio was the approximate proportion observed in previous studies of conceptual tempo before those subjects who did not fit into the reflection-impulsivity dimension were removed. It is assumed that there will be very little, if any, sex differences between the male and female subjects that is related to conceptual tempo1 Therefore, the separation of the sexes for observation and analysis is not required, and sex as a design variable will be disregarded.

The subjects will be categorized on the criteria of reflection-impulsivity on the basis of Kagan's Matching Familiar Figures test. SES classification of the areas in which the schools are located will be made through the use of the Michigan Educational Assessment Program's index of SES for each school in the district from which the sample is to be gathered. Each pupil will then be individually assigned to high SES or low SES categories on the basis of the McGuire-White scale which contains parental occupational and educational status subscales. The actual sample will be drawn from those two groups--specified high SES youngsters in high SES schools and low SES children in low SES schools.

Each child in the sample will be measured individually on three tests--the Matching Figures test or MFF, the intellectual Achievement Responsibility Questionnaire or IAR scale, and the Sense of Control Scale.

The MFF will be administered according to the standard procedure. Each child will be asked to select the one figure from six presented variants that is identical to the standard figure. Errors and response time will be recorded for each item. unfortunately, there is no semblance of a standard by which past researchers in the area of conceptual tempo used that would serve to indicate which response time and error rate are indicative of the particular dimensions of conceptual tempo. The usual method employed for categorizing reflective and impulsives was as follows: those subjects whose response times were above the median and rate of errors below, were classified as reflective, and those subjects whose response times were below the median and rate of errors above, were categorized as impulsive. The two "extreme" groups, fast accurate and slow inaccurate, were classified accordingly: the fast accurate were made up of those subjects whose response times and rate of errors were below the median; the "slow inaccurates" were those whose response latency and error rate were above the median. In a review of previous studies of conceptual tempo, the mean median cut-off employed for categorizing impulsives and reflectives was approximately 10 seconds for response latency and 9 total errors for the error rate. Those values will be used in this study as indicated in Table 1.

Table 1

| | Response Latency | Error Rate |
|---|---|---|
| Reflectives | 10 sec. or above | Below 9 |
| Impulsives | Below 10 sec. | 9 or above |
| Fast Accurates | Below 10 sec. | Below 9 |
| Slow Inaccurates | 10 sec. or above | 9 or above |

The IAR scale is composed of 34 forced-choice items. Seventeen items describe positive achievement experiences and 17 items describe negative achievement experiences. The experiences are supposed to represent routime occurences for a child. The stem of each item is followed by two alternatives--one stating that the event occurred because of the behavior of someone else in the child's

immediate environment. Positive event items by a minus sign (1-). The total score (10 is obtained by summing all the plus and minus subscores (for example, eight positive items plus seven negative event items equals a total score of 15). The higher the score, the greater the indication that the child believes in his own control of reinforcements in an intellectual-academic achievement situation. The following are positive and negative event items from the IAR scale:

If a teacher passes you to the next grade, would it probably be

____a. because she likes you, or
I+ ____b. because of the work you did?

When you have trouble understanding something in school, is it usually
____a. because the teacher didn't explain it clearly, or
I- ____b. because you didn't listen carefully

The Sense of Control Scale is a five item Likert-type scale: strongly disagree to strongly agree. The scale assesses the feeling of control a child has over his environment in relationship to his school performance.

Teacher conducted standardized achievement reading and arithmetic test scores will be obtained and will serve as measures of academic achievement. Teacher ratings will be gathered for each subject and will serve as indices of classroom success. Scores from school district authorized IQ tests will serve as standardized measures of school-related intelligence.

Hypotheses

The level of significance for testing all hypotheses will be at .05.

General Hypothesis 1: Reflective and fast accurate subjects will significantly differ on the six dependent variables from impulsive and slow inaccurate subjects.

1. Reflective and fast accurate subjects will have higher arithmetic achievement levels.
2. Reflective and fast accurate subjects will have higher reading achievement levels.
3. Reflective and fast accurate subjects will have higher teacher ratings.
4. Reflective and fast accurate subjects will have higher IQ scores.
5. Reflective and fast accurate subjects will have higher intellectual achievement responsibility.

6. Reflective and fast accurate subjects will have higher sense of control.

General Hypothesis 2: Reflective and fast accurate subjects will not significantly differ on the six dependent variables: reading achievement, arithmetic achievement, teacher rating, intellectual achievement responsibility, sense of control, and IQ scores.

General Hypothesis 3: Impulsive and slow inaccurate subjects significantly differ on the six dependent variables.

1. Impulsive subjects will have higher reading achievement levels.
2. Impulsive subjects will have higher arithmetic achievement levels.
3. Impulsive subjects will have higher teacher ratings.
4. Impulsive subjects will have higher IQ scores.
5. Impulsive subjects will have higher intellectual achievement responsibility.
6. Impulsive subjects will have higher sense of control.

General Hypothesis 4: High Socioeconomic status subjects and low socioeconomic status (SES) subjects will significantly differ on the six dependent variables.

1. High SES subjects will have higher reading achievement levels.
2. High SES subjects will have higher arithmetic achievement levels.
3. High SES subjects will have higher teacher ratings.
4. High SES subjects will have higher IQ scores.
5. High SES subjects will have higher intellectual achievement responsibility.
6. High SES subjects will have higher sense of control.

General Hypothesis 5: Conceptual tempo and SES will significantly interact with the six dependent variables.

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# APPENDIX B

## METHOD

### Purpose

One objective of this study is to examine existing differences between impulsive, "fast accurate," reflective and "slow inaccurate" middle grade elementary school children on eight criteria variables: (1) IQ, (2) standardized reading achievement test scores, (3) crite-referenced reading achievement test scores, (4) standardized arithmetic achievement test scores, (5) criterion-referenced arithmetic achievement test scores, (6) teacher ratings, (7) intellectual achievement responsibility, and (8) sense of control. Another objective is to examine the interactions of conceptual tempo and SES with the eight dependent variables.

In the design of the study, conceptual tempo and SES are the independent variables. Both reading achievement test scores, both arithmetic achievement test scores, IQ scores, teacher ratings, intellectual achievement responsibility, and sense of control are the dependent variables. Differences within the dependent variables associated with conceptual tempo and SES will be examined as well as the interactions that the two independent variables may have with the eight observations. The design of the study is illustrated in Figure 3. Multivariate analysis will be the statistical technique employed in the study.

| | High SES | | | | | | | | Low SES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SRATS | CRRATS | SAATS | CRAATS | IQ | TR | IAR | SC | SRATS | CRRATS | SAATS | CRAATS | IQ | TR | IAR | SC |
| Reflectives | | | | | | | | | | | | | | | | |
| Fast Accurates | | | | | | | | | | | | | | | | |
| Impulsives | | | | | | | | | | | | | | | | |
| Slow Inaccurates | | | | | | | | | | | | | | | | |

SRATS--Standardized Reading Achievement Test Scores
CRRATS--Criterion-Referenced Reading Achievement Test Scores
SAATS--Standardized Arithmetic Achievement Test Scores
CRAATS--Criterion-Referenced Arithmetic Achievement Test Scores
TR--Teacher Ratings
IAR--Intellectual Achievement Responsibility
SC--Sense of Control

Fig. 3.

Reading and Mathematic Achievement

Reading and mathematics are two areas that command great amounts of attention in the elementary school grades. These two subjects are largely looked upon as measures of academic success. Pupil performances in the two areas are assessed by the Metropolitan Achievement Test and the Minimal Performance Objective Test of the Michigan Educational Assessment Program. The Metropolitan Achievement Test will provide a standardized measure of pupil academic achievement. The scores will be transformed and presented as grade equivalent values. The minimal Performance objective Test, on the other hand, is a criterion-referenced instrument that was iniated by the Michigan Department of Education under the Michigan Assessment Program (MEAP). The MEAP criterion-referenced tests were constructed to assess performance objectives in reading and math. Through the implementation of brief subtests that measures a single learner performance objective, the Minimal Performance Objective Test was developed to assess specific skills that pupils have or have not attained. MEAP noted that the approved reading and math objectives incorporated in the Minimal performance Objective Test were not intended to cover every aspect of instruction in those areas, but the objectives were termed minimal skill objectives--ones that are desirable for all pupils to have mastered.

Teacher Rating

Another measure will involve teacher evaluation of pupils as related to classroom success and achievement. Teacher ratings of each subject will be gathered for observation and analysis. The evaluations by teachers will provide an index of pupil achievement in the classroom.

IQ

Pupil IQ scores will be incorporated as a standardized measure of school-related intelligence. Eska and Black (1971) found significant differences between reflective and impulsive children on the variables of IQ, THE Otis-Lennon Mental Ability Test--section 1 and 2 (figural and symbolic content), and mental age, with all levels higher for reflective youngsters (the subjects were all third grade pupils). However, Kagan--in his studies--indicated a rejection of the notion that conceptual tempo has significant effects upon IQ. The Standford Achievement Test, was viewed as indices of academic achievement. The test provided a standardized measure of pupil academic achievement in the classroom.

Intellectual Achievement Responsibility

The Intellectual Achievement Responsibility Questionaire (IAR) created by Crandall, Katkovsky, and Crandall (1965), was designed to measure the degree to which a child perceives his own control in regards to reinforcement responsibility exclusively in intellectual-academic situations. In essence, the IAR assesses whether or not a child perceives himself as his own controlling agent of reinforcements and therefore views himself as responsible for successes and failures.

Although the IAR is an internal-external scale (internal or self control versus external or environmental control), it is unlike

other internal-external scales that describe external forces such as luck, fate, impersonal social forces, and more personal significant others. The IAR is concerned with a child's face to face contacts--his parents, teachers, and peers. The focus is upon the child's belief in the importance of his own actions compared with those of others in his immediate environment. The test-retest correlation for the IAR after a 2-month interval between the first and second testing was .69, which indicates high reliability.

Sense of Control

Sense of control is defined as a child's feeling of control over his own destiny (Coleman et al, 1966). In describing sense of control Coleman and his associates stated: "If a child feels that his environment is capricious, or beyond his ability to alter, then he may conclude that attempts to affect it are not worthwhile and stop trying."

Coleman et al indicated that sense of control correlated strongly with educational achievement. In the same study, they reported that middle class youngsters had a greater sense of control over the environment than lower class youngsters. They also found that those who had a higher sense of control over the environment performed better, academically, than those whose sense of control was low. Mosteller and Moynihan (1972) suggested that such findings might indicate the displaying of feedback from reality; children who do well in school, for instance might feel good about themselves as well as possessing a perception of control over their environment. Although sense of control has not been extensively studied in early elementary school children, a general belief is that differences are not evident until the later grades (Bartel, 1971). The sample for the study, however, was drawn from a middle elementary grade, and it was hypothesized that differences will be found.

The Sense of Control Scale, derived by Brookover, Gigliotti, Henderson, and Schneider (1973), is based upon the work of Coleman and others. Brookover and his associates described the scale as a measure of a child's feeling of personal efficacy over his environment in relationship to his school performance. The Hoyt"s Analysis of Variance reliability coefficient for the scale was .65.

Procedure

The subjects were 180 fourth grade boys and girls from seven elementary schools located in the same school district. Two schools were located in low socioeconomic regions and the remaining five were situated in middle to high socioeconomic areas. Ninety high SES pupils and 90 low SES pupils were obtained from the seven schools. Fifty-five children were designated as reflective, 71 as impulsive, 24 as "slow inaccurate," and 30 as "fast accurate." The approximate 2 to 1 ratio of reflectives and impulsives was very much in line with the proportions observed in previous studies of conceptual tempo before those who did not fit into the reflection-impulsivity dimension were removed (Kagan 1965a, 1965b, and 1966; Kagan, Pearson, and Welch, 1966; Yando and Kagan, 1968). When the subjects were placed in the appropriate SES category, there were 29 high SES reflectives

and 26 low SES reflectives, 35 high SES impulsives and 36 low SES impulsives, 9 high SES "slow inaccurates" and 15 low SES "slow inaccurates," and finally 17 high SES "fast accurates" and 13 low SES "fast accurates." Table 1 illustrates, quanitatively, the subject classification by conceptual tempo and SES.

Table 1

| | High SES | Low SES | | |
|---|---|---|---|---|
| Reflectives | 29 | 26 | 55 (30.6%) | |
| | | | | 70% |
| Impulsives | 35 | 36 | 71 (39.4%) | |
| Slow Inaccurates | 9 | 15 | 24 (13.3%) | |
| | | | | 30% |
| Fast Accurates | 17 | 13 | 30 (16.7%) | |
| | 90 | 90 | 180 | |

It was assumed that there would be very little, if any, sex differences between male and female subjects that is related to conceptual tempo. Therefore, the separation of the sexes for observation and analysis was not required, sex as a design variable was disregarded.

The subjects were categorized by the criteria of reflection-impulsivity on the basis of Kagan's Matching Familiar Figures test. SES classifications of the areas where the schools were located were made through the use of the Michigan Educational Assessment Program's index of SES for each school in the district from which the sample was gathered. Each pupil was then individually assigned to high SES or low SES categories on the basis of the McGuire-White Scale (Kennedy, 1969) which contains parental occupational and educational status subscales. The actual sample was drawn from those two groups--specified high SES youngsters in high SES schools and low SES children in low SES schools.

Each child in the sample was measured on three tests--the Matching Familiar Figures test or MFF, the Intellectual Achievement Responsibility Questionaire or IAR scale, and the Sense of Control Scale.

The MFF was administered according to the prescribed standard procedure. Each child was asked to select the one figure from six presented variants that is identical to the standard figure. Errors and response time were recorded for each item. Unfortunately, there was no semblance of a standard employed by past researchers in the

area of conceptual tempo that would serve to indicate what response times and error rates are indicative of the particular dimensions of conceptual tempo. The usual method employed for categorizing reflectives and impulsives was as follows: those subjects whose response times were above the median and whose error scores were below the median, were classified as reflective, and those subjects whose response times were below the median and with error scores above, were categorized as impulsive. The two "extreme" groups, fast accurate and slow inaccurate, were classified accordingly: the fast accurates were made up of those subjects whose response times and error scores were below the median; the slow inaccurates were those whose response latency and error rate were above the median. In a review of previous studies of conceptual tempo, the mean median cut-off employed for categorizing impulsive and reflective 4th grade subjects was approximately 10 seconds for response latency and 10 total errors for the error score (Kagan, 1966; Kopfstein, 1973). Those values will be used in this study as indicated in Table 2.

Table 2

| | Response Latency | Error Scores |
|---|---|---|
| Reflectives | 10 sec. or above | 9 or below |
| Impulsives | Below 10 sec. | 10 or above |
| Fast Accurates | Below 10 sec. | 9 or below |
| Slow Inaccurates | 10 sec. or above | 10 or above |

The IAR scale is composed of 34 forced-choice items. Seventeen items describe positive achievement experiences and 17 items describe negative achievement experiences. The experiences are supposed to represent routine occurences for a child. The stem of each item is followed by two alternatives--one stating that the event occurred because of the behavior of someone else in the child's immediate environment the other indicating the child as responsible for the event. Positive event items are indicated by a plus sign (I+) and negative event items by a minus sign (I-). The total score (I) is obtained by summing all the plus and minus subscores (for example, eight positive event items plus seven negative event items equal a total score of 15). The higher the score, the greater the indication that the child believes in his own control of reinforcements in an intellectual-academic achievement situation.

The following are positive and negative event items from the IAR scale:

If a teacher passes you to the next grade, would it probably be

___a. because she liked you, or
I+ ___b. because of the work you did?

When you have trouble understanding something in school, is it usually

___a. because the teacher didn't explain it clearly, or
I- ___b. because you didn't listen carefully.

A tape recorded adult female voice of the reading of the IAR questionaire was provided for the subjects so that they might follow along at the recorded pace if desired, and also to control for any reading difficulties that might have been evident.

The Sense of Control Scale is a five item Likert-type scale: strongly disagree to strongly agree. The scale assesses the felling of the amount of control a child has over his environment in relationship to his school performance. Each branch of the item had a weighted value of 1 to 4. A total score of 20 was possible. The higher the score, the greater the degree of the perceived control one has over his own destiny. A tape recorded reading of the Sense of Control Scale was also provided for the subjects.

Teacher ratings were gathered for each subject and served as indices of classroom success. The ratings were numerical transformations (1 to 4: poor to excellent) of the evaluation of pupils expressed in statements or terms used by teachers on the pupils' records. The records were also presented to parents as a form of pupil evaluation during parent-teacher conference periods. The ratings were a cumulative evaluation of each child's academic achievement and social habits. A list of the rating values and the type of terms or statements used by the teachers is presented in Table 3.

Table 3

| Terms or Statements | Rating Values |
|---|---|
| Poor<br>Unsatisfactory<br>Needs Improvement<br>Below Average | 1 |
| Fair<br>Satisfactory<br>Average | 2 |
| Good<br>Higher Than Average<br>Better Than Average<br>Above Average | 3 |
| Excellent<br>Outstanding | 4 |

Teacher conducted standardized achievement reading and math test scores from the Metropolitan Achievement Test were obtained and served as measures of academic achievement, as did the Michigan Educational Assessment Program criterion-referenced tests on math and reading objectives: the Minimal Performance Objective Reading Test and the Minimal Performance Objective Math Test. For the criterion-referenced tests, the mathematic test contains measures of 35 "minimal performance objectives," and the reading test has 23 measures of "minimal performance objectives."

IQ scores derived from the school district authorized Otis-Lennon Mental Ability Test were used as standardized measures of school-related intelligence.

# APPENDIX C

## HYPOTHESES

Hypotheses

The level of significance for testing all hypotheses will be at .05.

General Hypothesis 1: Reflective and fast accurate subjects will significantly differ on the eight dependent variables from impulsive and slow inaccurate subjects.

1. Reflective and fast-accurate subjects will have higher standardized math achievement test scores.
2. Reflective and fast-accurate subjects will have higher standardized reading achievement test scores.
3. Reflective and fast-accurate subjects will have higher criterion-referenced math test scores.
4. Reflective and fast-accurate subjects will have higher criterion-referenced reading scores.
5. Reflective and fast accurate subjects will have higher teacher ratings.
6. Reflective and fast accurate subjects will have higher IQ scores.
7. Reflective and fast accurate subjects will have higher intellectual achievement responsibility.
8. Reflective and fast accurate subjects will have higher sense of control.

General Hypothesis 2: Reflective and fast accurate subjects will not significantly differ on the six dependent variables: reading achievement, arithmetic achievement, teacher rating, intellectual achievement responsibility, sense of control, and IQ scores.

General Hypothesis 3: Impulsive and slow inaccurate subjects significantly differ on the six dependent variables.

1. Impulsive subjects will have higher standardized reading achievement test scores.
2. Impulsive subjects will have higher standardized math achievement test scores.
3. Impulsive subjects will have higher criterion-referenced reading test scores.

4. Impulsive subjects will have higher criterion-referenced math test scores.
5. Impulsive subjects will have higher teacher ratings.
6. Impulsive subjects will have higher IQ scores.
7. Impulsive subjects will have higher intellectual achievement responsibility.
8. Impulsive subjects will have higher sense of control.

General Hypothesis 4: High socioeconomic status subjects and low socioeconomic status (SES) subjects will significantly differ on the six dependent variables.

1. High SES subjects will have higher standardized reading achievement test scores.
2. High SES subjects will have higher standardized math achievement test scores.
3. High SES subjects will have higher criterion-referenced reading test scores.
4. High SES subjects will have higher criterion-referenced math test scores.
5. High SES subjects will have higher teacher ratings.
6. High SES subjects will have higher IQ scores.
7. High SES subjects will have higher intellectual achievement responsibility.
8. High SES subjects will have higher sense of control.

General Hypothesis 5: Conceptual tempo and SES will significantly interact with the six dependent variables.

## APPENDIX D

## OVERALL REPORT OF RESULTS AND TABLES

The design was a 2 X 4 analysis with eight dependent variables. Because of the number of observing variables, a multivariate analysis of variance (MANOVA) was the statistical technique employed.

All observations except IQ scores were obtained for each S. However, because of the necessary computer programming constraints for MANOVA, it was necessary to supply IQ values for any missing IQ data encountered. Since each S was categorized relative to SES and conceptual tempo, a group mean of each dependent variable could be calculated. The cell mean for obtained IQ scores was used as the value for those Ss (42) who had missing IQ data. Table 1 illustrates the full cells as opposed to the cells containing missing IQ data.

Table 1.--The Number of Ss per Full Cell for Each Category Except IQ. Numerals in Parentheses Represent the Number of Ss Whose IQ Data was Collected.

| | Low SES | High SES |
|---|---|---|
| Reflective | 26 (16) | 29 (27) |
| Impulsive | 36 (23) | 35 (32) |
| Slow Inaccurate | 15 ( 7) | 9 ( 8) |
| Fast Accurate | 13 (10) | 17 (16) |
| Total | 90 (56) | 90 (83) |

The overall mean per cell is displayed in Tables 2 and 3 for high and low SES Ss. Observed cell means for all eight observations from high SES Ss: MPORT (Minimal Performance Objective Reading Test), MPOMT (Minimal Performance Objective Math Test), MART (Metropolitan Achievement Reading Test), MAMT (Metropolitan Achievement Math Test), IQ (IQ scores as derived from the Otis-Lennon Mental Ability Test), TR (Teachers Ratings), IAR (Intellectual Academic Responsibility), and SC (Sense of Control).

HIGH SES

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Reflective | 17.76 | 31.14 | 4.65 | 4.76 | 115.24 | 3.09 | 24.97 | 16.07 |
| Impulsive | 14.29 | 29.60 | 4.43 | 4.40 | 113.43 | 2.49 | 22.77 | 15.43 |
| Slow Inaccurate | 16.22 | 32.00 | 4.49 | 4.38 | 110.44 | 3.22 | 24.11 | 14.67 |
| Fast Accurate | 16.35 | 30.53 | 5.06 | 4.75 | 155.82 | 3.00 | 24.06 | 15.71 |

Observed cell means for all eight observations from low SES Ss

LOW SES

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Reflective | 8.88 | 23.31 | 2.91 | 3.34 | 92.00 | 2.54 | 21.50 | 13.46 |
| Impulsive | 5.97 | 21.94 | 2.65 | 3.02 | 85.86 | 2.28 | 21.86 | 13.69 |
| Slow Inaccurate | 6.87 | 19.27 | 2.47 | 2.64 | 90.73 | 2.03 | 20.27 | 13.27 |
| Fast Accurate | 11.46 | 27.77 | 3.59 | 3.76 | 102.23 | 3.08 | 23.92 | 14.31 |

The use of MANOVA is appropriate when the assumption of no correlations between the observed variables cannot be met. As shown in Table 4, the sample correlation matrix demonstrated that all the variables are interdependent, with all correlations significant at $p<.01$ except for IAR and IQ which had probability levels of $p<.05$. Therefore the assumption of correlation cannot be maintained, and hence MANOVA was employed.

Table 2.--Cell Means for High SES Reflective, Impulsive, Slow-Inaccurate, and Fast Accurate Ss. Standard Deviations are in Parentheses.

| | High SES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
| Reflective | 17.76 (5.77) | 31.14 (5.27) | 4.65 (1.46) | 4.76 (1.07) | 115.24 (10.82) | 3.09 (.90) | 24.97 (3.77) | 16.07 (2.59) |
| Impulsive | 14.29 (7.24) | 29.60 (6.58) | 4.43 (1.70) | 4.40 (1.08) | 113.43 (21.98) | 2.49 (.83) | 22.77 (3.79) | 15.43 (2.91) |
| Slo-Inacc | 16.22 (7.40) | 32.00 (2.40) | 4.49 (1.77) | 4.38 (1.52) | 110.44 (11.14) | 3.22 (.83) | 24.11 (4.11) | 14.67 (2.35) |
| Fast-Acc | 16.35 (7.89) | 30.53 (5.92) | 5.06 (1.93) | 4.75 (1.05) | 115.82 (15.71) | 3.00 (.90) | 24.06 (3.77) | 15.71 (2.39) |

Table 3.--Cell Means for Low SES Reflective, Impulsive, Slow-Inaccurate, and Fast-Accurate Ss. Standard Deviations are in Parentheses.

| | Low SES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
| Reflective | 8.88 (7.67) | 23.31 (9.34) | 2.91 (1.09) | 3.34 (1.05) | 92.00 ( 7.56) | 2.54 (.84) | 21.50 (3.50) | 13.46 (2.83) |
| Impulsive | 5.97 (6.10) | 21.94 (8.45) | 2.65 ( .66) | 3.02 ( .61) | 85.86 ( 8.21) | 2.28 (.69) | 21.86 (3.15) | 13.69 (2.59) |
| Slo-Inacc | 6.87 (7.96) | 19.27 (8.03) | 2.47 ( .93) | 2.64 ( .84) | 90.73 ( 5.98) | 2.03 (.81) | 24.11 (4.11) | 14.67 (2.39) |
| Fast-Acc | 11.47 (7.62) | 27.77 (7.35) | 3.59 (1.62) | 3.76 (1.08) | 102.23 (12.06) | 3.08 (.70) | 23.92 (5.01) | 14.31 (3.12) |

Table 4.--Sample Correlation Matrix for the Eight Observation Variables.

| | MPORT | MPOMT | MART | MAMT | IQ | IAR | SC | TR |
|---|---|---|---|---|---|---|---|---|
| MART | 1.00 | | | | | | | |
| MAMT | .66 | 1.00 | | | | | | |
| MART | .65 | .42 | 1.00 | | | | | |
| MAMT | .63 | .49 | .72 | 1.00 | | | | |
| IQ | .38 | .30 | .48 | .47 | 1.00 | | | |
| IAR | .27 | .22 | .36 | .31 | .17 | 1.00 | | |
| SC | .29 | .26 | .40 | .41 | .28 | .28 | 1.00 | |
| TR | .58 | .50 | .53 | .55 | .36 | .25 | .40 | 1.00 |

The model to be tested for fit is $y = \mu + \alpha i + \beta j + eij$; where:

$y$ = observation variables
$\mu$ = population
$\alpha i$ = socioeconomic status
$\beta j$ = conceptual tempo
$eij$ error term

The claim of the model is that there will be no interaction. As shown by tables 5 and 6, the estimated means and residuals in the form of t statistics respectively, the vast majority of the t scores were not significant. Thus the model seemed appropriate.

The test for interaction yielded a multivariate F of 1.2447 ($df = 3/172$, $p < .20$) that indicated no significant interaction. Thus the previous decision concerning the absence of interaction in the test of the fit of the model ($y = \mu + \alpha i + \beta j + e$ instead of $y = \mu + \alpha i + \beta j + \gamma + e$) is confirmed.

The hypothesis of a significant difference related to socio-economic status was supported by the multivariate F of 21.6510 ($df = 1/172$, $p < .0001$).

Hummel and Sligo (1971) stated that a test of MANOVA followed by univariate ANOVA is a suggested technique when dependent measures are correlated. They reasoned that such an approach results in a conservative experimentwise error rate (the probability that at least one comparison will be significant when in fact the null

Table 5.--Estimated Cell Means for All Eight Variables

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Hi SES Ref. | 17.37 | 31.00 | 4.65 | 4.74 | 115.09 | 3.01 | 24.25 | 15.74 |
| Hi SES Imp. | 14.15 | 29.54 | 4.41 | 4.39 | 111.07 | 2.58 | 23.29 | 15.52 |
| Hi SES SI | 15.41 | 28.75 | 4.32 | 4.15 | 112.45 | 2.72 | 22.92 | 14.98 |
| Hi SES FA | 17.72 | 32.60 | 5.18 | 4.91 | 119.87 | 3.20 | 24.84 | 15.93 |
| Lo SES Ref. | 9.32 | 23.46 | 2.90 | 3.36 | 92.17 | 2.62 | 22.30 | 13.83 |
| Lo SES Imp. | 6.10 | 22.00 | 2.67 | 3.02 | 88.15 | 2.19 | 21.35 | 13.61 |
| Lo SES SI | 7.36 | 21.21 | 2.58 | 2.78 | 89.53 | 2.33 | 20.98 | 13.08 |
| Lo SES FA | 9.67 | 25.06 | 3.44 | 3.54 | 96.94 | 2.81 | 22.90 | 14.02 |

Table 6.--Residuals in the Form of t Statistics

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Hi SES Ref. | .52 | .18 | -.01 | .20 | .11 | .87 | 1.81 | 1.17 |
| Hi SES Imp. | .20 | .09 | .12 | .04 | 1.89 | -1.21 | -1.49 | -.35 |
| Hi SES SI | .47 | 1.81 | .50 | .88 | -.61 | 2.49* | 1.29 | -.48 |
| Hi SES FA | -1.34 | -1.96* | -.59 | -1.10 | -2.08* | -1.71 | -1.43 | -.56 |
| Lo SES Ref. | -.52 | -.18 | .01 | -.20 | -.11 | -.87 | -1.81 | -1.17 |
| Lo SES Imp. | -.20 | -.09 | -.12 | -.04 | -1.89 | 1.21 | 1.49 | .35 |
| Lo SES SI | -.47 | -1.81 | -.50 | -.88 | .61 | -2.49* | -1.29 | .48 |
| Lo SES FA | 1.34 | -1.96* | .59 | 1.10 | 2.08* | 1.71 | 1.43 | .56 |

*$p < .05$

Note.--The residuals in the form of t statistics tested whether or not the observed mean value differed significantly from the estimated mean.

hypothesis is true for an investigation with more than one companion) regardless of the number of variables and the proportion of variance that are in common. The use of the univariate F in the present study followed the method suggested by Hummel and Sligo (1971). As illustrated in Table 7, the univariate F for each observation was significant; thus indicating strong associations with SES on each measure.

Table 7.--Univariate ANOVA Related to SES

| Variable | Mean Square Between | Univariate F | p Less Than |
|---|---|---|---|
| IQ | 24546.69 | 137.6414 | .0001 |
| MATR | 144.54 | 74.9657 | .0001 |
| MATM | 91.16 | 82.8259 | .0001 |
| MART | 3050.45 | 61.6797 | .0001 |
| MAMT | 2722.22 | 51.5394 | .0001 |
| TR | 8.02 | 12.1385 | .0007 |
| IAR | 192.20 | 13.6513 | .0003 |
| SC | 174.05 | 24.3830 | .0001 |

The  level for testing each univariate F will be in accordance to the Bonferroni Inequality index. The purpose is to hold the experimentwise error rate at .05 when the Finn Computer Program (1970) is employed, because the Finn program is designed to compute independent F tests. Therefore, the level of  for hypothesis testing was $\alpha = .05/8 = .006$. The value 8 represents the number of dependent variables.

The observed combined means for SES, as shown in Table 8, indicated that the high SES Ss performed better on all eight measures. All differences were significant as demonstrated by the univariate F tests.

Table 4.--The Means for High and Low SES Ss on the Eight Observation Measures. Standard Deviations are in Parentheses

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| High SES | 15.99 (6.78) | 30.51 (5.62) | 4.62 (1.67) | 4.58 (1.20) | 114.20 (17.34) | 2.85 (.86) | 23.86 (3.92) | 15.61 (2.65) |
| Low SES | 7.76 (7.08) | 22.73 (8.48) | 2.83 ( .97) | 3.15 ( .84) | 90.81 ( 8.21) | 2.43 (.78) | 21.79 (3.66) | 13.64 (2.66) |

Table 5.--The Means for Reflective, Impulsive, Slow-Inaccurate, and Fast-Accurate Ss on the Eight Observation Measures. Standard Deviations are in Parentheses.

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Reflective | 13.56 (6.67) | 27.44 (7.19) | 3.83 (1.28) | 4.09 (1.06) | 104.30 ( 9.28) | 2.83 (.87) | 23.33 (3.64) | 14.84 (2.70) |
| Impulsive | 10.07 (6.66) | 25.72 (7.53) | 3.53 (1.17) | 3.70 ( .84) | 99.45 (15.00) | 2.38 (.76) | 22.31 (3.46) | 14.55 (2.75) |
| Slo-Inacc | 10.37 (7.75 | 24.04 (5.92) | 3.23 (1.31) | 3.29 (1.09) | 98.12 ( 7.91) | 2.48 (.82) | 21.71 (4.02) | 13.79 (2.20) |
| Fast-Acc | 14.23 (7.77) | 29.33 (6.53) | 4.42 (1.80) | 4.32 (1.30) | 109.90 (14.13) | 3.03 (.81) | 24.00 (4.25) | 15.10 (2.71) |

Table 8.--The Observed Combined Means For SES

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| High SES | 15.99 | 30.51 | 4.62 | 4.58 | 114.20 | 2.85 | 23.86 | 15.61 |
| Low SES | 7.76 | 22.73 | 2.83 | 3.15 | 90.81 | 2.43 | 21.79 | 13.64 |

The hypothesis that conceptual tempo was associated with the eight observation variables was not supported at the .05 level of significance by the multivariate F of 1.4172 (df + 3/172, p <.09 but p >.05). Of the univariate F tests, as displayed in Table 9, only teacher rating is significant at the .006 level (the level of significance when Bonferroni's Inequality index is employed). However, for the univariate F tests per se, IQ, MART, MATM, along with TR were variables with p values of less than .05.

Table 9.--Univariate ANOVA Related To Conceptual Tempo

| Variable | Mean Square Between | Univariate F | p Less Than |
|---|---|---|---|
| IQ | 584.88 | 3.2796 | .022 |
| MATR | 4.85 | 2.5167 | .060 |
| MATM | 3.79 | 3.4453 | .018 |
| MART | 146.50 | 2.9623 | .034 |
| MAMT | 93.31 | 1.7666 | .155 |
| TR | 3.57 | 5.4003 | .002 |
| IAR | 26.46 | 1.8794 | .135 |
| SC | 4.55 | .6368 | .592 |

The observed combined means for conceptual tempo are shown in Table 10.

Table 10.--The observed Combined Mean For Conceptual Tempo

| | MPORT | MPOMT | MART | MAMT | IQ | TR | IAR | SC |
|---|---|---|---|---|---|---|---|---|
| Reflective | 13.56 | 27.44 | 3.83 | 4.09 | 104.30 | 2.83 | 23.33 | 14.84 |
| Impulsive | 10.07 | 25.72 | 3.53 | 3.70 | 99.45 | 2.38 | 22.31 | .4.55 |
| Slow Inaccurate | 10.37 | 24.04 | 3.23 | 3.29 | 98.12 | 2.48 | 21.71 | 13.79 |
| Fast Accurate | 14.23 | 29.33 | 4.42 | 4.32 | 109.90 | 3.03 | 24.00 | 25.10 |

Because of the differences observed in the factor of conceptual tempo, a post hoc comparison using the least squares estimates of effects and the standard error of least squares estimates was applied. This was done in order to examine specific contrasts. Comparisons made on the variables of IAR and sense of control were not presented in view of the small univariate F ratios ($F = 1.8794$, $p < .13$ and $F = .6368$, $p < .59$ respectively), it was found that no significant contrasts existed in those two areas. Tables 11 and 12 show the conceptual tempo comparisons along the academic related measures.

Table 11.--Contrasts of Conceptual Tempo Through the Application of Least Squares Estimates of Effects (LSE) and the Standard Error of Least Squares Estimates (SE of LSE).

| Comparisons | MPORT | | MPOMT | | MART | |
|---|---|---|---|---|---|---|
| | SE of LSE | LSEE | SE of LSE | LSEE | SE of LSE | LSEE |
| Ref. - Imp. | 1.263757 | 3.2169* | 1.306006 | 1.4593 | .249528 | .2403 |
| Ref. - SI | 1.727913 | 1.9627 | 1.785679 | 2.2465 | .341176 | .3307 |
| Ref. - FA | 1.596708 | -.3525 | 1.650087 | -1.5999 | .315269 | -.5292 |
| Imp. - SI | 1.665151 | -1.2543 | 1.720819 | .7827 | .328783 | .0905 |
| Imp. - FA | 1.533348 | -3.5695* | 1.584609 | -3.0592 | .302759 | -.7694* |
| SI - FA | 1.936517 | -2.3152 | 2.001257 | -3.8464 | .382364 | -.8599* |

Table 12.--Contrasts of Conceptual Tempo Through the Application of Least Squares Estimates of Effects (LSEE) and the Standard Error of Least Squares Estimates (SE of LSE).

| Comparisons | MAMT | | IQ | | TR | |
|---|---|---|---|---|---|---|
| | SE of LSE | LSEE | SE of LSE | LSEE | SE of LSE | LSEE |
| Ref. - Imp. | .188531 | .3430 | 2.399799 | 4.0172 | .146089 | .4336** |
| Ref. - SI | .257775 | .5866* | 3.281202 | 2.6390 | .199745 | .2888 |
| Ref. - FA | .238201 | .1787 | 3.032051 | 4.7758 | .184578 | .1907 |
| Imp. - SI | .248412 | .2436 | 3.162021 | -1.3782 | .192490 | -.1449 |
| Imp. - FA | .228749 | -.5217* | 2.911735 | -8.7930** | .177253 | -.6243*** |
| SI - FA | .288895 | -.7653** | 3.677328 | -7.4148* | .223859 | -.4795* |

For Tables 11 and 12:
* $p < .05$
** $p < .01$
*** $p < .001$

Through the application of the post hoc procedure it was found that reflective Ss had higher Michigan Assessment Reading Test scores ($p < .05$) and higher teacher ratings ($p < .01$) than impulsive Ss. Reflective Ss also had higher Metropolitan Achievement Math Test scores ($p < .05$) than slow inaccurate Ss. Fast accurate Ss had higher Michigan Assessment Math Test scores ($p < .05$), Metropolitan Achievement Reading Test scores ($p < .05$), Metropolitan Achievement Math Test scores ($p < .05$), IQ scores ($p < .01$), and teacher ratings ($p < .001$) than impulsive Ss. Fast accurate Ss also compiled higher Metropolitan Achievement Reading Test scores ($p < .05$), Metropolitan Achievement Math Test scores ($p < .01$), IQ scores ($p < .05$), and teacher ratings ($p < .05$) than slow inaccurate Ss. No significant differences on any measures were found between reflective and fast-accurates or between impulsives and slow-inaccurates.

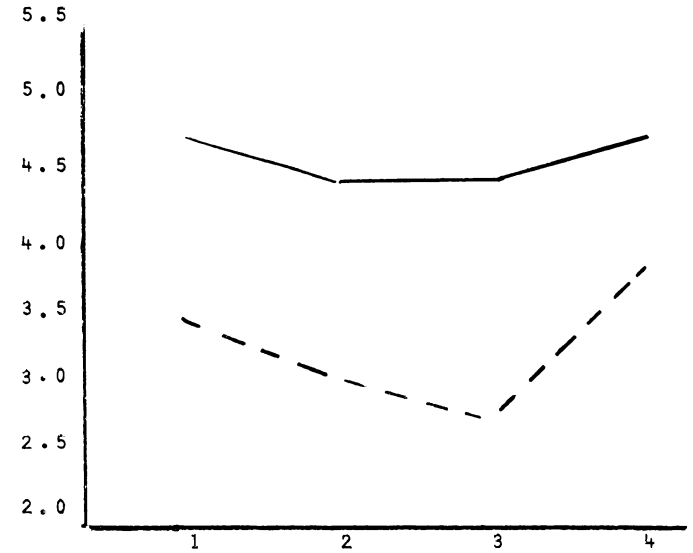

Key:

1 = Reflective

2 = Impulsive

3 = Slow-Inaccurate

4 = Fast-Accurate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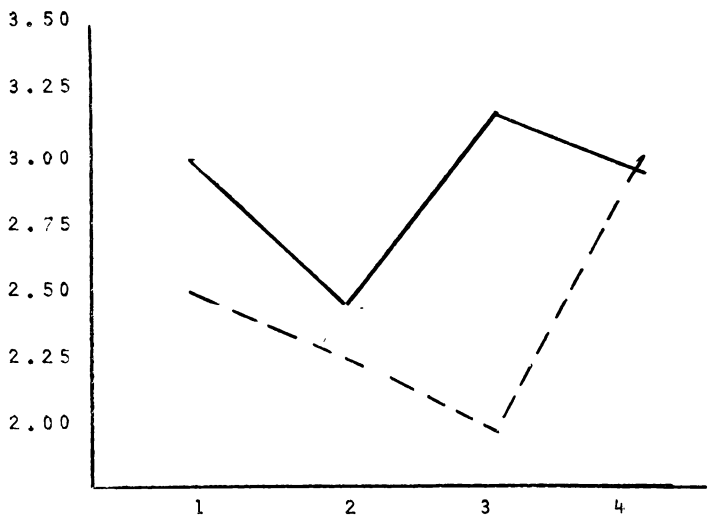
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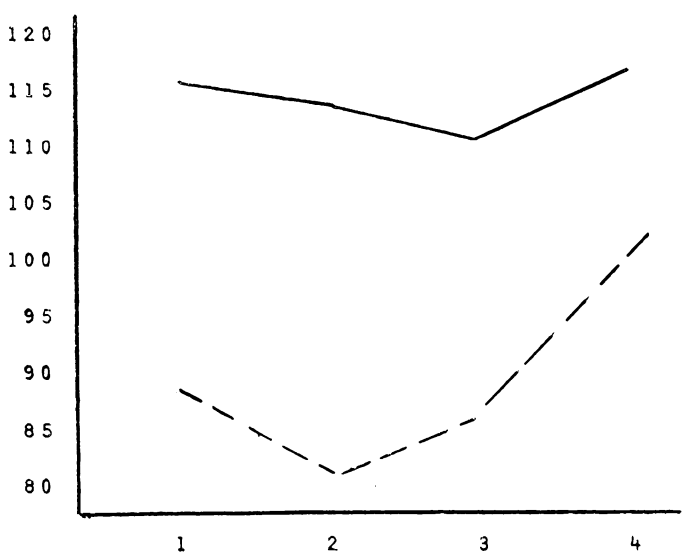
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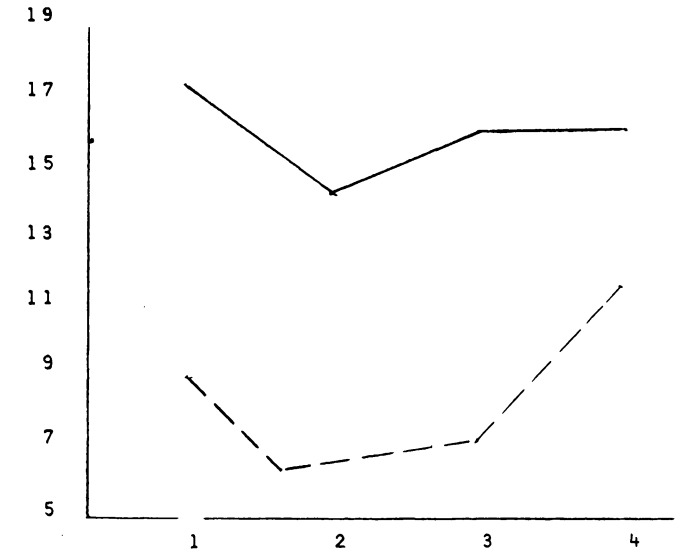
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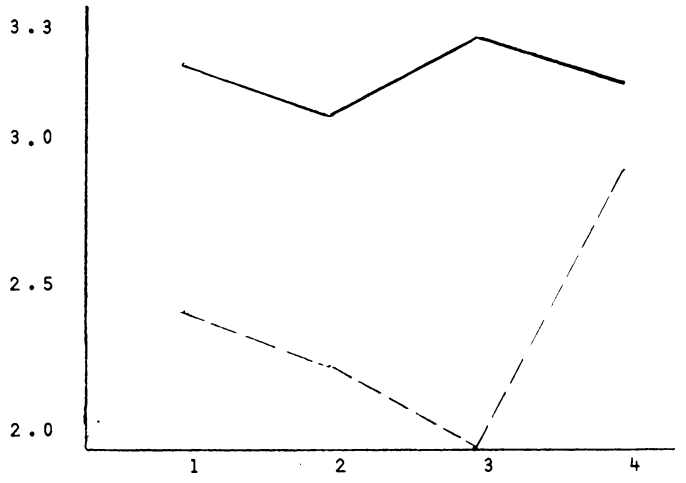
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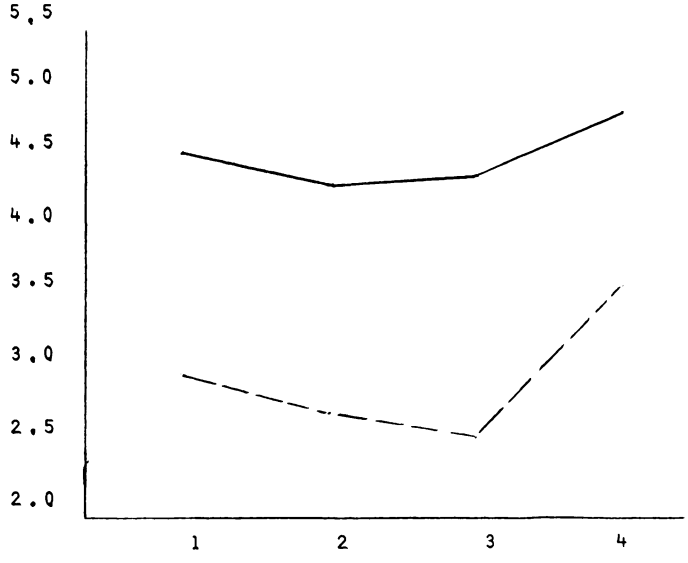
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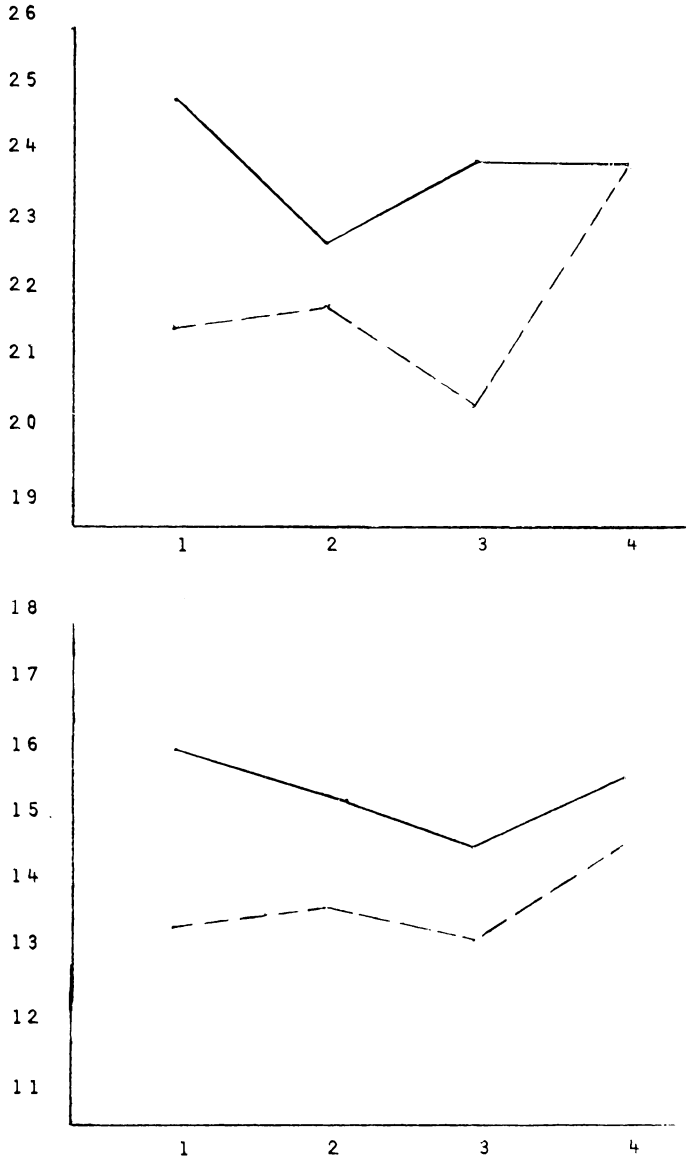
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# APPENDIX F

## TESTS OF HYPOTHESES

The level of significance for testing all hypotheses will be at the .05 probability level.

General Hypothesis 1: Both reflective and fast-inaccurate subjects on the eight dependent variables: scores on standardized math achievement tests, standardized reading achievement tests, criterion-referenced math achievement tests, criterion-referenced reading achievement tests, teacher ratings, IQ, intellectual achievement responsibility, and sense of control.

1. Both reflective and fast accurate subjects will have higher standardized math achievement test scores.

The hypothesis was accepted for fast accurates over impulsives ($p < .05$) and slow-inaccurates ($p < .01$), and also for reflectives over slow-inaccurates but no significant difference was found between reflectives and impulsives.

2. Both reflective and fast accurate subjects will have higher standardized reading achievement test scores.

The hypothesis was accepted for fast-accurates over impulsives ($p < .05$) and slow-inaccurates ($p < .05$), but no significant differences were found between reflectives and impulsives nor reflectives and slow-inaccurates.

3. Both reflective and fast-accurate subjects will have higher criterion-referenced math achievement test scores.

The hypothesis was rejected. No significant differences were found.

4. Both reflective and fast-accurate subjects will have higher criterion-referenced reading achievement test scores.

The hypothesis was accepted for fast-accurates over impulsives ($p < .05$) and reflectives over impulsives ($p < .05$), but no significant differences were found between reflectives and slow-inaccurates nor between fast-accurates and slow-inaccurates.

5. Both reflective and fast-accurate subjects will have higher teacher ratings.

The hypothesis was accepted fast-accurates over impulsives ($p < .001$) and slow-inaccurates ($p < .05$), and also for reflectives over impulsives ($p < .01$) but no significant difference was found between reflectives and slow-inaccurates.

6. Both reflective and fast-accurate subjects will have higher IQ scores.

The hypothesis was accepted for fast-accurates over impulsives ($p < .01$) and slow-inaccurates ($p < .05$), but no significant differences were found between reflectives and impulsives nor reflectives and slow-inaccurates.

7. Both reflective and fast-accurate subjects will have higher intellectual achievement responsibility scores.

The hypothesis was rejected. No significant differences were found.

8. Both reflective and fast-accurate subjects will have higher sense of control scores.

The hypothesis was rejected. No significant differences were found.

General Hypothesis 2: Reflective and fast-accurate subjects will not significantly differ on the eight dependent variables.

The hypothesis was accepted. No significant differences were found on any of the dependent variables when reflectives and fast-accurates were contrasted.

General Hypothesis 3: Impulsive and slow-inaccurate subjects will significantly differ on the eight dependent variables.

The hypothesis was rejected. No significant differences on any of the dependent variables were found when impulsives and slow-inaccurates were contrasted.

General Hypothesis 4: High socioeconomic status and low socioeconomic status subjects will significantly differ on the eight dependent variables.

The hypothesis was accepted for all dependent variables (multivariate $F = 21.65$, $df = 1/172$, $p < .0001$).

General Hypothesis 5: Conceptual tempo and socioeconomic status will significantly interact on the eight dependent variables.

The hypothesis was rejected (multivariate $F = 1.25$, $df = 3/172$, $p < .20$).

APPENDIX G

MATCHING FAMILIAR FIGURES

Answer Sheet

Set 1 - F

Note: First two items are practice

| Item | | |
|---|---|---|
| | 1. | house . . . . 1 |
| | 2. | scissors. . . 6 |
| | 3. | phone . . . . 3 |
| | 4. | bear. . . . . 1 |
| | 5. | tree. . . . . 2 |
| | 6. | leaf. . . . . 6 |
| | 7. | cat . . . . . 3 |
| | 8. | dress . . . . 5 |
| | 9. | giraffe . . . 4 |
| | 10. | lamp. . . . . 5 |
| | 11. | boat. . . . . 2 |
| | 12. | cowboy. . . . 4 |

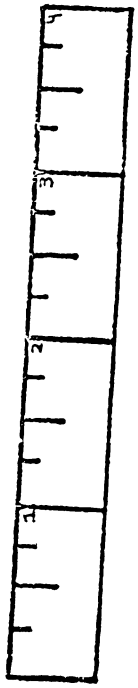
Kagan 9/29/65

## 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)." Concinue 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.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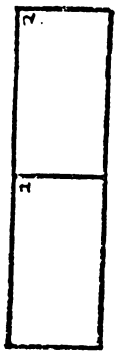
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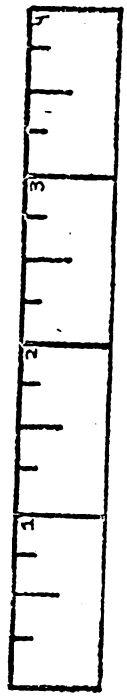
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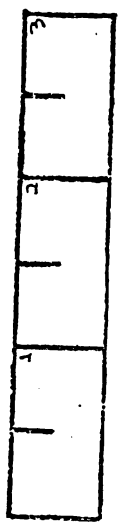
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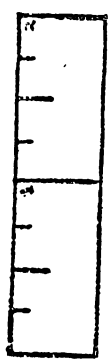
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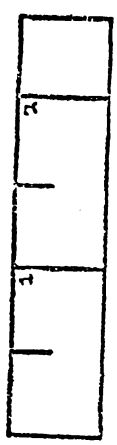
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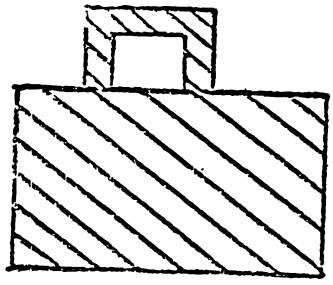

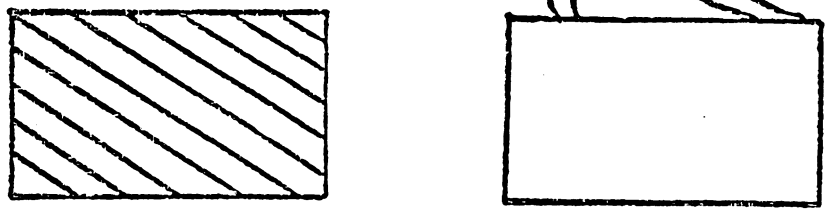

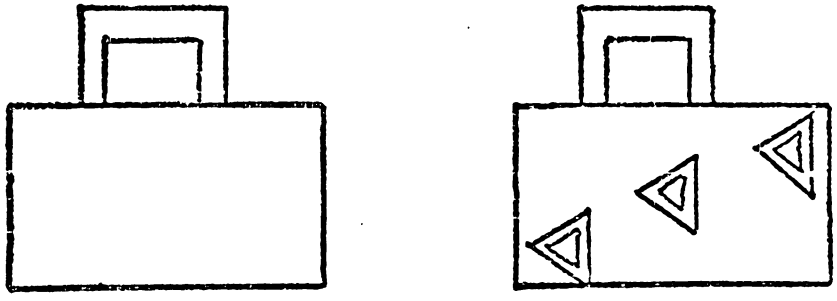

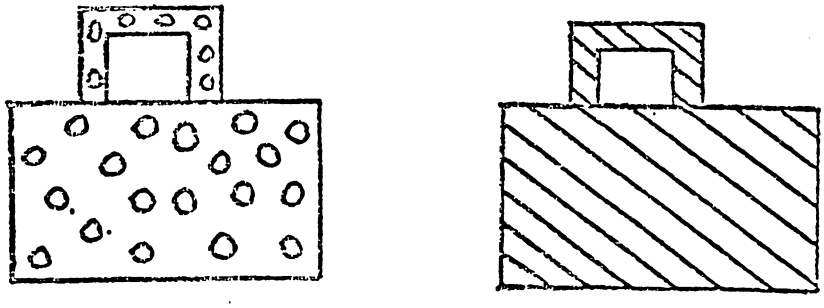

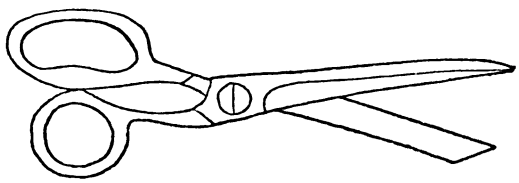

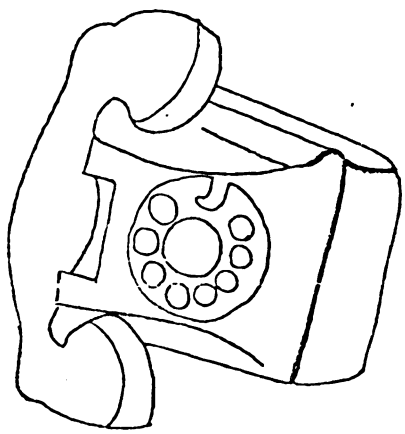

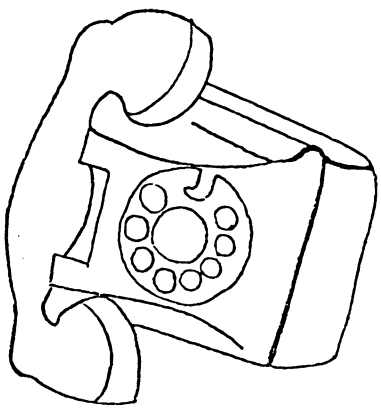

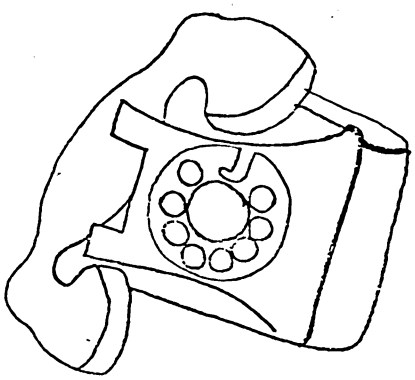

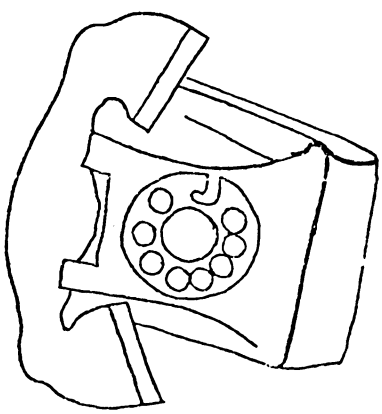

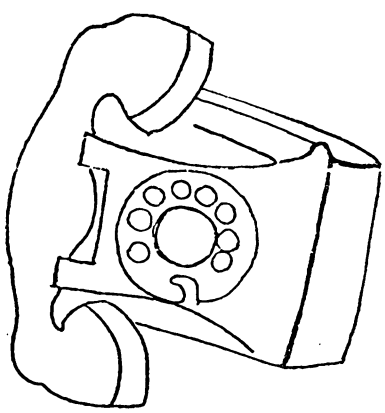

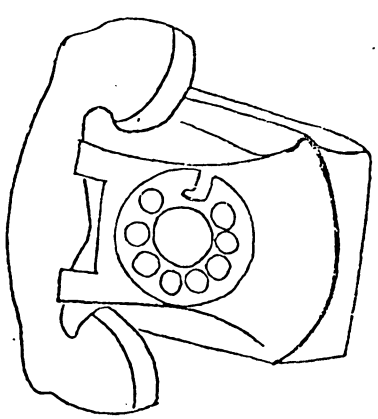

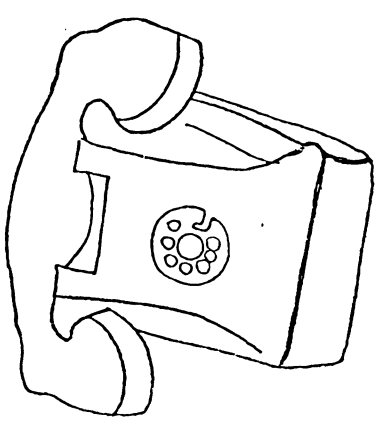

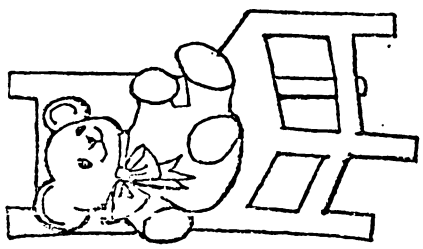

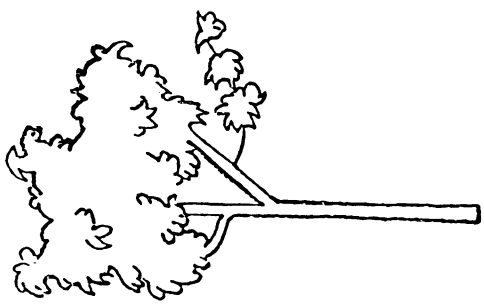

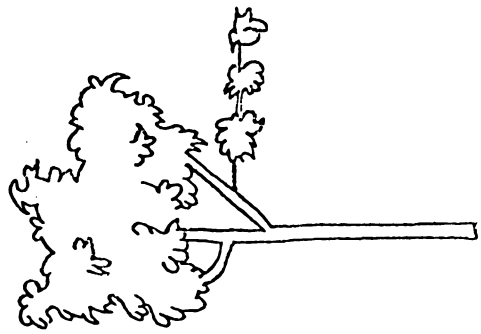

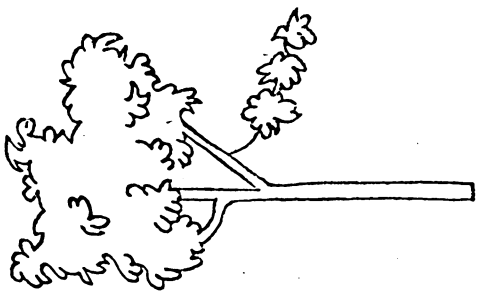

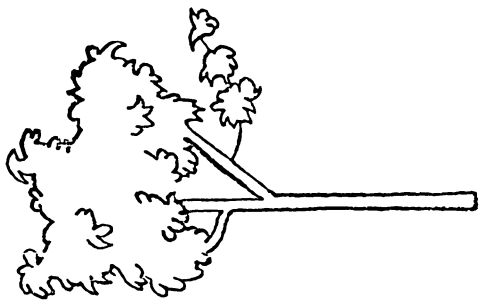

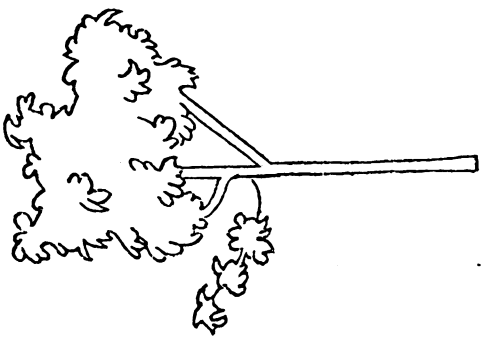

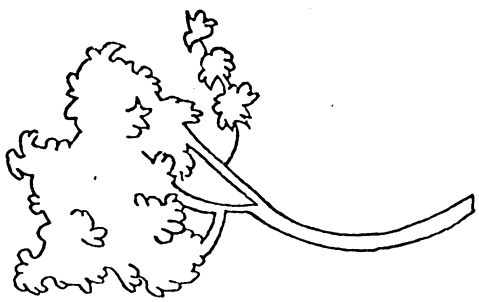

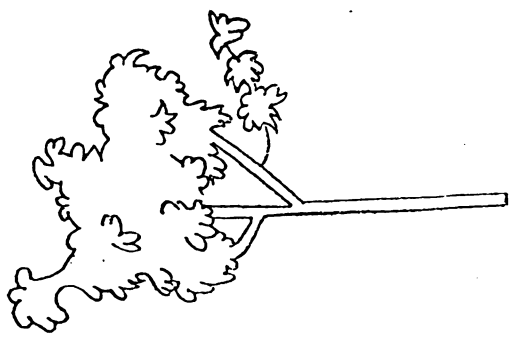

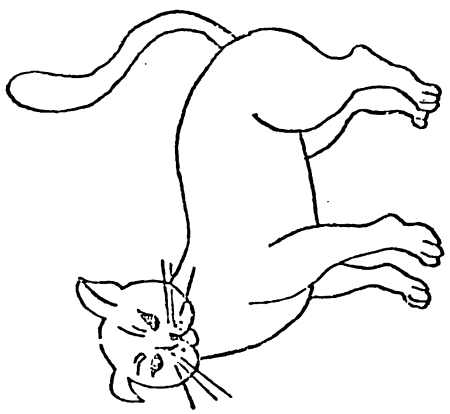

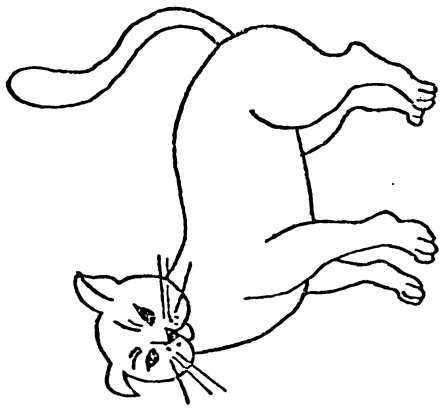

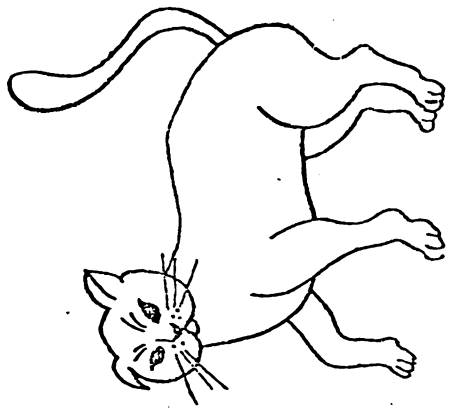

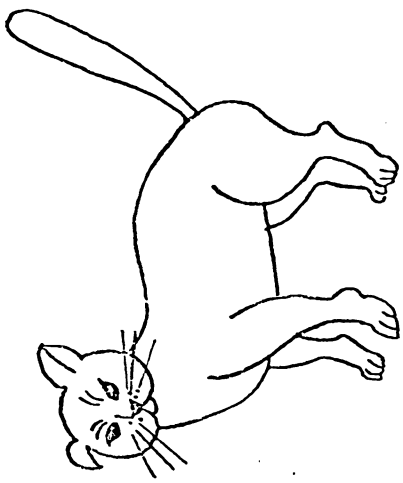

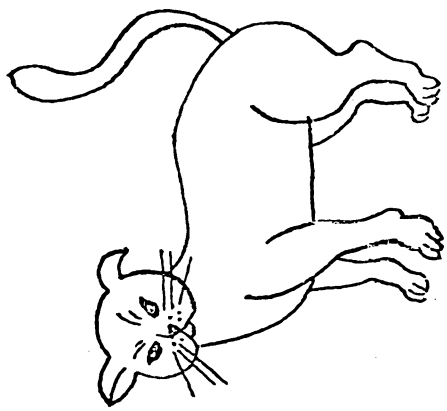

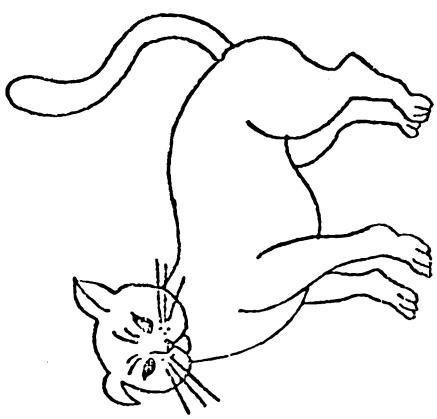

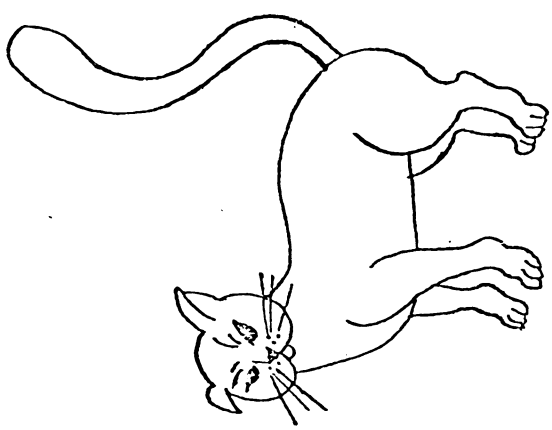

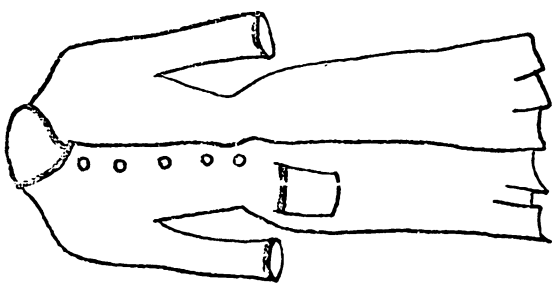

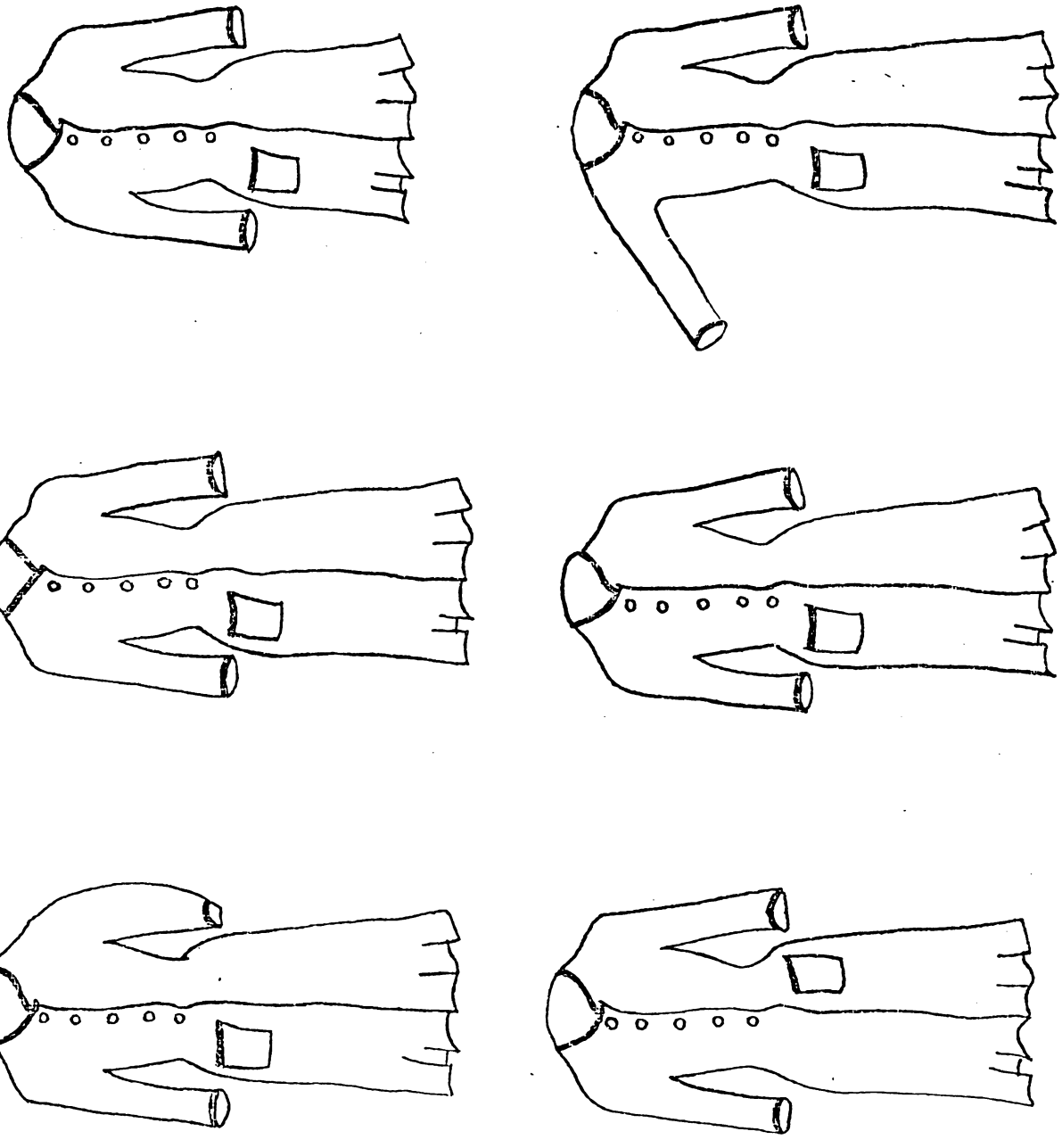

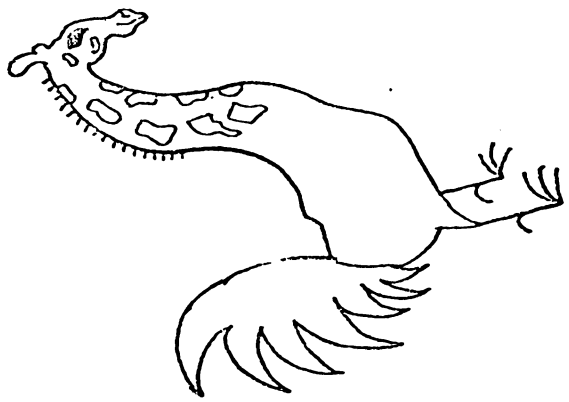

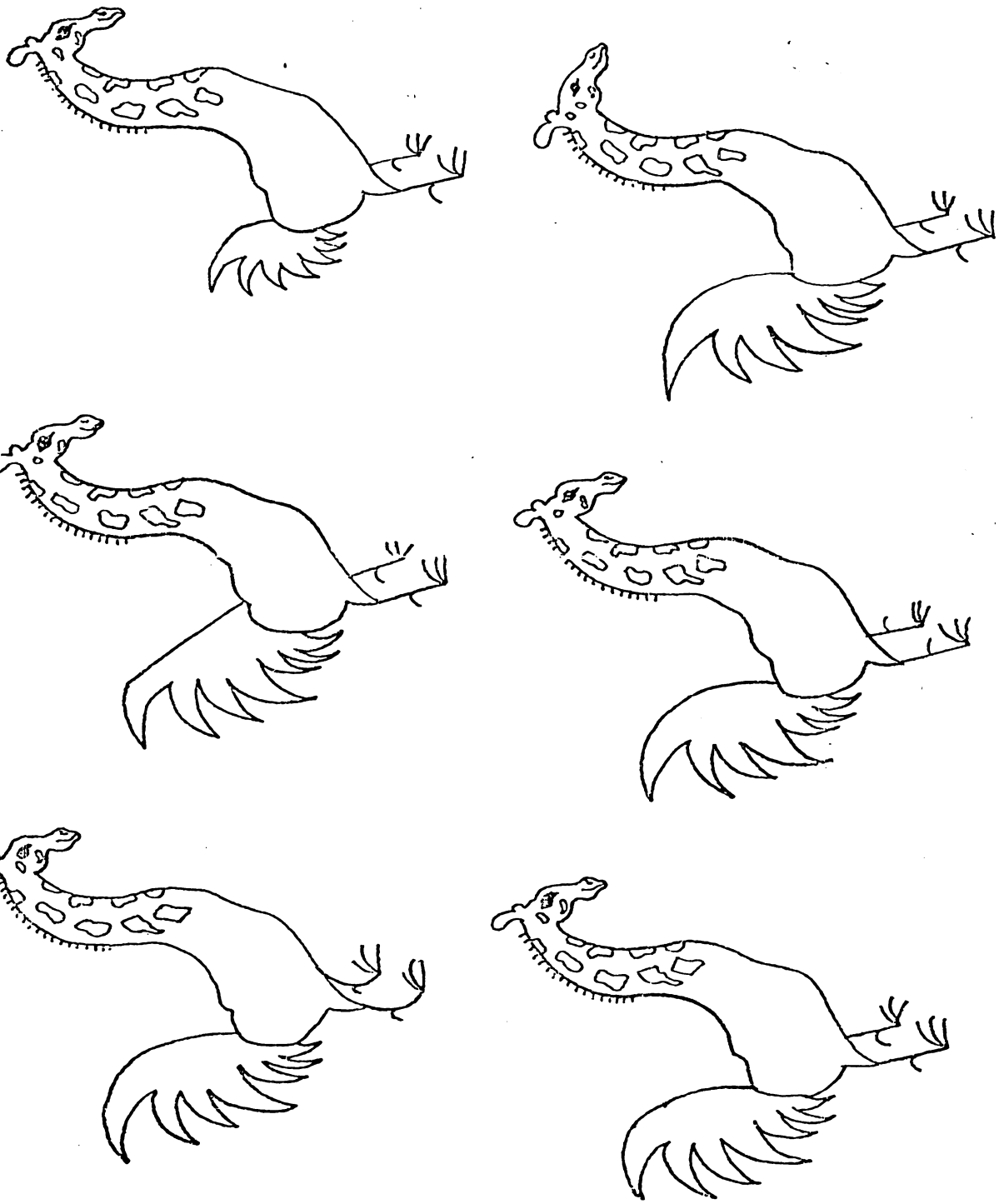

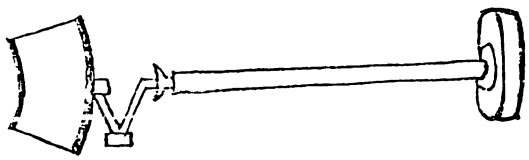

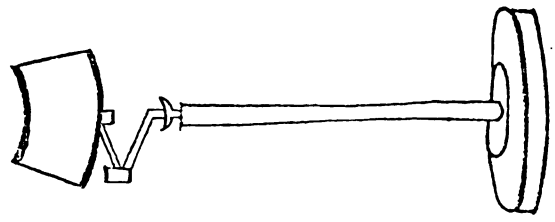

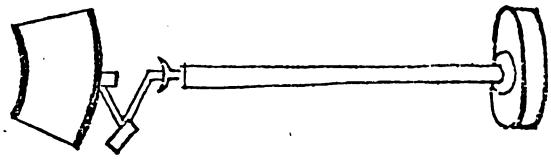

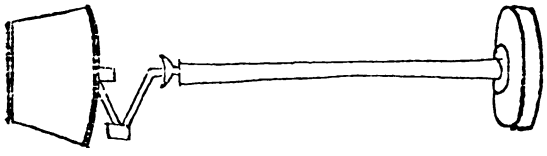

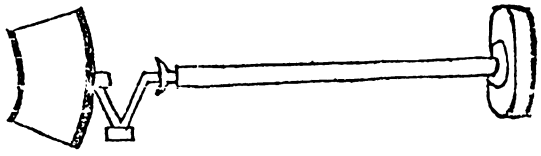

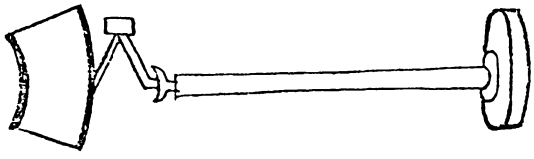

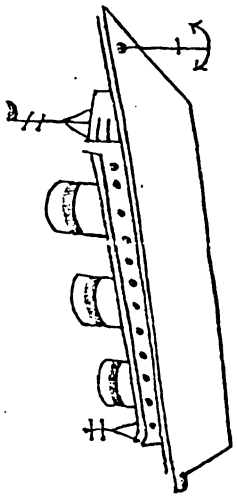

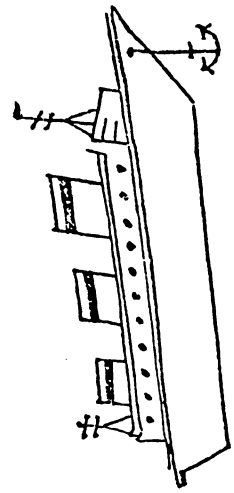

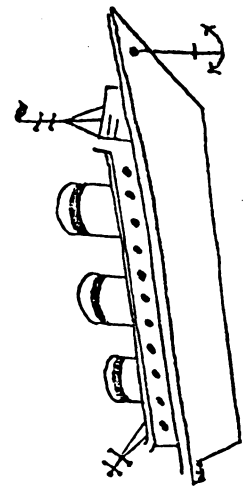

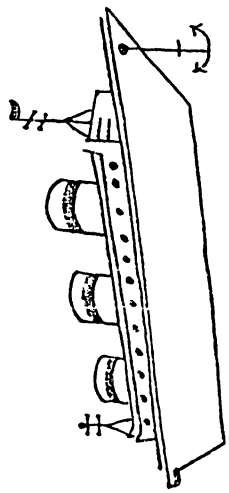

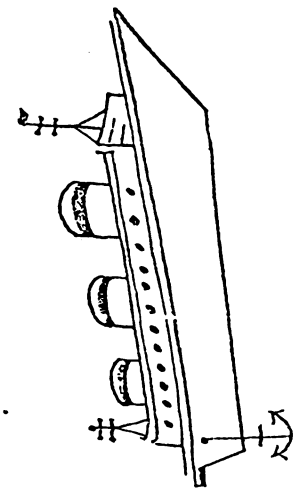

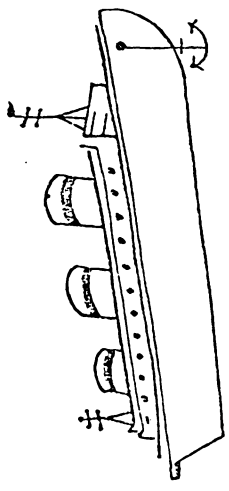

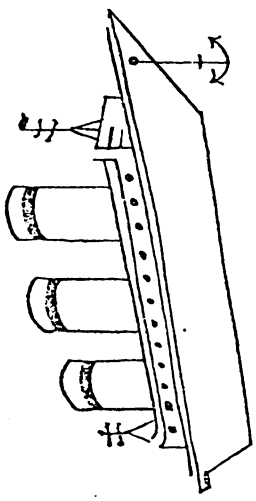

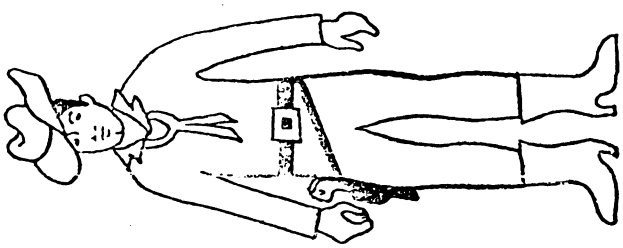

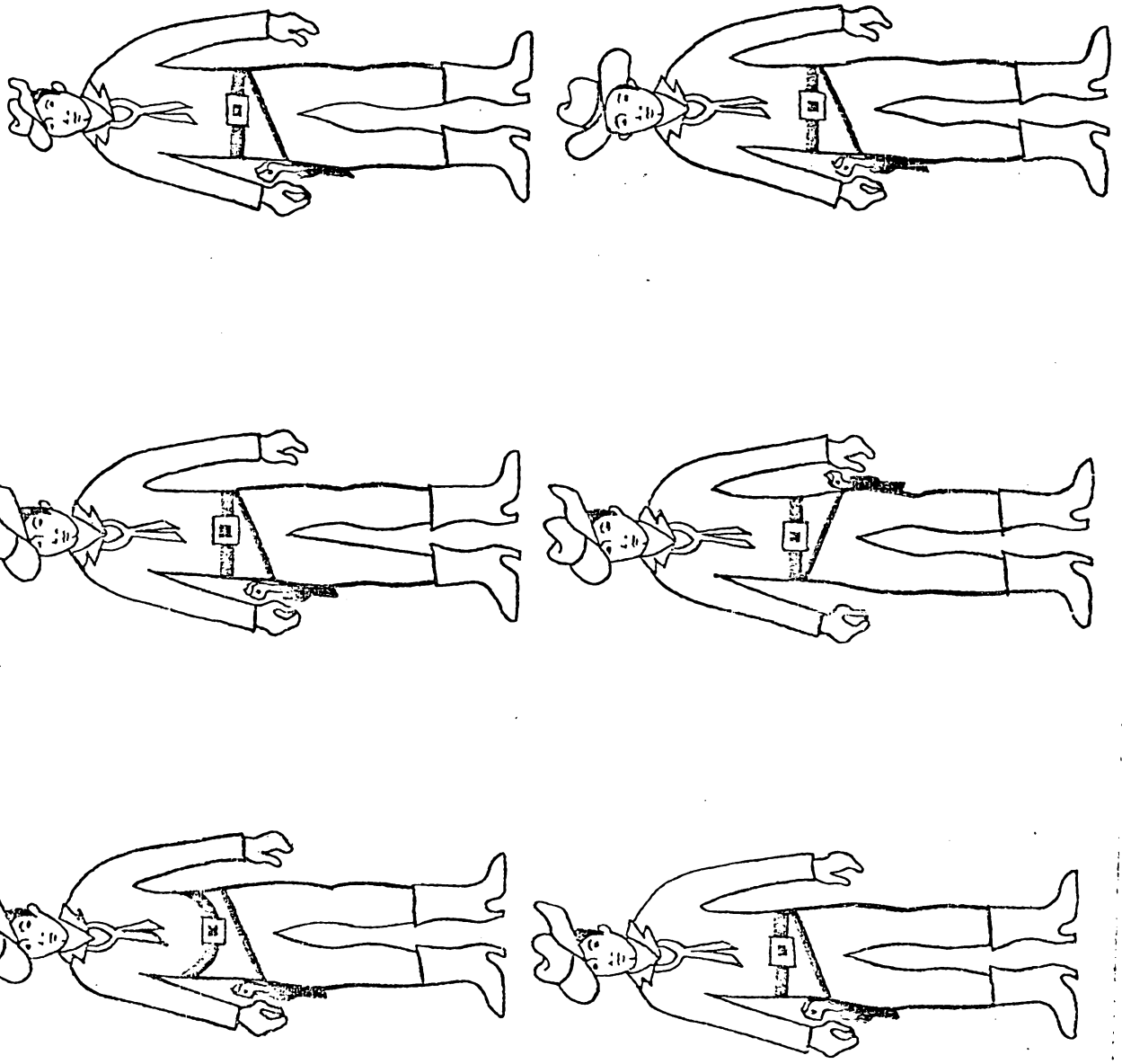

# APPENDIX H

## APPENDIX B. FROM THE McGUIRE-WHITE SCALE

For Coding in Line J Section 1-Occupational Level
(L-M Project: Score 0 for No Information)

Code J

Level 1

*Professionals*.-Lawyer, judge, physician, engineer, professor, school superintendent, et al.

*Proprietors*.-Large businesses valued at $100,ooo or more, depending on community.

*Businessmen*.-Top Executive president, et al., of corporations, banks, public utilities.

*White collar*.-CPA; editor of newspaper, magazine; executive secretary of status organization.

*Blue collar*.-None.

*Service*.-None.

*Farm people*.-Gentlemen farmers or landowners who do not supervise directly their property.

Level 2

*Professionals*.-High school teacher, librarian, and others with four-year degrees.

*Proprietors*.-Businesses valued at $50,000 to $100,000.

*Businessmen*.-Assistant office and department managers or supervisors; some manufacturing agents.

*White collar*.-Accountant; insurance, real estate, stock salesmen; editorial writers.

*Blue collar*.-None.

*Service*.-None.

*Farm people*.-Land operators who supervise properties and have an active urban life.

Level 3

*Professionals*.-Grade school teacher, registered nurse, minister without four-year degree.

*Proprietors*.-Business or equity valued from $10,000 to $50,000.

*Businessmen*.-Managers of small branches or buyers and salesmen of known merchandise.

*White collar*.-Bank clerks, auto salesmen, postal clerks, railroad or telephone agent or supervisor.

*Blue collar*.-Small contractor who works at or supervises his jobs.

*Service*.-None.

*Farm people*.-Farm owners with "hired help," operators of leased property who supervise.

Level 4

*Professionals*.-None.

*Proprietors*.-Business or equity valued from $5,000 to $10,000.

*Businessmen and white collar*.-Stenographer, bookkeeper, ticket agent, sales people in department stores, et al.

*Blue collar*.-Foreman; master carpenter, electrician, et al; railroad engineer

*Service*.-Police captain, tailor, railroad conductor, watchmaker.

*Farm people*.-Small landowners, operators of rented property hiring "hands."

Level 5

*Professionals*.-None.

*Proprietors*.-Business or equity valued from $2,000 to $5,000.

*Businessmen and white collar*.-Dime store clerks, grocery clerks, telephone and beauty operators, etal.

*Blue collar*.-Apprentice to skilled trades, repairmen, medium skilled worker.

*Service*.-Policeman, barber, practical nurse, brakeman, et al.

*Farm people*.-Tenants on good farms; foremen; owners of farms who "hire out".

Level 6

*Professionals*.-None.

*Proprietors*.- Business or equity valued at less than $2,000.

*Businessmen, white collar, and blue collar*.-Semiskilled factory and production workers, assistants to skilled trade, warehousemen, watchmen.

*Service*.-Taxi and truck drivers, waiter, waitress, gas station attendant.

*Farm people*.-Sharecroppers, established farm laborers.

Level 7

*Professionals*.-None.
*Proprietors*.-None.
*Businessmen*.-None.
*White collar*.-None.
*Blue collar*.-Heavy labor, odd-job men, mine or mill hands, unskilled workers.
*Service*.-Domestic help, busboy, scrubwoman, janitor, janitor's helper.
*Farm people*.-Migrant workers,"squatters" and "nesters".
*Plus*.-The reputed lawbreakers and the unemployed.

## STUDY OF NEGRO INTELLIGENCE AND ACHIEVEMENT

For Coding in line K Section 1-Source of Income
(L-M Project: Score 0 for No Information)

Code K

Level 1

Inherited saving and investments; "old money" reputed to provide basic income.

Level 2

Earned wealth; "new money" has provided "transferable" investment income.

Level 3

Profits, fees, royalties; includes executives who receive a "share of profit."

Level 4

Salary, commissions, regular income aid on monthly or yearly basis.

Level 5

Wages on hourly basis; piecework; weekly checks as distinguished from monthly.

Level 6

Income from "odd jobs" or private relief; "sharecropping" or season work.

Level 7

Public relief or charity; nonrespectable incomes (reputation).

For Coding in Line L Section 1-Education Attainment
(L-M Project: Score 0 for No Information

Code L

Level 1

Completed appropriate graduate work for a recognized profession at highest level; graduate of a generally recognized, high-status, four-year college.

Level 2

Graduate from a four-year college, university, or professional school with a recognized bachelor's degree, including four-year teacher colleges.

Level 3

Attended college or university for two or more years; junior college graduate; teacher education from a normal school; RN from a nursing school.

Level 4

Graduate from high school or completed equivalent secondary education; includes various kind of "post-high" business education or trade school study.

Level 5

Attended high school, completed grade nine, but did not graduate from high school; for persons born prior to 1900, grade eight completed.

Level 6

Completed grade eight but did not attend beyond grade nine; for persons born prior to 1900, grades four to seven would be equivalent.

Level 7

Left elementary or junior high school before completing grade eight; for persons born prior to 1900, no education or attendance to grade three.

# APPENDIX I

NAME_____

SCHOOL_____

GRADE_____

## THE INTELLECTUAL ACADEMIC ACHIEVEMENT RESPONSIBILITY QUESTIONNAIRE

(IAR)

1. If a teacher passes you to the next grade, would it probably be
   _____a. because she liked you, or
   _____b. because of the work you did?

2. When you do well on a test at school, is it more likely to be
   _____a. because you studied for it, or
   _____b. because the test was expecially easy?

3. When you have trouble understanding something in school, is it usually
   _____a. because the teacher didn't explain it clearly, or
   _____b. because you didn't listen carefully?

4. When you read a story and can't remember much of it, is it usually
   _____a. because the story wasn't well written, or
   _____b. because you weren't interested in the story?

5. Suppose your parents say you are doing well in school. Is this likely to happen
   _____a. because your school work is good, or
   _____b. because they are in a good mood?

6. Suppose you did better than usual in a subject at school. Would it probably happen
   _____a. because you tried harder, or
   _____b. because someone helped you?

7. When you lose at a game of cards or checkers, does it usually happen
   _____a. because the other player is good at the game, or
   _____b. because you don't play well?

8. Suppose a person doesn't think you are very bright or clever.
   _____a. can you make him change his mind if you try to, or
   _____b. are there some people who will think you're not very bright no matter what you do?

9. If you solve a puzzle quickly, is it
   _____a. because it wasn't a very hard puzzle, or
   _____b. because you worked on it carefully?

10. If a boy or girl tells you that you are dumb, is it more likely that they say that
    _____a. because they are mad at you, or
    _____b. because what you did really wasn't very bright?

11. Suppose you study to become a teacher, scientist, or doctor and you fail. Do you think this would happen
    _____a. because you didn't work hard enough, or
    _____b. because you needed some help, and other people didn't give it to you?

12. When you learn something quickly in school, is it usually
    _____a. because you paid close attention, or
    _____b. because the teacher explained it clearly?

13. If a teacher says to you, "Your work is fine," is it
    _____a. something teachers usually say to encourage pupils, or
    _____b. because you did a good job?

14. When you find it hard to work arithmetic or math problems at school, is it
    _____a. because you didn't study well enough before you tried them, or
    _____b. because the teacher gave problems that were too hard?

15. When you forget something you heard in class, is it
    _____a. because the teacher didn't explain it very well, or
    _____b. because you didn't try very hard to remember?

16. Suppose you weren't sure about the answer to a question you teacher asked you, but your answer turned out to be right. Is it likely to happen
    _____a. because she wasn't as particular as usual, or
    _____b. because you gave the best answer you could think of?

17. When you read a story and remember most of it, is it usually
    _____a. Because you were interested in the story, or
    _____b. because the story was well written?

18. If your parents tell you you're acting silly and not thinking clearly, is it more likely to be
    _____a. because of something you did, or
    _____b. because they happen to be feeling cranky?

19. When you don't do well on a test at school, is it
    _____a. because the test was especially hard, or
    _____b. because you didn't study for it?

20. When you win at a game of cards or checkers, does it happen
    _____a. because you play real well, or
    _____b. because the other person doesn't play well?

21. If people think you're bright or clever, is it
    _____a. because they happen to like you, or
    _____b. because you usually act that way?

22. If a teacher didn't pass you to the next grade, would it probably be
    _____a. because she "had it in for you," or
    _____b. because your school work wasn't good enough?

23. Suppose you don't do as well as usual in a subject at school. Would this probably happen
    _____a. because you weren't as careful as usual, or
    _____b. because somebody bothered you and kept you from working?

24. If a boy or girl tells you that you are bright, is it usually
    _____a. because you thought up a good idea, or
    _____b. because they like you?

25. Suppose you became a famous teacher, scientist or doctor. Do you think this would happer
    _____a. because other people helped you when you needed it, or
    _____b. because you worked very hard?

26. Suppose your parents say you aren't doing well in your school work. Is this likely to happen more
    _____a. because your work isn't very good, or
    _____b. because they are feeling cranky?

27. Suppose you are showing a friend how to play a game and he has trouble with it. Would that happen
    _____a. because he wasn't able to understand how to play, or
    _____because you couldn't explain it well?

28. When you find it easy to work arithmetic or math problems at school, is it usually
    _____a. because the teacher gave you especially easy problems, or
    _____b. because you studied your book well before you tried them?

29. When you remember something you heard in class, is it usually
    _____a. because you tried hard to remember, or
    _____b. because the teacher explained it well?

30. If you can't work a puzzle, is it more likely to happen
    _____a. because you are not especially good at working puzzles, or
    _____b. because the instructions weren't written clearly enough?

31. If your parents tell you that you are bright or clever, is it more likely
    _____a. because they are feeling good, or
    _____b. because of something you did?

32. Suppose you are explaining how to play a game to a friend and he learns quickly. Would that happen more often
    _____a. because you explained it well, or
    _____b. because he was able to understand it?

33. Suppose you're not sure about the answer to a question your teacher asks you and the answer you give turns out to be wrong. Is it likely to happen
    _____a. because she was more particular than usual, or
    _____b. because you answered too quickly?

34. If a teacher says to you, "Try to do better," would it be
    _____a. because this is something she might say to get pupils to try harder, or
    _____b. because your work wasn't as good as usual?

APPENDIX J

NAME_____

SCHOOL_____

GRADE_____

A SENSE OF CONTROL SCALE

1. People like me will not have much of a chance to do what we want to in life.

| | |
|---|---|
| Strongly agree | 1. |
| Agree | 2. |
| Disagree | 3. |
| Strongly disagree | 4. |

2. People like me will <u>never</u> do well in school even though we try hard.

| | |
|---|---|
| Strongly agree | 1. |
| Agree | 2. |
| Disagree | 3. |
| Strongly disagree | 4. |

3. I can do well in school if I work hard.

| | |
|---|---|
| Strongly agree | 1. |
| Agree | 2. |
| Disagree | 3. |
| Strongly disagree | 4. |

4. In this school, students like me don't have any luck.

| | |
|---|---|
| Strongly agree | 1. |
| Agree | 2. |
| Disagree | 3. |
| Strongly disagree | 4. |

5. You have to be lucky to get good grades in this school.

| | |
|---|---|
| Strongly agree | 1. |
| Agree | 2. |
| Disagree | 3. |
| Strongly disagree | 4. |