An Experimental Study of Two Strategies for Modifying Impulsivity of Children Ages Eight Through Eleven

BY

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Abstract of Dissertation Presented to the
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AN EXPERIMENTAL STUDY OF
TWO STRATEGIES FOR MODIFYING IMPULSIVITY OF CHILDREN
AGES EIGHT THROUGH ELEVEN

By

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Chairman: Dr. William W. Purkey, Sr.
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For children with impulsive tempo, high errors on task performance, among others, impede their optimal learning, informative measurement, and healthy personality development.

Purpose

The purpose of this study was to help solve the above problem by modifying children's impulsivity in terms of error reduction as measured by Kagan's Matching Familiar Figures (MFF). In this study, an assumption was made, relating language form with impulsive tempo. Therefore, two strategies, enriching children's ability to deal with redundancy as well as enriching children's ability to deal with variability, were introduced into this study to cope with the problem. Furthermore, two hypotheses representing the two strategies were formulated for testing. The two hypotheses are:

Hypothesis 1: Training in writing long sentences has a significant effect on impulsivity in terms of reducing

impulsive children's errors as measured by Matching Familiar Figures.

Hypothesis 2: Training in making multiple alternative choices has a significant effect on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures.

Procedure

Eighty-six boys and 89 girls in grades 3, 4, 5 of P. K. Yonge Laboratory School at the University of Florida, Gainesville, Florida, participated in this study. Their ages ranged from eight through eleven. By using Kagan's MFF and the split-half method, 59 impulsive and 59 reflective subjects were identified. Fifty-seven impulsives were randomly selected and assigned into three groups with block design in terms of errors. Nineteen reflectives were randomly selected as matched control group.

Two experimental tasks, Long Sentence Task (LS Task) and Multiple Alternatives Task (MA Task), were designed by this researcher for testing the two hypotheses. These two tasks were randomly assigned to two impulsive groups with the third group as control group which received no training. A male and a female graduate student were trained to conduct the trainings. In LS Task training, subjects were instructed to write two long sentences for each task. While in MA Task, subjects were instructed to write at least three alternative choices for each part of a task (each task includes two parts). Ten tasks for each group were finished in five weeks. After training, the same version of MFF was individually administered to all subjects in four groups.

Results

The results of this study are summarized as follows: (1) LS Task group and MA Task group significantly reduced their errors as compared with control group. (2) LS Task group showed more error reduction among boys, higher mental ability children, and those who were from lower socioeconomic status. (3) MA Task group reduced more errors among boys, lower mental ability children, and children from higher socioeconomic families. (4) MA Task was effective in reducing errors for both extremely and moderately impulsive children. (5) No significant increase of response time was found in all four groups. (6) Between response time and error, the correlation of LS Task group was significantly decreased, while the correlation of MA Task group was increased significantly. (7) After training, the two experimental groups produced equal or fewer errors than reflective group on three out of twelve items of MFF, while before training no impulsive groups produced fewer errors than reflective group on any items of MFF.

The results were interpreted as confirmation of the assumption that restricted language form is related to impulsive tempo. Therefore, implications of the two strategies in terms of their possible contributions to learning, measurement, and personality development were discussed. Also, suggestions for further studies on impulsivity modification were proposed by this researcher.

CHAPTER I

INTRODUCTION

Learning appears to be the result of interaction between the individual and his environment. In the learning process, the individual's cognitive style (here defined as the individual's relatively consistent mode of conceptual process in dealing with his external environment) seems to have important effects on perceiving or identifying stimulus patterns, selecting perceived stimulus input, organizing input information, interpreting information, storing organized information, and on retrieving stored knowledge. A better understanding of the individual's cognitive style should help us control learning situations and thus predict the result of learning for the best benefit of the learner.

Numerous efforts, therefore, using different criterion measures have been made by psychologists to identify or study various cognitive styles (Kelly, 1955; Gardner, Holzman, Klein, Linton, and Spence, 1959; Gardner, Jackson, and Messick, 1960; Rokeach, 1960; Witkin, Dyk, Faterson, Goodenough, and Karp, 1962; Messick and Kogan, 1963; Kagan, Rosman, Day, Albert, and Phillips, 1964, Schroder, Driver, and Streufert, 1967; Kipnis, 1971). These successes in identifying cognitive styles have triggered a large number of studies on the relationship between various cognitive styles and learning or instruction. Their findings appear to be fruitful and may provide appropriate information about strategies for optimal cognitive development in children.

Statement of the Problem

In terms of effective learning and optimally attainable achievement at school, undesirably high errors are frustrating, especially when American educational standards emphasize accuracy and predetermined correctness. When the cognitive style plays an important role both in learning and in evaluation (Kagan and others, 1964; Messick, 1968; Frederick and Klausmeier, 1970), the possibility of being misgraded, misplaced, or mistreated due to the high incidence of errors on given evaluative measures could be harmful to personality development.

The purpose of this study was to test the effectiveness of two strategies designed by this researcher for modifying children's impulsivity in terms of error reduction. The two strategies were: (1) enriching children's ability to deal with redundancy, and (2) enriching children's ability to deal with variability. The two strategies were assumed to have an effect on children's impulsivity in terms of reducing errors of task performance on Kagan's Matching Familiar Figures (MFF).

Kagan and others (1964) have identified in children's cognitive process a conceptual tempo which they call "reflection-impulsivity." In order to measure children's reflection-impulsivity tempo, Kagan devised Matching Familiar Figures (MFF) which is a set of visual analytical tasks with relatively high stimulus uncertainty. There are 12 items in the task. Each item includes one standard picture and six similar stimuli, only one of which is identical to the standard. On the basis of performance on Kagan's MFF, children whose average response times (latency) to first selection across 12 items were below median

(faster), and total errors (accuracy) summed up from 12 items were above median (more errors), for the sample tested, were classified as impulsive. Children were classified as reflective whose average response times were above median (slower), and total errors were below median (fewer errors). Those children who were either above medians on both variables or below medians on both variables were classified as nonextreme (Yando and Kagan, 1970).

Kipnis (1971) used the Impulsive Scale (IS) combined with the Socialization Scale of the California Psychological Inventory (CPI) to identify impulsive psychopaths. Each of these three categories comprised about one-third of the total sample diagnosed as psychopathic. According to Kipnis, this classification method can also be applied to normal population.

The reflective-impulsive cognitive style appears to be stable with age and may be generalized across situations for normal children (Kagan, 1965b; Yando and Kagan, 1970; Messer, 1970). However, the generalization could also be applied with discretion to other specific situations including preschool headstart children (Zucker, 1968) and educable mentally retarded children (Gozali, 1969) as well as those who were diagnosed psychopathic (Kipnis, 1971).

Results of certain studies indicate that normal children who are classified as impulsive by using MFF show motor hyperactivity (Campbell, 1969; Meichenbaum and Goodman, 1969), and suffer from restlessness and distractibility (Kagan and others, 1964). Such children also use poor problem-solving strategies (Drake, 1970), jump at decisions before they have carefully examined available alternatives (Kagan, 1965a, 1966; Drake, 1970; Rhetts, 1970), pile up errors as task complexity increases (Rhetts, 1970; Yando and Kagan, 1970), demonstrate poor verbal ability

(Schwebel, 1966), are usually pessimistic in the face of threatened frustration (Campbell, 1969), and have higher percentages of school failure (Messer, 1970).

In a study of one lower-class situation, Zucker (1968) also found that preschool headstart children, compared with middle-class similar aged children, were more impulsive and indulged in considerable guesswork. On the other hand, Gozali (1969) observed that the educable mentally retarded children who were classified as impulsive tended to employ a position response set in responding to the test items.

In his character structure study of the impulsive psychopath, Kipnis (1971) found that the impulsive psychopath experienced less anxiety or shame and rejected conventional social values. In addition to becoming easily bored, he also rejected advice and suggestions from others. Besides, he tended to show inadequate psychomotor control, restlessness, and poor interpersonal coping behavior. All of these characteristics of impulsive psychopath certainly contributed to high percentages of under-achievement in school. It might also be reasonable to infer that the impulsive psychopath with some of the above personality characteristics would have relatively high errors on a visual analytical task with high uncertainty such as MFF.

The studies referred to in the above section demonstrate that persons with the impulsive cognitive style tend to show certain weaknesses and behavioral correlates which may impede successful and effective learning, valid measurement, and adequate personality development. Increasingly, such problems are concerning psychologists and educators in fields of general education as well as special education. With this in mind, then, this study was an attempt to contribute to one of these vital fields. Reduction of performance errors through enriching impulsive

children's communication codes was expected to achieve modification of impulsivity to a significant degree.

Chapter II, Review of Literature, is a discussion of studies related to the development of assumptions, hypotheses, and the approach to achieving the purpose of this study.

CHAPTER II

REVIEW OF LITERATURE

The successful identification of reflection-impulsivity conceptual tempo by Kagan and others (1964) has been followed by numerous studies on the personality characteristics and other correlates of impulsivity. As described in Chapter I, there are several undesirable behavior patterns found in children who are classified as impulsive either by Kagan's MFF or by Kipnis' combination of Impulsive Scale with Socialization Scale of CPI. Such findings have triggered interest among psychologists in the inquiry into the modification of reflection-impulsivity tempo.

Modifiability of Reflection-Impulsivity Tempo

Since Kagan, Pearson, and Welch (1966) found that impulsive tempo could be modified, several researches have been conducted to further knowledge about modifiability of reflection-impulsivity conceptual tempo.

Directly instructing children to be reflective

In order to inquire into the modifiability of impulsive tempo, Kagan, Pearson and Welch (1966) tried instructing impulsive children to be reflective. The first grade impulsive children were randomly assigned to one of three groups. One training group (Group I-Id) shared some interests and attributes with the trainer of the same sex. The other training group (Group I-non Id) shared few interests and attributes with the trainer of the same sex. The control group received no training at all. For the Group I-Id, the subjects were instructed to

try not to make a mistake on a haptic-visual matching task, a design-matching task, and an inductive reasoning test. The trainer showed his appreciation of the reflective way of doing things. For the Group I-non Id, the trainer merely commented positively on the subject's choices. No delay of responses was required.

The training significantly lengthened the impulsive subject's response time on MFF for both training groups as compared with the control group and the matched reflectives. Unfortunately, as the report stated, the error changes were not much affected by the training although the direction of changes was in accordance with the expectation.

There were two kinds of manipulations involved in the research: (1) trying not to make a mistake on the task, and (2) trying to inhibit impulsive (rapid) answers. The results of the study showed that only the second manipulation had its effect on MFF response time. The lack of effect on MFF errors from the first manipulation was not explained specifically.

Manipulating reinforcement contingencies upon latency and accuracy

A Skinnerian method was introduced by Briggs (1966) to modification of reflection-impulsivity tempo. He tried to manipulate reinforcement contingencies upon response speed and errors on geometric figural match-to-sample tasks. Both impulsive and reflective subjects were trained to respond in a way opposite to their own models. For impulsive subjects, long latency and fewer errors were positively reinforced by showing green lights; otherwise, red lights were turned on with warning messages. The two lights were separately operated to manipulate each variable by its own criterion. Similar training was given to reflective subjects except that they had to respond quickly, or they were urged to guess.

Treatment results showed significant changes of MFF posttest scores on response time and errors for both reflective and impulsive groups with trainings. How well the result could be generalized to other situations was not ascertained. Modification of reflection-impulsivity tempo was, however, tentatively proved to be possible.

Teacher as model for children

Yando and Kagan (1968) hypothesized that the teacher's conceptual tempo had its effect on the student's conceptual tempo if both were in the same classroom for a period of time. Eighty boys and eighty girls in the first grade were randomly selected from 20 classrooms. Of the 20 classrooms, 10 were impulsive teachers and the other 10 teachers were reflective teachers according to the Adult Form of MFF. All had differential experiences in terms of years taught. After about an eight month period, all subjects were retested to see if any significant changes in response time and errors took place.

Results indicated that the child with the highly experienced reflective teacher had significantly greater increase in response time than all other children. Boys in the classroom of the experienced reflective teachers significantly increased response times. Girls in the classrooms of the experienced reflective teachers had only sizable increases in response times. Analysis of the main effect indicated that the teacher tempo had significant effect on the child's response time. There was no significant main or interaction effect on errors, however.

In light of the above findings, then, Yando and Kagan argued that the capacity to delay a response was more modifiable than was the ability to perform perceptual discrimination. They further held that delay-inhibition vector could be altered without necessarily causing the change

of accuracy. They also suggested specific training in scanning strategies for accuracy.

Directly instructing children to deploy their attention over tasks

Nelson (1968) assumed that attention might be related to the child's response time and errors. He tried to manipulate the child's attention in observing visual stimuli. Six sets of geometric figures as match-to-sample task were used for the research. In the training, the trainer presented the task to the fourth grade subjects. He worked with the subject in looking for the right figure which matched the standard. While seeking a correct match, the subject was told to distribute his attention over the standard and all available alternatives before making his decision. The control subject was allowed to work on the same figures used in the training group, given equal time, and received the same sorts of verbal reinforcements as the experimental subject.

It was found that there was a significant effect of attention deployment strategy on response time. Analysis of the training effect showed that the trained subject tended to give more overall observations, to canvass the array of alternatives more evenly, and to process more information before making a decision. The accuracy in this matching task was also found affected by the training.

The effect of training was so confined within the training task and the similar task that it could not be transferred to the time and errors of the WISC Picture Arrangement subtest. Lack of positive transfer of training of attention deployment strategy was attributed to pretraining group differences as well as differences in the format between the training task and WISC Picture Arrangement subtest.

Teaching children a scanning strategy of eliminating incorrect stimuli

Albert (1969) hypothesized that both the delay of response and the scanning strategy had effects on performance of the visual matching task such as the MFF. He assigned the second and the third grade impulsive children into three groups. For the first group, the subject was told to take his time and "think" for awhile before giving his answer to the matching task. For the second treatment group, the subject was taught to scan the alternatives by eliminating incorrect stimuli presented. For the third group, no training was given.

Analysis of the data showed that the training for both groups had a significantly greater effect on both response time and errors than the group without training. It was found that subjects who learned the strategy of eliminating incorrect stimuli had a significantly greater increase in response time than the first or the third groups.

Concerning generalization of training effect, both Albert and Nelson agreed that results were not to be generalized to other discrimination tasks when those tasks differed from the training task.

Teaching children to learn rules of a model

Ayabe (1969) tried to analyze rules for different conceptual models and asked children to learn the rules opposite to his own conceptual tempo. Forty fourth grade children were placed in four different groups: reflective training group, reflective control group, impulsive training group, and impulsive control group. For the reflective training group, subjects were told to memorize the rules of impulsive tempo, to see the demonstration of the rules by the trainer, and then to apply the rules practically to the items provided. The impulsive training group followed the same steps of training for learning the rules of reflective tempo.

The rules learned by the control group were to be neutral. For both training groups, the trainer corrected the errors and the trainer praised when subjects learned the rules correctly.

It was found that training in impulsive strategy induced impulsive tempo for reflective subjects. However, training in reflective strategy failed to induce reflective tempo for impulsive subjects. The implications of the research were not very clear in terms of modification of cognitive styles.

Directly observing a film-mediated model

The possibility of using film-mediated models to modify conceptual tempo was tested by Ridberg (1969). Ridberg asked fifty fourth grade impulsive boys to view a film in which a peer was doing his match-to-sample test in the reflective way. The other fifty fourth grade reflective boys viewed a film in which a peer was doing the same kind of match-to-sample test in the impulsive way. The viewing of the conceptual models opposite to the subject's conceptual tempo was clarified by verbalizing various cues of the models. In the film, the testing situation provided several response possibilities simultaneously. For testing the effect of film-mediated modeling on conceptual tempo, all subjects were tested immediately after viewing the film. They were also retested a week later to see if the shift of conceptual tempo, if any, was stable.

The study results demonstrated that the impulsive subject did perform reflectively with significant increase in response time and significant decrease in errors. Such a change was found stable over a week. The reflective subject, however, showed increases in both response time and errors.

Both Ayabe and Ridberg tried to see if they could make the impulsive child reflective and make the reflective child impulsive by providing either experience or information of the model opposite to the subject's conceptual tempo. They worked for the same purposes. But the slightly different modeling methods yielded results contradictory to each other. Ayabe made the reflective subject more impulsive but Ridberg did not. On the contrary, Ridberg made the impulsive child reflective--unlike Ayabe. It seems to indicate that the subject's reaction to the method plays an important role in determining the effect of the training. Ayabe's impulsive subjects might have been impatient with his step-by-step, memory-demonstration-practice approach. In Ridberg's study, simply viewing the impulsive model in the film lacked sufficient appeal to induce the reflective subject to change his way of responding.

Observing patterns of model behavior with associated reinforcement contingencies

Situations at home and in school often exist in ways which suggest that a wide range of modeling is experienced by children. In view of this, then, Debus (1970) asked third grade impulsive children to observe sixth grade models in different behavior patterns with different reinforcement contingencies. Four patterns were shown to four impulsive groups with one control group. The four patterns and reinforcement contingencies were as follows: reflective model with positive reinforcement consequence, impulsive model with less positive reinforcement, change model from impulsive model to reflective model at halfway with differing reinforcement, and dual model of two different models with contrasting reinforcement consequences.

Observation of the reflective model showed significant effect for

both boys and girls of impulsive tempo in increasing latency. Change model and dual model significantly changed girls' latency. Changes were maintained over two and one-half weeks only for girls who observed change model. Those subjects who increased latency made significantly fewer errors than those whose latency was unchanged.

The studies reviewed above seem to contribute much to our knowledge about modifiability of reflection-impulsivity conceptual tempo. The following points are summarized from these researches: (1) It is not impossible to modify reflection-impulsivity conceptual tempo. A new conceptual tempo can be learned. (2) It seems more pertinent and knowledgeable to modify impulsivity than reflection since these researchers seem to favor reflective behavior patterns. Impulsivity tends to be related to some behavioral patterns which seem to correlate with poor strategies in learning and testing. (3) Increase in response time on the figure-matching task does not necessarily bring about corresponding decrease in errors. Accuracy is assumed to be related to the scanning strategy. (4) The majority of those researches have been interested in tackling this outstanding problem with strictly direct modeling methods. (5) As far as the training methods and materials are concerned, the intention of the training seems to be directed to "training for criterion testing." Therefore, little significant effect can be generalized to other situations, even discriminations. (6) All samples are within the range from first grade to fourth grade. (7) Some controversial effects of training may be related to variations in sampling techniques, control group situations, manipulation of experimental variables, subjects' knowledge about and reaction to the purposes of the research, duration of training, reinforcement techniques, criterion of training, reaction

to measurements, and in the research design.

Relationship Between Response Time and Error

As indicated above, it is possible to modify impulsivity in children. Therefore, it seems reasonable to ask what is to be modified: response time or errors? The combination of response time and errors for an operational definition of reflection-impulsivity (Kagan, Pearson, and Welch, 1966a, p. 591) indicates that impulsivity is not simply determined by response time only. The combination of the two variables, response time and errors, also avoids ambiguity caused by interchanging "quickness" with "impulsivity" in the research.

The evidence shows that sheer manipulation of the impulsive child's response time has no significant effect on accuracy. The relationship between response time and errors, furthermore, is not direct and simple. Some other factors such as mental ability, attention, strategy and its flexibility, interest, value, anxiety, incentive, motivation, other personality characteristics, complexity and sequency of task presentation may partly determine the degree of correlation between response time and error. Yando and Kagan (1968) stated that delay-inhibition vector could be altered without necessarily causing a change of accuracy. They suggested specific training for scanning strategy to accomplish accuracy. Seemingly, this indicates that the direct association between response time and error is rather weak.

In order to account for the differentiation of reflection and impulsivity, by means of combining response time and errors, Kagan (1966) listed three possible causes: (1) constitutional predisposition, (2) involvement in the task, and (3) anxiety over task competence. The last one, anxiety over task competence, was not supported by a study done by

Ward (1968) who partially replicated Kagan's study. After studying the subject's eye movements by using Mackworth's eye-marker camera, Drake (1970) argued that it was scanning strategy, not response time, that was more powerful in differentiating the impulsive from the reflective.

From the analysis of past researches centered around modification of conceptual tempo, one may assume that psychologists have been gradually putting more weight on modifying scanning strategy than on inhibiting response. This may indicate a gradual increase in their concern about accuracy in performance in areas of academic learning and measurement. This trend has received much attention since evidence shows that merely holding a response does not contribute much to error reduction.

Some Commentary in Regard to Direct Modeling Method

In summarizing past researches on modification of conceptual tempo, it was also found that the majority of researchers were interested in tackling this distinct problem by strictly direct modeling methods. For example, one may ask a child to spend more time on the standard picture and to keep his eyes on all alternatives before responding. If he does not do so, he may be viewed as impulsive. The underlying assumption is that the impulsive behavioral rule or model brings about short response time and more errors. On the other hand, the reflective behavioral rule or model results in long response time and fewer errors. Under such an assumption, it should follow that if an impulsive child is taught to follow the reflective model, he should henceforth act reflectively. This has not been unequivocally supported by past researches. The problem stems from the modeling method reversal of the operational definition of reflection-impulsivity conceptual tempo.

In terms of sampling, those researches followed Kagan's operational definition of reflection-impulsivity. That is, a child is classified as reflective by having response time above median and errors below median for the sample tested on the MFF. But, in training, those researches introduced various "supposed' reflective models for the impulsive subject to imitate. Such models may be oversimplified. Then, too, some rules of the impulsive model may not be representative of the generalizable impulsive behavior which can be tested out by a task such as MFF.

Furthermore, these models may have neglected several behavioral correlates of impulsivity or reflectivity. Impulsivity, for example, has been found to be statistically related to anxiety, restlessness and distractibility, problem-solving strategies, verbal ability, acceptance of traditional social values, and task complexity. The modeling technique which has been employed by some of past researchers may not take into account the role of certain behavioral correlates in training and testing.

In conclusion, only after seriously considering the possible causes or behavioral correlates of the impulsive child's undesirably short response time and his unreasonably high errors, the appropriate method of modification can be designed. Otherwise, it is not advantageous to induce modification by modeling in order to achieve the testing goal. A reasonable method should also diminish the subject's deliberately conforming behavior which has little to do with cognitive reconstruction.

Consequently, the present attempt to modify the child's impulsivity emphasizes not only the <u>reduction</u> of errors but also the appropriate <u>approach</u> to reducing errors. Thus, to accomplish this purpose, two strategies have been developed with the following speculation in mind.

These strategies will be explained in detail in Chapter III.

Language Forms Affecting Cognitive Development

The present study originated from speculations about possible causes of error-making by impulsive children. Bernstein (1965) stated that children from the working-class (here defined as all members of a semi-skilled and unskilled group) were accustomed to a restricted code of communication which is contingent upon a specific form of social relationship. The restricted code of communication, as Bernstein reported, is characterized by comparatively short, simple, and incomplete sentences, poor syntactical organizations, repetitive uses of conjunctions, rigid and limited uses of adjectives and adverbs. Such individuals experience relatively few alternatives. They are also restricted in their attempts to express themselves in a verbally explicit form. The social relationship which reinforces the use of restricted code of communication produces cognitive process recognizing events as unconnected facts. Within the social relationship of the working-class, children's cognitive differentiation is comparatively less developed.

Bernstein's position which states that a relationship exists between the use of restricted code of communication and poor development of cognitive process (Bernstein, 1958) will be used in this study. It seems reasonable to assume that this relationship can account to a marked degree for the high errors made by impulsive children on the visual analytical task.

Based on this position, two assumptions have thus been derived and formulated: (1) impulsive children are accustomed to reading or using short sentences in communication, and (2) impulsive children are accustomed to thinking or handling a very limited number of alternatives in communication.

Furthermore, the relationship between thought and language is definitely a dynamic process (Vygotsky, 1962). Daily family language usually symbolizes the family interaction system. Bernstein (1960) reported that the middle-class families (here defined as family members who received high school education, some advanced education, or certificated training in either skilled or non-manual occupations) used more elaborate forms of language in contrast to certain working-class people's less complex language forms. The elaborated form is characterized by accurate grammatical order, complex sentence constructions, frequent use of prepositions and impersonal pronouns, relatively wide range of alternatives, verbal mediation of individual qualification through the structure, and the relationship within and between sentences. Bernstein's position was confirmed by Deutsch's study (1965). He reported that lower-class was associated with poor language functioning. Furthermore, Hess and Shipman (1968) found that family interaction system determined the degree of provision of an array of alternatives for thought and action. Used as an instrument of thinking (Bruner, 1966), language may either facilitate or impede the individual's use of alternatives for thought and action in interaction.

A Possible Cause of Impulsive Children's Making Errors

In impulsive children, an unduly shortened period of circumspection before making decisions (Kelly, 1955) may be related to the children's being accustomed to restricted codes of communication. High errors, in this sense, may be caused by impulsive children's poor ability and low desire to communicate with reality in elaborated form which is the typical characteristic of today's learning materials and tests. This can be interpreted as a developmental phenomenon of inappropriate match between

the external requirement and the intrinsic ability (Hunt, 1961) of impulsive children. When a restricted code is so familiar and accessible to them, impulsive children who are confronted with elaborated code of communication should be able to overcome the temptation of going back to their habit of using the restricted code. On the other hand, they should be able and willing to communicate in a seemingly redundant elaborated code. Apparently, this is a matter of cognitive adaptation.

Pribram (1970) demonstrated his great concern for man's "human state" in his analysis of the brain's function in the area of information processing and retrieving. When a man encounters uncertainty, according to Pribram, he can either seek real information for temporary relief or reduce uncertainty by enhancing redundancy and varying patterns of a code. To employ the first strategy of temporary relief by seeking real information is very much similar to the way, described by Kelly (1955), used by the impulsive to resolve confusion. To adopt the second strategy, man is encoding and varying the patterns of redundancy in which information is encoded. Enhancing redundancy and varying the patterns of redundancy, as Pribram sees it, allows man to use stored information in unexpected ways. This is the strategy, no matter how it is labeled, which helps learning to be more meaningful for man.

At this point, it would seem appropriate to review Pribram's position on the brain function and Bernstein's position in regard to differential language forms. To facilitate meaningful learning, one should enable the individual to live with redundancy in which information is coded as well as to variate patterns of redundancy in order to permit using information in various unexpected ways. It seems reasonable to infer that the elaborated code of communication, compared with the restricted communication

code, is more redundant (long and complete) and variable (offering more alternatives).

According to the two assumptions aforementioned, the individual, who is unable and impatient in terms of communicating with reality in an elaborated code, has no alternatives but to escape the uneasy situation. Under such circumstances, he tends to seek a quick and temporary solution without much regard for how many errors he has accumulated. Hence, errors become inevitable results of impulsive children's performance when they have to deal with elaborated codes.

Modification of children's impulsivity may thus be accomplished by enriching impulsive children's communication code. In so doing, children may be more able and willing than before to communicate in elaborated code. Once children are able and willing to work with an elaborated code, they can tolerate some redundancy and various patterns of redundancy which provide a powerful tool for reducing uncertainty.

A New Indirect Method

Reviewing past studies on modification of conceptual tempo has enabled this researcher to be more sensitive to the need of developing a more knowledgeable and workable approach for such modification. It is a new, indirect method which seems more appropriate than other current methods for modification of a conceptual tempo.

As modification of reflection-impulsivity has been shown possible and in progress, it seems reasonable to see the modification in psychological terms rather than physical or physiological. By this it means that some psychological strategies can be developed to achieve the goal of modification. It also suggests that unless either some negative psychological barriers are removed or unlearned, or some positive

psychological vectors are developed, there is little hope to obtain a long term and generalizable effect of training.

The indirect approach was introduced in this study because of its strength over direct modeling. The two strategies of this study did not employ test-like match-to-sample tasks as training materials, nor did it follow procedures similar to criterion testing when training. The rationale for employing the indirect approach is more obvious when the method not only discourages the trainee's temporary conformance to the trainer's expectations, but also prevents the training from becoming too parsimoniously attached to a specific task or criterion measure.

The immediate goals for the two strategies in this study, as a result, were two-fold in nature: (1) to help impulsive children develop their ability to use a kind of communication code other than their own, which exists and prevails around them, and (2) to help impulsive children appreciate other communication codes aside from their own. At first glance this has nothing to do with children's performance on any match-to-sample tasks. But as far as information is involved, the code in which information is encoded and the cognitive style through which information is assimilated should be relatively matched in order to make optimal communication possible. The two strategies were used to enable children to handle a code which, formerly, they had been unable to deal with. Hence, if a match-to-sample task is representative of a redundant type of code, those who are unable to make sense from that code should be taught how to handle it. This exemplified the generic method representative of the indirect approach used in this study.

CHAPTER III

DESIGN OF THE STUDY

An experimental research method was employed in carrying out this study. The design included hypotheses, instrumentation, sampling, training and control, data collection, and analyses of data.

Hypotheses

To accomplish the purposes of this study, the following hypotheses were formulated.

Hypothesis 1

Training in writing long sentences has a significant effect on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures.

Hypothesis 2

Training in making multiple alternative choices has a significant effect on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures.

The length of a "long" sentence was arbitrarily determined by the individual subject according to his past experience. But it was anticipated that a long sentence would be grammatically complete and relatively complex in structure. It was also expected that the subjects would discover more than two alternatives.

Sampling and Sample

Eighty-six boys and 89 girls, ages eight through eleven, in grades 3, 4, 5 of P. K. Yonge Laboratory School at the University of Florida, Gainesville, Florida, participated in this study. At the time of the pretest, 81 boys and 87 girls were individually administered Kagan's Matching Familiar Figures. Seven children did not take the test mainly because of illness. A graduate student, working for his Specialist degree in Educational Psychology, and this researcher administered MFF. The major variables scored were the total number of errors and average response time (in seconds) to first selection across 12 items in the MFF. To avoid the possible effects of grade and discrimination learning experience, medians of response time and errors of each grade level were calculated separately. For the third grade, the medians of response time and errors were 7.8 and 15. For the fourth grade, they were 9.4 and 11. Fifth grade medians were 8.8 and 9. These data supported this researcher's prediction that response time would increase with grade, and errors would decrease with grade. The only exception to this prediction was that response time did not increase as grade advanced from the fourth to the fifth.

After the three pairs of medians were calculated, 59 impulsive subjects and 59 reflective subjects were classified. Impulsive subjects included those whose average response times were below median (faster) and total errors were above median (more errors) for each grade tested. Reflective subjects included those whose average response times were above median (slower) and total errors were below median (fewer errors)

TABLE 1

DESCRIPTION OF THE SAMPLE BY GROUP

	Sex		Grade			Age				MFF*				CTMM**	Socio-economic Index***
										Error		Response Time			
	M	F	3	4	5	8	9	10	11	Mean	S.D.	Mean	S.D.	Score	(Duncan's)
	n	n	n	n	n	n	n	n	n						
Group 1 (impulsive)	9	10	5	7	7	2	3	8	6	15.74	4.85	5.56	1.73	109.6	70.8
Group 2 (impulsive)	8	11	5	7	7	3	5	5	6	15.74	4.16	5.52	1.63	107.6	67.6
Group 3 (impulsive)	14	5	5	7	7	2	5	10	2	15.59	3.92	5.73	1.73	115.2	73.8
Group 4 (reflective)	3	16	4	7	8	1	5	8	5	5.89	2.96	16.11	6.29	116.3	63.8

*Matching Familiar Figures
**California Test of Mental Maturity
***Otis D. Duncan's Socioeconomic Index for Occupations (Duncan, 1961)
Group 1 and 2 are experimental groups; Group 3 and 4 are control groups.

for each grade tested.

Fifty-seven impulsive subjects were randomly selected for the experiment. Ninteen reflective subjects were randomly selected as a matched control group for later comparison. The completely randomized block design was applied to eliminate individual differences in error for the same blocks. All impulsive subjects were then randomly assigned into three groups, 19 subjects in each, after they had been ramified into blocks according to the number of their errors. The three groups were randomly selected as two experimental groups and one control group.

Table 1 summarized the main variables which included sex, grade, age, response time and error of MFF, score on California Test of Mental Maturity, and socioeconomic status, of the four groups--two experimental and two control. Although subjects were assigned into blocks exclusively by number of errors, group differences in response time and other main variables for three impulsive groups were small and therefore insignificant. The reflective control group, however, deviated significantly from the three impulsive groups in response time and error because of the classification method. This reflective control group was selected for comparisons. The table of original data for the four groups is shown in Appendix A.

The product-moment correlation coefficients between response times and errors for the four groups were: -0.498, -0.171, -0.470, -0.528. The strikingly low correlation coefficient between response time and error for the second group might have its effect on the later training. The coefficients of the other three groups, however, did not differ significantly.

Instrumentation

Only one test, Matching Familiar Figures, was actually used by this

researcher for this study. The test was given twice, a pretest and a posttest.

Matching Familiar Figures (MFF)

This test was developed by Jerome Kagan in 1965 to identify reflection-impulsivity conceptual tempo. Construction of the test was based on the assumption that response time to visual analytical tasks and the like, with high uncertainty, was a faithful reflection of decision time for solution. The assumption also followed that speed of making decisions would affect the probability of producing a successful solution.

The test consists of 12 items including: house, scissors, phone, bear, tree, leaf, cat, dress, giraffe, lamp, boat, and cowboy. Each item has one standard picture on the top page. The other six pictures are on the bottom page. Only one of these six pictures is identical to the standard. Figures 1 and 2 show the standard and six variations of a sample item.

According to testing procedure, the subject is shown the standard picture and six similar pictures. The standard and the six variations are always available to the subject. The subject is instructed to point to a picture on the bottom that is exactly like the standard on the top. After two practices, the tester begins the actual test by recording latency to first selections and total errors across all 12 items. The record form of MFF is shown in Appendix B.

Impulsive subjects are those whose average response times fall below median and total errors above median for the pool being tested. Reflective subjects are those whose average response times are above median and total errors below median. Yando and Kagan label other

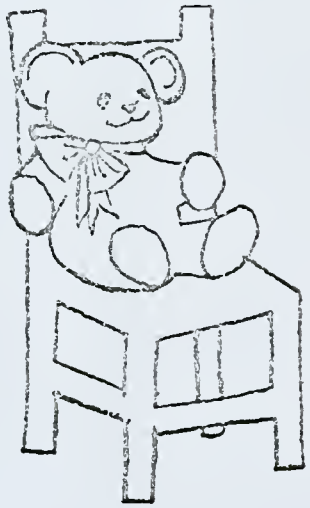


FIGURE 1: A SAMPLE ITEM OF MATCHING FAMILIAR FIGURES -- THE STANDARD

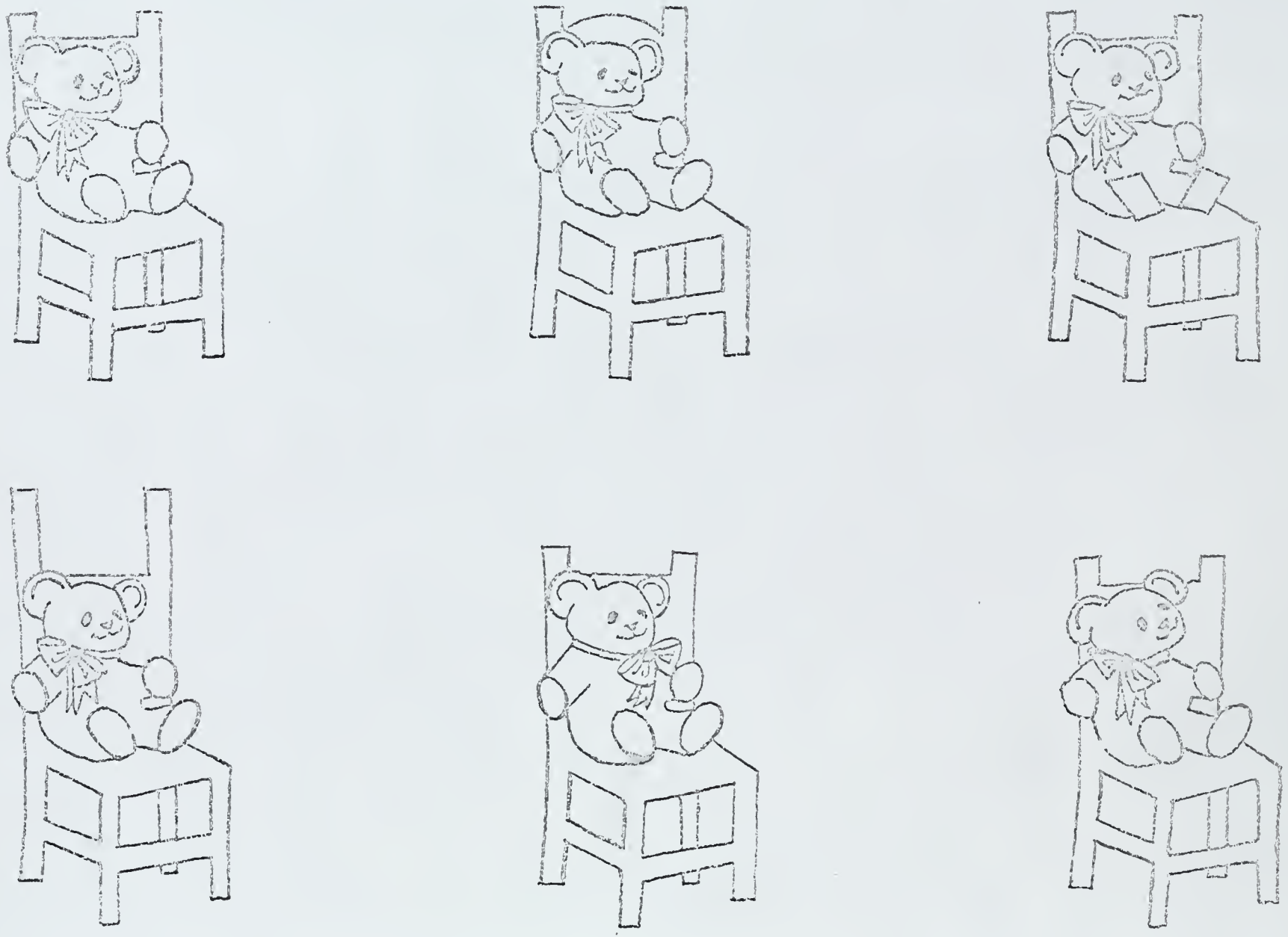


FIGURE 2: A SAMPLE ITEM OF MATCHING FAMILIAR FIGURES -- THE VARIATIONS

subjects as nonextreme.

The stability of MFF response time over ten weeks ranged from .46 to .92 (Yando and Kagan, 1970), over one year averaged .62 (Kagan, 1965a), over two and one-half years ranged from .25 to .43 (Messer, 1970). The stability of MFF errors over ten weeks ranged from .22 to .87 (Yando and Kagan, 1970), over two and one-half years was .33 (Messer, 1970). The generality across MFF and Haptic Visual Matching (HVM) ranged from .61 to .87 (Kagan, 1965a).

The correlation between MFF response time and error varied: -.347 (Gozali, 1969), -.51 and -.70 (Zucker, 1968), -.47 to -.66 (Kagan and others, 1964), and -.46 to -.75 (Kagan, 1965a). All data showed significant negative correlation between the two variables.

The decrease in stability of MFF response time and errors was negatively related to the increase of time span between two administrations of MFF to school children (Kagan, 1965a; Yando and Kagan, 1970; Messer, 1970). There were indications that growth and experience in discrimination learning, among others, affected MFF response time and errors in terms of stability.

The test has been validated for children ranging from kindergarten through fifth grade. It can be used for children with normal mental ability as well as educable mental retardates (Gozali, 1969).

Experimental Tasks

To test the two hypotheses of this study, two corresponding experimental tasks were designed by this researcher. The two experimental tasks, using long sentences and making multiple alternative choices, were presented to the subject in the form of exercises.

It was assumed that to reinforce usage of long sentences in training would increase the subject's subsequent frequency of using long sentences. Therefore, it was expected that the process of becoming gradually accustomed to using long sentences might eventually reduce resistance against the "redundancy" of long sentences in which information was coded. It was also expected that, with increased ability to deal with redundancy of long sentences, the subject would assimilate more information from stimulus situations.

In addition, it was assumed that to reinforce making multiple alternative choices through training would increase the subject's subsequent frequency of making multiple alternative choices for a solution. Therefore, it was expected that the increased ability to make alternative choices for solutions could also enhance ability to examine existing alternatives more efficiently. Obviously, too, the subjects would assimilate more information through examining more alternatives.

Long Sentence Task (LS Task)

The task was designed to help impulsive children write a long, elaborate and complete sentence. The arbitrary length of a long sentence was based on both the grammatical completeness and the subjective judgment of the subject according to his past experience.

To begin the task, the trainer reads the instruction aloud to the group of subjects accordingly:

> I am going to ask you to do something. We call it a task. There are two parts in each task. Write a long sentence for each part. Write as long a sentence as possible. Use as many words as you can to make it a good long sentence.

If a sentence is not complete, the trainer should point out the reason for such grammatical incompleteness. If the sentence seems too short,

the trainer should suggest adding some words to make it longer. LS Tasks vary in form, but they are used for manipulating the same variable--the formation of a long sentence. Samples of the LS Task are shown in Appendix C.

Multiple Alternatives Task (MA Task)

The task was designed to help impulsive children make more than two alternative choices. The main concern of the task is to increase children's ability in making multiple alternative choices. In the beginning, the trainer reads instruction aloud to the group of subjects accordingly:

> I am going to ask you to do something. We call it a task. There are two parts in each task. You will have to change some things. Or you will have to think out different ways of doing something. I would like you to put them together as many different ways as you can.

It was suggested that the subject write at least three alternative choices for each part of the task. MA Tasks also vary in form but they are designed for manipulation of the same variable--making multiple alternative choices. Samples of MA Task are shown in Appendix D.

A pilot task was used in Starke Elementary School, Starke, Florida, before the task was revised and used in this experiment. This opportunity was helpful in rewording instructions and adjusting complexity for all tasks.

Procedure

After this research proposal was approved by the research coordinator at P. K. Yonge Laboratory School, the subjects and other facilities for testing were arranged. The pretest of MFF lasted six days, with approximately 30 subjects a day. During the testing period seven subjects

were absent, mainly because of illness. Immediately following classification and grouping of subjects, the names of the subjects in the two experimental groups were sent to both the research section of the school and the six classroom teachers. Concurrently, training times and other schedules were settled. The two experimental tasks, LS Task and MA Task, were randomly assigned to the two experimental groups, along with one control group and one matched reflective control group. The two control groups received no treatment.

Twice a week, each experimental group was given the experimental task designed for that group. Each hand-out was a 8 1/2 x 11 xeroxed worksheet which included the instruction and task. An assignment took from 20 minutes to 35 minutes, depending on the subject's familiarity with the task and the task complexity. For those who were absent from a training session, an additional session was arranged by the subject, the teacher, and the trainer.

A male and female graduate student, in the College of Education at the University of Florida, were trained to conduct the training sessions of this study. At first, they read the proposal of this study and clarified their questions, especially regarding the method. Later, they were given some samples of the experimental task for practice. The two trainers were then randomly assigned to the two training groups for five weeks. Responsibilities of the trainers were defined as follows: (1) reading the instruction of the task for the group in the beginning, (2) distributing task sheets to subjects, (3) reading instructions and examples on the task sheet, (4) asking subjects to see if they understand how to do their tasks, (5) using examples to illustrate instructions, (6) using verbal reinforcement such as "Very good," "You did a good job,"

"You wrote a good long sentence," and "You made many good ways of doing things," to praise subjects' achievement, (7) helping subjects in spelling, (8) urging subjects to write a sentence longer by saying, "It is a good sentence, but I know you can write it longer," and (9) checking attendance and collecting finished assignments.

In order to avoid confounding experimental variables with other nonexperimental variables, the trainers were told to refrain from using the following admonitions: "Pay attention to...," "You have to follow instructions carefully," "It is easier to do it like this...," "Think of it before you write," "It is too short to me," and "Long sentences are much better than short sentences."

The training took five weeks to finish ten tasks for each experimental group. At the end of training, 89 per cent of the subjects in LS Task group finished their assignments, while 95 per cent of the subjects in MA Task group finished their assignment. The difference could be attributed partially to the less desirable and inconsistent training attitudes and techniques employed by the trainer of LS Task group. The training in MA group, compared with LS Task group, was well conducted so that many subjects made more alternatives than the space could accommodate. Enthusiasm was markedly higher in MA Task group than in LS Task group.

As the training ended, subjects in all four groups were retested individually with the same version of MFF. The same testers administered MFF to all subjects in the four groups.

Analysis of Data

The following data were collected for this study.

Name

Sex

Grade

Age

California Test of Mental Maturity score

Socioeconomic index of Occupations

Pretest of MFF response time and errors

Posttest of MFF response time and errors

All data were coded and punched on IBM cards for calculation. The data of 76 subjects either in experimental groups or in control groups are shown in Appendix A. The main statistical computations were: analysis of variance and analysis of covariance appropriate for this completely randomized block design, association between the experimental variable and the criterion variable, means and standard deviations for response time and errors for each group, t test for mean differences, correlations between response time and errors and between pretest and posttest of MFF, and mean response times and errors for each item in MFF.

The two hypotheses were tested by using the same statistical methods. Analyses of variance were followed by Dunnett's multiple comparisons between each experimental group and control group. (Hereafter, the impulsive control group will be labeled as control group, while the matched reflective control group will be called reflective control group.) At least .05 level of significance was acceptable for F test and Dunnett's test. The association between experimental variable and criterion variable was calculated to see how much variation in criterion measure could be accounted for by training. All tests between experimental groups and control groups were one-tailed. All tests between the two experimental

groups or between the two control groups were two-tailed.

Further analysis of training effect on response time and errors in various subgroups was done by t tests of mean differences. Significance level of at least .10 was required for comparisons between subgroups. Correlation coefficients of pretest and posttest between response time and error were obtained to help understand variation of the relationship between response time and error.

Correlation method and other descriptive statistics were used to help depict the nature of the population and the sample. This would provide information about generalizability of the findings from this study.

The Limitation of the Study

The generalizability of the results of this study would be limited by several factors: the size and the nature of the sample, the quality and the duration of the training, the task complexity and validity, repeated measures and memory, and the control situation.

The sample

The major limitation of this study was the size of the sample. The strategies employed by this study could be tested in either small or large groups. In small group training, which has the advantage of clinical observation, the trainer can better deal with individual differences. In large group training, which resembles classroom instruction, the trainer can gain considerable insight into what a teacher can do about modification of a conceptual tempo in classroom teaching.

This research was originally designed for large group training. It may have been advantageous to have a sample of 25 to 30 subjects in

each group. Each group of this study consisted of 19 subjects.

The second limitation encountered by this research was the nature of the sample. The population from which the sample was drawn was highly selected. Mean and standard deviation of CTMM scores of the population were 111.1 and 13.5. Mean and standard deviation of socioeconomic indices were 70.6 and 21.9. Median of parents' occupational hierarchy was 84. On the Socioeconomic Index, college professor was ranked 84. Therefore, any generalization of the results of this study to other populations should take these two factors into account. In relation to this, Zucker (1968) found that correlations between response time and error were different between middle-class children and lower-class children.

The training

The third limitation of generalizability of this study was the quantity and quality of training. In LS Task training, the group finished 89 per cent of assigned tasks. Eleven subjects finished all 10 tasks, one finished 9, two finished 8, four finished 7, and one finished 6. While in MA Task training, the group finished 95 per cent of assigned tasks. Fourteen subjects finished all 10 tasks, two finished 9, one finished 8, and two finished 7. In addition, the trainers judgment on quality of training in terms of criterion might vary from person to person. In this study, no instrument was designed and used to objectively measure the subject's progress in ability to use long sentences or to make alternative choices.

The fourth limitation came from the duration of training. The training of five weeks seemed not long enough to enable the subject to

adjust himself at ease with a communication code opposite to his own. Besides, the modification of a cognitive style requires new coordination and cooperation among cognitive factors which have been "harmoniously" relating to that cognitive style. Therefore, the optimal length of training time depends on the criterion and progress of the training.

The task

The fifth limitation of this study was the complexity of the task designed by this researcher. Since general mental ability of this sample was slightly higher than that of general population, the experimental task for this sample might not fit a sample drawn from another population.

The sixth, a crucial, limitation to generalization, was the validity of the task. The task could become invalid if it turned out to be an exercise for remedial writing. LS Task, for example, emphasized the length or redundancy of the sentence. But the remedial writing seemed to work for acceptability or grammatical correctness of the sentence. Similarly, MA Task stressed variation of something rather than prompting ideas for "creativity" training. Fortunately, this research was effective in accomplishing the validity of the task in this instance. It is hoped that the result can be generalized across other situations.

The measurement

Kagan's Matching Familiar Figures was the only criterion measure of training effect. The two administrations, pretest and posttest, of MFF were spaced over seven weeks. It was not clear that if the "warm-up" of pretest would have significant effect on MFF errors (Rhetts, 1970) by favoring impulsive children. Statistically, no significant "warm-up" was found between the two control groups. The time in between the two

administrations of the same test or the duplicate should be considered before making any generalization. Since all subjects of this study took the same version of MFF, memory effect would be relatively similar for each group.

The control

The last limitation of generalization was the control of nontreatment groups. In this study, some subjects' reactions to and knowledge about the training were "picked up" by some nontreatment subjects because of their curiosity. Some children who were not assigned to training groups did show their interest in training through different ways.

However, generally speaking, children in P. K. Yonge Laboratory School seemed accustomed to being observed, being called for a test or training, or not being called for a test or training. This greatly reduced any unnecessary psychological differences which were assumed to be equivalent between all groups.

In conclusion, generalizability of the training effect of this study was not tested against other task situations except MFF. Since the assumptions of the two strategies employed in this study were generic in nature, it was expected that the training effect could be generalized to some other task situations with moderate complexity and high uncertainty.

CHAPTER IV

RESULTS AND ANALYSIS OF DATA

Results of this study were categorized into two parts: (1) hypothesis testings, and (2) other related findings. The first category was based strictly on error changes measured by MFF. In this part, two hypothesis testings were discussed separately, although in all cases data were shown in the same tables. The second category dealt with changes of response time and other related findings.

Results of Hypothesis Testings

Means and standard deviations of both the posttest and the pretest-posttest differences of MFF error were summarized in Table 2. The data appearing in the table provided a general picture of the training result in terms of error change.

Hypothesis 1

Training in writing long sentences has a significant effect on impulsivity in term of reducing impulsive children's errors as measured by Matching Familiar Figures.

The hypothesis was supported by this study at .05 (one-tailed) level of significance. At first, one-way analysis of variance in error was made for experimental groups and control group with completely randomized block design. Data in Table 3 showed an F of 5.390 ($p < .01$) which indicated that at least one significant variance could be found. Further examination of the data in Table 4 by applying Dunnett's multiple

TABLE 2

MFF ERROR AFTER TRAINING

	LS Task		MA Task		Control		Control (reflective)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Posttest	10.53	5.55	9.21	3.26	13.42	5.49	6.11	3.33
Pre- post-test diff.	-5.22	4.58	-6.53	3.32	-2.53	5.56	0.21	2.92

TABLE 3

ANALYSIS OF VARIANCE OF ERROR

Source	SS	df	MS	F	p
Treatments	157.929	2	78.965	5.390	$p < .01$
Blocks	605.227	18	33.624	2.295	$p < .05$
Residual	527.405	36	14.650		
Total	1290.562	56			

$F_{.01;2,36} = 5.26$
$F_{.05;2,36} = 3.28$
$F_{.05;18\ 36} = 1.91$

TABLE 4

MULTIPLE COMPARISONS: IN ERROR

(By Dunnett's Method)

	LS Task	MA Task	Control
LS Task	-	-	2.69*
MA Task	-	-	4.00**

*$p < .05$, one-tailed, $d' = 2.40$
**$p < .01$, one-tailed, $d' = 3.27$

TABLE 5

MULTIPLE COMPARISONS:[1] IN ERROR

	LS Task	MA Task	Control	Control (reflective)
LS Task	-	1.31	2.69	5.43**
MA Task		-	4.00*	6.74**
			-	2.74

*$p < .01$, one-tailed
**$p < .005$, one-tailed
[1]By using simple *t* test

comparisons (Kirk, 1968) indicated that LS Task group significantly ($p < .05$) reduced MFF errors as compared with impulsive control group. The mean difference between the two groups was 2.69. It exceeded the critical value of 2.40 to be declared significant at .05 by the one-tailed test.

For all three impulsive groups, variances of pretest-posttest differences in error, as shown in Table 2, did not violate the assumption of homogeneity of variance as tested by Cochran's test (Kirk, 1968). But violation would take place ($C = .4327$, $p < .05$) if reflective control group was added to the three groups. In multiple comparisons between experimental groups and reflective control group, pooled standard errors of mean differences were used instead of using mean of square residual. In Table 5, mean difference of errors between LS Task group and reflective control group was 5.43 ($t = 4.3579$) which exceeded the critical value of significance at .005.

The statistical analysis further looked into the training effect of LS Task on errors in various subgroups. Tables 6, 7, 8, 9, 10, and 11 in Appendix E show means and standard deviations of error changes in different subgroups. Data in these tables were summarized in Table 12 for significance testing. Cochran and Cox's t statistic (Cochran and Cox, 1957) was employed to overcome the effect of heterogeneity of variance between compared groups.

From data in Table 12, it appeared that LS Task training, in its effect on reducing impulsive children's errors, favored ($p < .10$) boys, helped ($p < .10$) children whose mental ability was above Q_3, benefited ($p < .01$) those who were ten years old, and enabled ($p < .10$) children from lower socioeconomic status families, as compared to nontreatment

TABLE 12

SUMMARY OF MEAN DIFFERENCES OF ERROR CHANGE

BY SEX, GRADE, AGE, IQ, AND SOCIOECONOMIC INDEX

(Summarized from Tables 6, 7, 8, 9, 10, 11 in Appendix E)

Subgroups	LS Task vs. MA Task	LS Task vs. Control	MA Task vs. Control
Boy	-1.21	3.46*	4.67**
Girl	-1.47	1.40	2.87
Grade 3	-2.80	1.20	4.60
Grade 4	-0.14	2.14	2.28
Grade 5	-1.43	3.00	5.43**
Age 8	-5.50	2.50	8.00
Age 9	-1.67	0.93	2.60
Age 10	2.53	5.13***	2.60
Age 11	-3.17	2.50	5.67
IQ (CTMM) above median	0.85	2.63	1.78
IQ (CTMM) below median	-2.68	3.50	6.18*
IQ (CTMM) above Q_3	2.25	5.92*	3.17
IQ (CTMM) below Q_1	-4.33	2.25	6.58*
Socioeconomic Index above median	-2.99	2.93	5.92*
Socioeconomic Index below median	0.69	3.29*	2.60

*$p < .10$, one-tailed
**$p < .025$, one-tailed
***$p < .01$, one-tailed

situation. Although all other data showed positive training effect of LS Task, significant level at .10 was not reached.

To sum up, training in using long sentences had significant effect ($p < .05$) on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures. The effect was more apparent ($p < .005$) when compared with reflective control group. It was also found that impulsive children, who were boys, or with high mental ability, or ten years old, or from lower socioeconomic families, were significantly benefited from training with Long Sentence Task.

Hypothesis 2

Training in making multiple alternative choices has a significant effect on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures.

The hypothesis was supported by this study at .01 (one-tailed test) level of significance. Data in Table 2 showed that the group having MA Task training performed better than LS Task group in terms of accuracy. Therefore, by one-way analysis of variance and Dunnett's multiple comparisons, data in Table 4 evidenced that training with MA Task significantly ($p < .01$) reduced MFF errors as compared with control group. The mean difference between the two groups was 4.00. It apparently exceeded the critical value of 3.27 to be declared as significant at .01 by one-tailed test.

A pooled standard error of mean difference was used to compare the error change of MA Task group with reflective control group. Mean difference of the two groups was 6.74 in Table 5. The difference yielded a t of 6.6456 which far exceeded the critical t value of significance at .005 by one-tailed test.

Training effects on various subgroups were also examined through comparing error changes between subgroups. Means and standard deviations of error changes of various subgroups within MA Task group were compared with means and standard deviations of corresponding subgroups within control group. To overcome the effect of violation of homogeneous variance assumption, Cochran and Cox's t statistic was again applied to test significance. Data in Tables 6, 7, 8, 9, 10, and 11 were also summarized in Table 12.

From Table 12, it was evidenced that for impulsive children MA Task training as compared with nontreatment situation engendered higher capacity to reduce errors for boys ($p < .025$), for fifth graders ($p < .025$), for those whose CTMM scores either below median ($p < .10$) or below Q_1 ($p < .10$), and for those from higher socioeconomic status ($p < .10$). All data demonstrated positive effect of MA Task training on reducing impulsive children's errors although some data did not reach the required significant level.

In sum, training in making multiple alternatives had significant effect ($p < .01$) on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures. The effect appeared to be more outstanding when compared with reflective control group. Analysis of data also showed that MA Task had significantly greater effect on reducing impulsive children's errors among boys, fifth graders, lower mental ability children, and children from high socioeconomic families. Training effects of MA Task on all other subgroups were positive even though they failed to reach the required level of significance.

Similarity and difference between the two hypotheses

The two hypotheses tried to suggest two different means to accomplish

the same goal--to modify impulsivity in terms of reducing impulsive children's errors. It was evidenced that the two tasks commonly possessed the same power to help achieve accuracy for subjects aged 8 through 11. To test the combined effect of LS Task training and MA Task training, the two error changes (-5.22 and -6.53) were averaged and compared with control group error change (-2.53). The standard error of mean difference for the comparison was 1.52. A t was obtained by dividing the mean difference of 3.34 by 1.52. The result, 2.197, exceeded the critical t value of 2.015 to be significant at .025 by one-tailed test. However, the difference between the two task groups was not significant at .05 by two-tailed test.

Nonsignificant difference between the two training effects did not provide much information about the relationship between the two tasks. In Table 12, 11 out of 15 subgroups (approximately 73 per cent) showed more improvement in error changes under MA Task training than under LS Task training. Since none of differences were significant at the required level, direct comparison between two task groups was by no means conclusive.

However, if comparisons between the two tasks were done by separately comparing LS Task group and MA Task group with control group, then the effect of the two tasks could be differentiated. In Table 12, though both tasks were effective for boys, MA Task showed more powerful than LS Task in reducing errors in fifth grade children. But the direction reversed when LS Task showed its strength in training ten year old children.

Another differentiable effect of the two tasks was demonstrated in that high IQ impulsive children did better in accuracy through LS Task

training which was heavily related to verbal expression. On the other hand, low IQ impulsive children tended to improve their accuracy through MA Task training which was involved more in task variability.

The two tasks also functioned differently when each group was divided into high and low socioeconomic subgroups. LS Task was found to be related to achieving accuracy for low socioeconomic children, while MA Task seemed to be associated with better error reduction for high socioeconomic group.

To summarize, LS Task and MA Task had a similar function in reducing impulsive children's errors measured by MFF. However, there was no significant difference between the two tasks in degrees of error reduction. Further examination showed that LS Task effect could be differentiated from MA Task effect if separately compared with the control situation. For error reduction, LA Task seemed more effective for high IQ and low socioeconomic status impulsive children, while MA Task tended to work better for low IQ and high socioeconomic impulsive children.

Other Related Findings

Other findings related to testing the effectiveness of the two strategies for modifying impulsivity were: (1) analysis of covariance, (2) changes of response time, (3) changes of relationship between error and response time, (4) association between the experimental variables and the criterion variable, and (5) analysis of variance with selected subjects.

Analysis of covariance

It was considered that factors other than experimental variables might confound the result of this study. From correlational analysis,

TABLE 13

ANALYSIS OF COVARIANCE WITH CTMM SCORE AS COVARIATE

Source	yy	xy	xx	df	Adjusted SS	MS	F	P
Treatments	157.929	302.605	581.625	2	173.102	86.551	5.915	$p < .01$
Blocks	605.227	-205.200	3192.000	18				
Residual	527.405	-334.621	7317.313	35	512.103	14.632		
Total	1290.562	-237.035	11090.930	55				

$F_{.01;2,35} = 5.29$

TABLE 14

MFF RESPONSE TIME AFTER TRAINING

	LS Task		MA Task		Control		Control (reflective)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Posttest	7.87	2.93	9.35	4.28	7.85	3.32	15.17	5.08
Pre- post-test diff.	2.31	2.83	3.83	3.66	2.12	3.03	-0.94	5.71

the pretest of MFF error was negatively correlated with CTMM scores ($r = -.2413$) for all 168 subjects tested. The correlation was significant at .01. From analysis of task training effect on subgroups, LS Task seemed to be more suitable for high IQ subjects, while MA Task seemed to be more helpful to low IQ subjects. In order to see if any differences in CTMM score between groups would have effect on treatment effect, analysis of covariance was made.

Data summarized in Table 13 evidenced that analysis of covariance with an F ratio of 5.915 did not significantly change the result through analysis of variance. Both were significant at .01, although adjusted means of squares yielded a slightly higher F ratio. This suggested that slight IQ differences among three groups did not affect training effect significantly. The nonsignificant IQ differences among three group was confirmed by checking F ratio of means of squares of CTMM scores. The F ratio of 1.391 was below the critical value of 3.27 to be significant at .05.

Change of response time

Would change of error be accompanied by change of response time? To answer the question, analysis of variance of response time was done in this study. To begin with, means and standard deviations of posttest and means and standard deviations of pretest-posttest differences of response time are summarized in Table 14. The result of analysis of variance of response time is shown in Table 15.

The result ($F = 1.362$) was not significant at .05. It seemed to indicate that significant change of error did not necessarily bring about significant change of response time. Therefore, reducing errors by applying two strategies designed for this study supported an assumption

TABLE 15

ANALYSIS OF VARIANCE OF RESPONSE TIME

Source	SS	df	MS	F	p
Treatments	33.196	2	16.598	1.362	NS
Blocks	111.696	18	6.206	0.509	NS
Residual	438.588	36	12.183		
Total	583.480	56			

$F_{.05;2,36} = 3.28$

that to be reflective (long latency and high accuracy) was not the only alternative for modifying impulsivity. It also suggested that change in accuracy did not necessarily induce change in response time.

Change of relationship between response time and error

MFF pretest correlation coefficients between response time and error for three impulsive groups were: -.498, -.171, and -.470 respectively. They were lower than over-all correlation of -.534 from 168 subjects. The second group, later assigned as MA Task group, showed significantly low correlation between the two variables. Incidentally, this group had slightly lower mean CTMM score and lower mean socioeconomic status as compared with other two groups. The first group, LS Task group, had highest correlation of response and error, with both CTMM and socioeconomic status in between the second and the third groups.

Though somewhat confusing, an interesting phenomenon occurred, perhaps, by training. The posttest correlation coefficients between response time and error for all groups turned out to be: -.162, -.522, and -.437. When control group remained stable, LS Task group and MA Task group pretest correlation coefficients reversed direction remarkably. LS Task group reduced the correlation by .336, while MA Task group increased the correlation by .351.

Association between experimental and criterion variables

Significant treatment effect of the two experimental tasks tested by F ratio did not provide information concerning the size of its effect. Indication of significant training effect of this study made further exploration of association between the experimental variable and the criterion variable necessary. By using the formula for calculating association (Kirk, 1968, p. 134) W^2 was found .10. The result showed that task training was estimated to account for 10 per cent of variance in error rate change. What caused the other 90 per cent of change was unknown, statistically. This might be partially due to the characteristics of indirect modification methods.

Analysis of variance for selected extremely impulsive subjects

Although the two experimental tasks were designed primarily for impulsive children to improve accuracy, it would be interesting to learn how they worked when "seriousness" of impulsivity varied. Subjects in each group were classified again into moderate impulsives and extreme impulsives by combining response time and errors. Seven subjects in each group were classified as extremely impulsive, leaving 12 subjects in each group as moderately impulsive.

TABLE 16

ERROR CHANGE BY EXTREMELY AND MODERATELY IMPULSIVE GROUPS

	LS Task		MA Task		Control	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Extremely impulsive	-6.86	5.40	-7.86	3.24	-4.86	3.62
Moderately impulsive	-4.25	3.96	-5.75	3.25	1.17	6.16

Table 16 shows means and standard deviations of error changes by extremely impulsive subjects. Simple t tests were used to compare LS Task and MA Task groups with control group. MA Task training had significant effect ($t = 1.976$, $p < .05$, one-tailed) on error reduction as compared with control group. Other differences were not significant. For the moderately impulsive category, data in Table 16 were also tested by t statistics. The result also favored MA Task significantly ($t = 2.278$, $p < .025$, one-tailed) as compared with control group.

In general, extremely impulsive subjects tended to reduce more errors on MFF in both training groups and control groups than did moderately impulsive subjects.

To conclude: (1) analysis of covariance did not show significant group differences of IQ and their effect on training, (2) there was no significant change in response time when errors did change significantly,

(3) different task trainings did alter the relationship between response time and error, (4) the training was estimated to account for error change by about 10 per cent, and (5) only MA Task training could have a discernible effect on both extremely and moderately impulsive children in achieving accuracy.

CHAPTER V

DISCUSSION

Results obtained in this study provided clear evidence to support the hypotheses. Training in both writing long sentences and making multiple alternatives was effective in reducing impulsive children's errors as measured by Kagan's Matching Familiar Figures.

The two underlying assumptions proved to be sound. The indirect approach to modifying impulsivity in terms of error was demonstrated useful. By enhancing redundancy of a code and by enlarging variations of codes, impulsive children learned to be more able and willing than before to deal with reality in different codes. Although training tasks in this study bore little resemblance to figural "match-to-sample" tasks in terms of format and procedure, training effect provided generalizability in reducing error.

Language and Forming of a Cognitive Style

In the beginning section of this paper, cognitive style is defined as the individual's relatively consistent mode of conceptual process in dealing with his external reality. Furthermore, it seems reasonable that no cognitive style is formed simply by a single factor. Formation of a cognitive style thus is consistently operating in each individual's growth and development, environmental structure and dynamics, as well as in interactional tools between the individual and his environment. Once a style is formed and proved to be workable and economical, it will be maintained and enhanced by the individual through his preferred

surroundings. Therefore reflective-impulsive tempo, without exception, is formed, maintained, and enhanced by several factors in a relatively consistent way. Language is one factor consistently influencing reflective-impulsive tempo.

Relationship Between Restricted Language and Impulsivity

Language has been found to be a powerful tool for mental "operation." Bernstein's position (1958) that a relationship exists between the communication code and cognitive development was considered for this study. The relationship was extended by this researcher to assume that restricted communication code is related to formation of impulsive tempo which was identified by Kagan and others (1964). Short sentences and limited alternatives were assumed to be two major characteristics of a restricted language form used by certain people. This researcher further assumed, in light of certain people's using restricted language, that impulsive children are accustomed to using short sentences and handling very limited alternatives in communication. In other words, impulsive children were relatively able and willing to communicate in a less redundant and less variable form of language.

This assumption was confirmed by empirical observation in this study. Subjects in both training groups did demonstrate their poor ability and impatience in using long sentences and making alternatives in the beginning. Boys, especially, made several efforts before making a long sentence for the first few tasks. Certain girls even put a few short sentences together by using "ands" and called them a long sentence. Both boys and girls experienced uneasiness when they were first asked to communicate in a code different from that with which they were familiar.

Cognitive Mismatch by Mismatched Codes of Communication

The reason for the uneasiness described above seemed very clear. A once "workable" and "economic" restricted code of communication could become "unworkable" and "uneconomic" if the situation changed. A learning, should it require or actually include an elaborated communication code, may create a gap between information to be acquired and the cognitive style which handles information assimilation. When information is encoded in visually or auditorily redundant and variable ways, the impulsive child is unable and consequently unwilling to make information acquisitable. Therefore, mismatch between a language form and the child's own language form may result in mismatch between a cognitive style which is called for by that language form and the child's own cognitive style which is rather akin to his language form.

When this is true, a child can show disgust at the appearance of another form of language by avoidance or "living with it" without knowing what it is communicating. Some children would rather shun any books in which sentences look redundant. Others may give answers without understanding the questions.

If an impulsive child is asked to act when encountering a language form different from his own, he usually tries to "quit" the uneasy situation by quickly doing something. He may guess or cheat if possible. The correct answer is the one which signals that he is "allowed" to "leave" that situation. When guessing, there is very little real communication between the individual and the situation.

Such a "guess-and-see" response pattern was frequently demonstrated

in this study, taking place in testing of MFF with impulsive children. Subjects quickly chose an answer and glanced at the tester almost simultaneously. If the tester's feedback was positive, subjects would usually guess again at the next item. If the first selection was indicated incorrect, subjects tried to shift to the other answer as quickly as possible. Inevitably errors were then accumulated progressively. In this case, they "learned" the correct answer by being negatively reinforced. (The correct answer "took them away" from the uneasy situation caused by the mismatch.) The answer was correct not because it should be correct but because it signaled "passing."

Though frequent as they were, this was not the whole "story" of impulsive children's response patterns in testing of MFF. For some impulsive subjects, directly after the first unsuccessful pick, there was a brief moment of hesitation. Their fingers undecidedly hovering over some other variations. Anxiety might partially account for that short delay. But observation with scrutiny seemed to indicate that intrusion of information took place before his second trial. Information, involving either commonalities or differences between the standard and variations, though mostly incomplete and inadequate for a solution, intruded into subjects' guessing behavior. Subjects were tempted to use intruded information because it was less redundant and less variable. Ward (1968) found that impulsive subjects did appear more "reflective" if the first choice failed.

It was also found that some impulsive subjects had little intention to guess. But when confronted with redundancy and variations, these subjects demonstrated little interest (or ability) in getting into "details" of the test item.

They would neither concentrate on one single picture nor collect elements from all pictures. The only alternative they had seemed to be accepting certain dominant features of the standard at first glance, and using them as criteria for scanning. They looked back at standards for memory confirmation rather than seeking more information. Impulsive subjects (they might be moderately impulsive) liked to have and to work with a limited amount of information.

Consequences of mismatch in man-to-man communication were discussed by Bernstein (1965) in an article on social class, speech systems and psychotherapy. Bernstein reasoned that lack of clarity and presence of ambiguity between people using different forms of language would likely raise levels of tension for those who used restricted code. Those tensions would be dissipated "quickly" through some "immediate channels" other than verbal control.

Enriching Rather than Correcting

Psychological or educational intervention seems necessary to help solve mismatches. Otherwise, communication of information will be greatly handicapped by the existence of a gap created by mismatches. In this respect, this researcher agrees with the suggestion made by Cazden (1968) regarding language development that we forget about correction and concentrate on "adding," "enlarging," and "refining." With regard to modification of cognitive styles, this researcher adopted the idea that we should help children acquire and use alternative approaches rather than restrict ourselves to a specific approach. This idea was also proposed by Frederick and Klausmeier (1970).

Enriching Through Hypothesis Testing

The concept of enriching children's ability to encode information into different forms was integrated into the two hypotheses of this study. The first hypothesis represented a strategy to enrich impulsive children's ability to communicate in seemingly redundant forms by instructing them to use long sentences. The second hypothesis represented another strategy to enrich impulsive children's ability to communicate in various ways by instructing them to find multiple alternatives.

The two hypotheses were substantially supported by statistical analyses of data collected from this experimental study with children ages eight through eleven. In other words, impulsive children with training in either using long sentences or making multiple alternatives did communicate better with visually redundant and various match-to-sample tasks such as MFF. Furthermore, one may infer that significant error reduction could be accounted for by increases in information assimilation through better communication between subjects and MFF. Therefore, the gap existing between subjects and MFF could be diminished by the training. In addition, noticeable increases in response time on MFF could be partially interpreted as increased interest in communication.

Results of this study, in terms of an individual's ability to code variability, were consistent with Munsinger and Kessen's findings (1964). Preference for high variable stimulations was related to the individual's ability to code variability. In other words, an individual will code variable forms of information only when he is able to do so. They further

pointed out that such ability could be changed by experience with variable stimulations or special training.

Evaluation of the Experimental Task

The success of task training in terms of its effect on error reduction for impulsive children should be attributed much to the contribution of the experimental task. First, the task provided children with consistent actual experience which was necessary for enriching a communication code. There is no doubt that learning a specific communication code requires opportunity for repetition.

Second, the task was varied in form to enlarge the variety of stimulations. Both LS Task and MA Task variations not only broadened children's experience in communication but enhanced children's interest in communication. In this respect, Fiske and Maddi (1961) found that varied stimulation was related to enhancing subjects' attention arousal.

Third, the task served as stimulation for children to create their own forms of redundancy and variations. It was believed that starting from one's own experience, the training could be better integrated in children's cognitive structures. The task avoided imposing any uniform sentences or alternatives on children to learn or to imitate.

Finally, change of performance caused by the task training in this study was the best estimate of treatment effect. In the task training, no comment, contrasts, valuation or devaluation of the two criterion variables--response time and errors--were made. Therefore, the relationship between the variation of the experimental variable and the change on the criterion variables became highly interpretable without nuisance effect. In other words, the task training induced error reduction while it kept the criterion measure highly valid and sensitive. This

experimental task and task training demonstrated its superiority to modeling in terms of explaining treatment effect. In modeling, the criterion measure of the posttest becomes less valid or insensitive because the variable involved in the criterion measure is already distorted or desensitized by the training. Examples of desensitizing criterion measures can be seen in the original reports of those researches on modification of reflective-impulsive conceptual tempo using modeling techniques.

Analysis of Training Effect on Each MFF Item

Significant effect of task training on error reduction for children with impulsive tempo stimulated further interest in analyzing changes of errors on different items.

Figure 2 shows the average errors on each item of MFF pretest. The average errors on each item of MFF posttest are given in Figure 3. On the pretest, three impulsive groups were very similar in error-making throughout 12 items. They all encountered difficulties on items 1, 4, 7, 9, and 12. Similar to impulsive groups in trend, the reflective control group made relatively high errors on items 1, 3, 7, 12. Both impulsive groups and reflective group "enjoyed" low errors on items 2, 5, 6, and 10. However, no single impulsive group made fewer errors than reflective group on all 12 items.

Interestingly enough, the trend of MFF posttest for all four groups changed very little. But horizontally, error differences between three impulsive groups increased, while error differences between training groups and reflective group decreased. In other words, the task training made three impulsive groups more discernible while it brought the three groups closer to reflective groups. Among three impulsive groups,

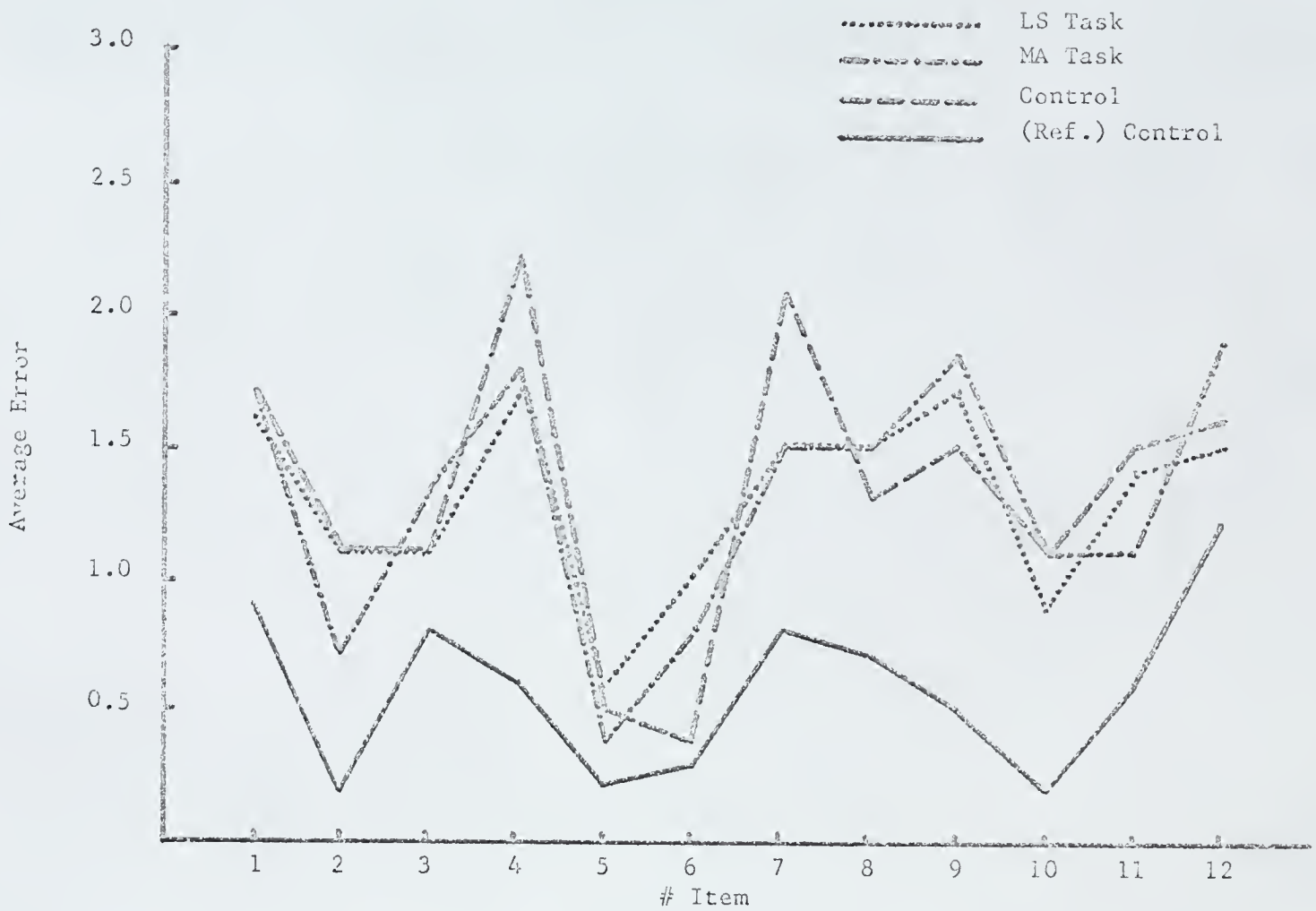


FIGURE 3. PRETEST AVERAGE ERRORS ON EACH MFF ITEM

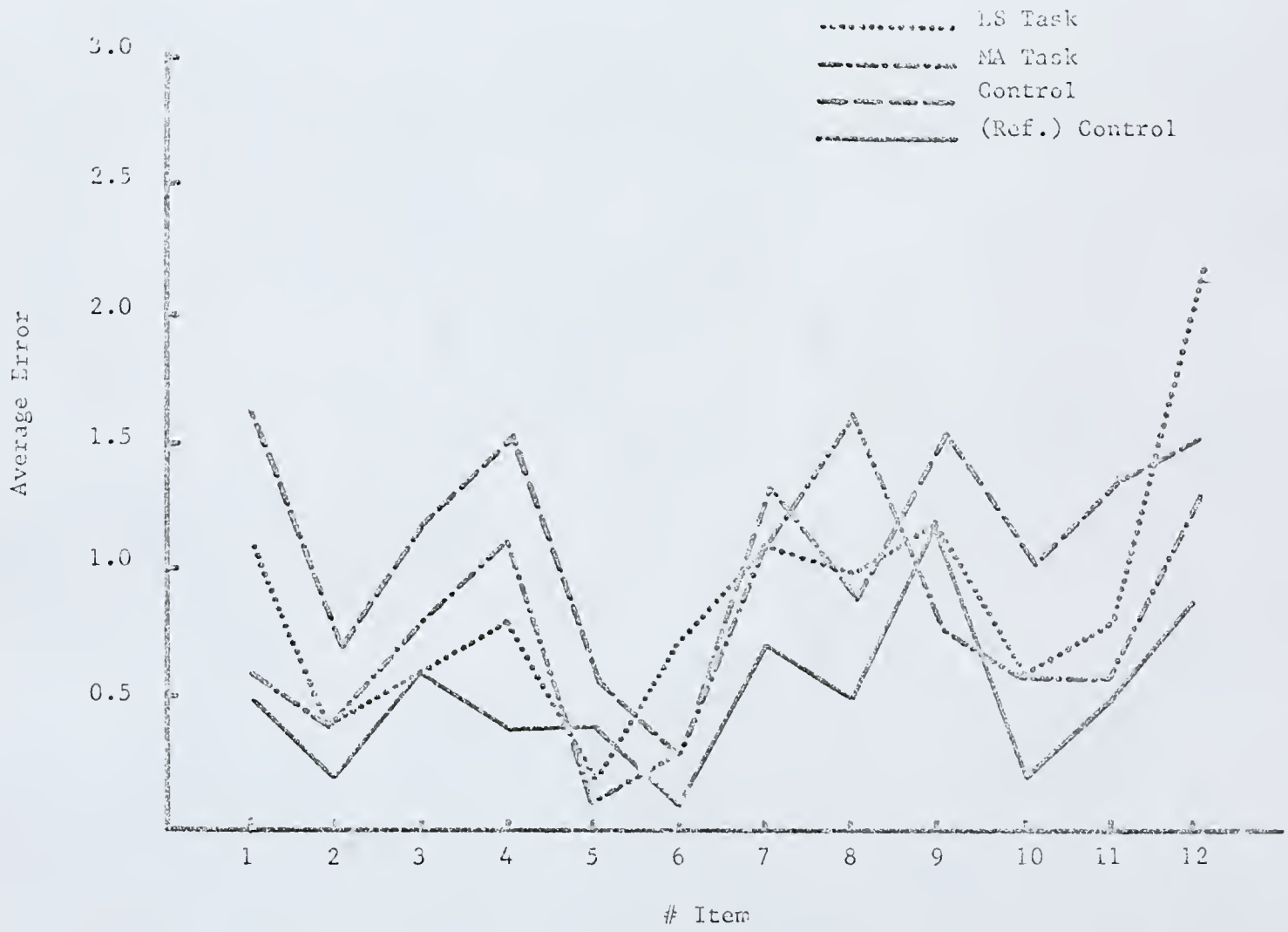


FIGURE 4. POSTTEST AVERAGE ERRORS ON EACH MFF ITEM

LS Group did equally or better than control group on 9 out of 12 items, while MA Group did equally or better than control group on 11 out of 12 items. Between the two experimental groups, MA Group showed superior to LS Group on 6 items while LA Group did better than MA Group on 3 items. Such results suggested that the task training caused general improvement (or overall error reduction) as well as specific improvement on some items.

Surprisingly, in terms of accuracy on MFF posttest, LS Group did equally or better than reflective group on items 3, 5, and 9. At the same time, MA Group exceeded reflective group on items 5 and 9. These three items, 5, 3, and 9, represented low to high task complexities. This could be interpreted to mean that enrichment of ability to deal with redundant and variable codes of communication also strengthened children's ability to deal with less redundant and less variable codes.

Training Effect on Relationship Between Response Time and Error

In Chapter IV, data showed that after training the relationship between response time and error for the two experimental groups changed in different directions. LS Task training "pulled down" the correlation coefficient from -.498 to -.162, while MA Task training "pushed up" the correlation coefficient from -.171 to -.522.

The unexpected changes of correlation between the two variables might be related to the two different task trainings when control group correlation decreased only slightly.

Since average response times and errors and average changes in response times and errors did not provide any predictable rule for the change of relationship between the two variables, a tentative interpretation was proposed by this researcher. It was found that the two task

trainings had differentiable effects on test performance in terms of response time and error. As data shown in Table 12, LS Task training had more effect on error reduction for the subject with higher mental ability or lower socioeconomic status. According to Zucker (1968), correlation between latency and accuracy for lower-class children's task performance on MFF dropped from -.63 to -.49, when intelligence was partialed out. LS Task training in this study, therefore, might function to "wash out" intelligence effect on MFF and "pull down" the correlation.

On the other hand, data in Table 12 showed that MA Task training was more effective in error reduction for the subject of low mental ability or high socioeconomic status. In the same study, Zucker found that the middle-class subject showed almost no correlation between intelligence and response time or error. Therefore, MA Task training in this study seemed to depend little on intelligence. The training, however, might enhance a certain scanning strategy which took longer latency and produced lower errors, and the correlation would increase accordingly.

Relative Efficiency of the Experimental Design

Interpretation of research results has much to do with the adequacy of the design of the study, especially an experimental study. The adequacy of an experimental design can be shown by calculating the relative efficiency of that design. For this study, the relative efficiency of the completely randomized block design was the ratio of mean of square within group (20.225) and mean of square of residual (14.650). The ratio is 1.38 which is greater than 1.00. This ratio suggested that the block design employed in this study demonstrated

its advantage in eliminating individual differences appearing in the same blocks in terms of error change on MFF.

Such advantage was evidenced by a significant F ratio of block effect shown in Table 3. The F ratio of the block effect (2.295) exceeded the critical value of 1.91 to be declared significant at .05. If the block design had not been used in this study, the block effect would then be added to the error term. This would make the statistical analysis less sensitive in exploring treatment effects.

Conclusion

This experimental study provided an opportunity to test the hypothesis that training in using long sentences and making alternatives had effects on error reduction for children with impulsive tempo. The result significantly supported the hypothesis.

Significant error reduction induced by the two task trainings was mainly interpreted from results of children's enriched ability to deal with redundancy and variability. The research demonstrated that: (1) the impulsive tempo was modifiable, (2) enriching impulsive children's ability to deal with redundant and variable codes was one approach to modification of impulsivity, (3) to solve mismatch between the individual's cognitive style and codes of communication was as important as teaching certain scanning strategies, and (4) the correlation between response time and error could be altered in either directions by providing some specific learning experiences.

CHAPTER VI

SUMMARY, CONCLUSION, AND IMPLICATIONS

Summary

This experimental study was to appraise the effect of two strategies for modifying impulsivity in terms of reducing impulsive children's errors measured by Kagan's Matching Familiar Figures. The assumptions of this study related children's impulsivity with their being accustomed to using restricted code of communication characterized partially by short sentences and limited alternatives. To cope with impulsive children's high errors when encountered with redundant and variable codes of communication, two strategies were employed. These two strategies, which were represented by the two hypotheses in this study, involved enrichment of children's ability to deal with redundancy and variability.

Hypotheses

The two hypotheses tested in this study were:

> Hypothesis 1: Training in writing long sentences has a significant effect on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures.
>
> Hypothesis 2: Training in making multiple alternative choices has a significant effect on impulsivity in terms of reducing impulsive children's errors as measured by Matching Familiar Figures.

Design

Eighty-six boys and 89 girls in grades 3, 4, 5, of P. K. Yonge Laboratory School at the University of Florida, Gainesville, Florida, participated in this study. Their ages ranged from eight through eleven. By using Kagan's Matching Familiar Figures (MFF), children whose average response times fell below median and total errors above median were classified as impulsive. Those whose average response time fell above median and total errors below median were labeled as reflective. Among 59 impulsives and 59 reflectives, 57 impulsives were randomly assigned into three groups with block design, and 19 reflectives were randomly selected as matched control group. Data showed that the three impulsive groups were very similar in such variables as mental ability and socio-economic status.

Two experimental tasks, Long Sentence Task (LS Task) and Multiple Alternatives Task (MA Task), were designed by this researcher to test the hypotheses. They were randomly assigned to two impulsive groups with the third group as control group which received no training. A male and a female graduate student were trained to conduct the training. In LS Task group, children were instructed to write two long sentences for each task. While in MA Task group, children were instructed to write at least three alternative choices for each part of a task. Ten tasks for each group were finished in five weeks. After training, the same version of MFF was individually administered to children in four groups.

Results

Results of the study significantly supported the two hypotheses at .01. Further comparisons of error changes by Dunnett's method showed

that both LS Task group and MA Task group significantly reduced errors (at .05 and .01 respectively) on MFF as compared with control group. Analysis of covariance indicated that mental ability did not significantly affect the discernible treatment effect. The LS Task training was found to be more effective for boys, for children with high mental ability, and for those who were from lower socioeconomic families. On the other hand, the MA Task training was more effective for boys, for children who had lower mental ability, and for those who were from higher socioeconomic status.

Other findings demonstrated that there was no significant increase of response time, and that the correlations between response time and error were altered in different directions by different training tasks. The study also showed that MA Task training affected both extremely and moderately impulsive children in terms of error reduction.

Conclusion

The major conclusion drawn from this study was that modification of children's impulsivity in terms of error reduction could be accomplished by enhancing children's ability to deal with redundancy and variability. This conclusion was based upon the significant training effect of writing long sentences and making alternatives on error reduction for impulsive children ages eight through eleven.

From the results of this study and subsequent discussion, the following conclusions may be drawn: (1) The impulsive tempo can be modified in terms of accuracy. (2) Enriching children's codes of communication may enhance children's ability in information assimilation. (3) Appropriate methods for modification of impulsivity can be developed if some critical behavioral correlates of impulsivity are taken into account.

(4) The relationship between latency and accuracy can be affected by certain experiences. (5) The indirect method for modification of impulsive tempo can be as effective as direct modeling method. However, the indirect method keeps the criterion measure as sensitive as possible. It also eliminates influence from the experimenter's expectation. (6) Modification of a tempo, either impulsive or reflective, should aim at facilitating optimal learning, informative measurement, as well as a healthy personality. These conclusions have not only emerged from the study results and discussion but also suggested some implications for consideration by educators and counselors.

Implications of the Study

From encountering a problem, seeking truth, to proposing keys to a solution, research studies should contribute to making man more human. With this in mind, the implications of this study will be considered according to possible contributions to optimal school achievement, informative measurement, and healthy personality development.

First, the family and school may provide children, in their early ages, experiences in various language forms. Since language is one of the powerful tools for cognitive development, a variety of experiences in different language forms, restricted and elaborated (or other forms), may consequently help children "internalize" a broader range of cognitive skills. With more available alternative cognitive skills, children may deal with "reality" more flexibly. Therefore, learning can be more effective.

Second, the curriculum planner may reorganize learning materials in a way that such materials may enrich children's coding and recoding

ability with different codes of communication. To vary language forms used in learning materials, education could avoid stereotyped, monotonic, and fixed materials which are less effective in attention arousal.

Third, the school may encourage teachers to be more flexible in verbal communication practices which not only allow children to use their own language forms but also facilitate children's ability to use other language forms. Obviously, this would presuppose no existence of bias against any forms of language. Therefore, children can use language forms more freely according to their judgment of the necessity.

Fourth, the test maker and test administrator may adjust measurement techniques to assure child's comprehension of each test question. They also should be sure that answers expressed in one form of language are as valid as in the other form, providing the answer is correct. If some children have difficulty understanding the question due to its language form, appropriate adjustment should be made in order to make optimal information communication possible.

Fifth, the school may give special training to those children who cannot benefit from language enrichment through regular classroom teaching. Such special training requires that a qualified trainer specialize in language instruction and be sufficiently knowledgeable about cognitive development. However, the training process should not evolve into training language form for maintaining a cultural tradition.

Sixth, the counselor may improve interpersonal communication in counseling. Tension increases if the counselor and the counselee speak "different" languages. Although the counselor can be trained to be familiar with different forms of language used by children, it is more advantageous to communicate with children who are not only proud of

their language, but also understand the counselor. This is essential in establishing rapport between the counselor and children.

Finally, the educator may enhance children's healthy personality development. If errors are caused by children's inability to communicate with stimulus situations, to remove the cause would reduce frustration and probably enhance children's self-concepts. One possible way to remove such a cause is to enrich children's ability to deal effectively with redundant and variable forms of language.

These implications cannot become significantly relevant to children's effective learning and healthy personality development until more studies are made in the area of impulsivity modification through error reduction. Furthermore, these results must be confirmed, and applied in terms of increasing teacher's sensitivity to children's current language forms and their cognitive styles.

The following suggestions in terms of research methodology for further studies on modification of impulsivity through error reduction are proposed by this researcher:

1. More detailed and professionally designed experimental tasks and standardized task training procedures are necessary for hypothesis testing.

2. An objective instrument should be designed to assess progress in task training.

3. In addition to the two characteristics of restricted language selected for this study (short sentences and limited alternatives), other such characteristics can be isolated and added to the study. These additions could provide increased depth in testing the hypothesis that language form is associated with conceptual tempo.

APPENDICES

APPENDIX A

TABLE OF ORIGINAL DATA FOR FOUR GROUPS

TABLE OF ORIGINAL DATA FOR FOUR GROUPS

S	Group[1]	Sex[2]	Grade	Age	CTMM[3] Score	SES Status[4]	MFF Pretest Time[5]	MFF Pretest Error[6]	MFF Posttest Time	MFF Posttest Error
9	2	2	5	11	116	84	5.4	9	10.6	2
11	4	2	5	10	109	62	11.3	3	8.9	11
12	2	1	3	8	105	72	5.3	20	12.8	9
13	1	1	5	11	118	84	4.5	10	8.0	15
16	2	1	4	10	125	44	6.0	12	10.5	10
17	4	2	5	11	118	12	22.0	6	19.7	5
18	4	2	4	10	117	65	11.6	11	24.3	10
19	1	2	4	11	104	44	4.2	12	8.3	7
21	2	1	4	9	102	61	6.5	19	12.9	10
23	3	1	5	11	120	92	8.8	14	16.3	8
24	1	1	4	10	102	84	5.6	21	10.2	13
25	4	2	5	10	120	96	31.5	1	22.5	4
29	1	2	3	8	86	44	3.4	18	6.0	21
30	3	1	5	11	86	14	7.3	10	5.2	15
32	1	2	5	10	117	92	8.0	9	5.6	4
38	2	1	5	11	111	66	7.7	15	21.6	4
40	2	2	5	11	115	92	6.7	10	10.6	8
41	2	1	5	11	121	59	7.4	13	7.5	7
42	2	2	5	10	114	36	3.0	11	6.3	9
43	4	2	5	11	130	84	10.2	8	10.2	5
46	4	2	5	10	108	49	9.9	4	16.0	1
48	1	1	5	11	121	84	6.8	11	8.5	3
50	3	2	5	10	100	85	6.2	16	5.8	11
52	2	1	5	11	94	84	6.5	13	4.7	9
53	3	1	5	10	95	92	4.1	20	6.2	18
54	3	1	5	10	126	84	5.5	11	2.5	16
62	3	1	4	9	115	84	3.3	14	10.4	13
63	3	1	4	10	127	92	7.0	11	8.1	8
64	2	2	4	10	112	61	6.3	14	7.9	12
68	2	2	4	10	96	21	7.0	18	11.7	9
70	2	2	4	10	131	92	4.5	15	10.0	7
71	1	2	4	10	101	72	5.3	13	5.2	8
72	4	2	4	10	115	84	11.0	5	10.8	4
73	3	2	4	9	116	93	4.5	17	6.2	9
75	4	2	4	10	127	84	16.2	2	19.0	1
78	3	1	4	10	119	68	5.8	19	8.0	12
81	3	1	4	10	133	85	3.6	13	8.1	10
82	4	2	4	10	82	19	14.5	10	15.9	9
84	3	1	4	10	108	39	5.8	17	10.0	7
85	1	1	4	10	123	67	7.9	12	9.5	4
87	1	2	4	10	69	44	7.8	14	10.6	9
88	3	1	4	10	122	84	9.5	12	9.2	13
89	4	1	4	9	93	62	11.5	6	11.5	12
91	4	2	3	8	127	84	14.8	8	21.1	7
99	3	1	3	9	117	92	4.0	23	5.5	16

TABLE OF ORIGINAL DATA FOR FOUR GROUPS (CONT'D)

S	Group[1]	Sex[2]	Grade	Age	CTMM[3] Score	SES Status[4]	MFF Pretest Time[5]	MFF Pretest Error[6]	MFF Posttest Time	MFF Posttest Error
100	2	2	3	8	74	9	5.8	20	7.1	15
105	2	1	3	9	106	84	7.7	16	14.5	8
108	4	2	3	9	118	84	14.9	9	8.9	6
113	3	2	3	8	118	67	6.1	18	12.1	23
115	4	2	3	9	127	67	13.1	8	11.5	7
116	1	2	3	9	91	47	6.5	20	11.3	20
117	4	1	3	9	115	72	28.8	3	16.9	3
118	2	2	3	8	113	82	2.9	23	7.1	15
122	4	2	5	11	130	48	25.2	3	19.2	5
124	2	2	3	9	115	84	5.5	16	4.0	10
130	1	1	5	11	117	66	8.3	13	12.2	13
132	3	1	5	10	118	84	4.0	24	4.0	23
134	1	1	4	10	113	47	3.5	30	3.6	20
136	3	1	3	9	133	84	6.1	15	4.5	18
140	2	2	5	11	110	92	2.5	14	7.7	7
141	1	2	5	10	118	92	3.9	18	9.3	7
143	1	2	3	8	109	84	4.4	19	6.0	11
145	1	1	5	11	127	84	3.0	17	3.9	13
146	1	1	4	10	110	61	4.5	16	7.8	11
149	3	1	3	8	114	44	5.0	19	9.8	14
154	4	2	5	11	106	49	13.0	8	8.4	7
158	2	2	4	9	93	66	4.8	24	6.4	11
161	4	1	4	9	139	92	14.2	5	15.2	6
162	4	2	4	10	106	61	14.7	9	9.7	11
164	3	2	5	10	96	46	4.6	14	5.9	19
167	4	2	5	11	122	39	17.7	3	18.5	2
168	1	2	3	9	122	96	5.4	15	6.7	9
173	2	1	4	9	92	96	3.4	17	3.7	13
174	1	1	3	9	131	84	5.2	17	13.5	4
177	3	2	3	9	126	84	7.6	16	11.3	2
180	1	2	5	11	105	70	7.5	14	3.4	8

[1]One for LS Group, 2 for MA Group, 3 for Control Group, 4 for Matched Reflective Control Group.
[2]One for Boy, 2 for Girl.
[3]California Test of Mental Maturity.
[4]Duncan's Socioeconomic Index by Occupations.
[5]Average Time in Second.
[6]Total number of error.

APPENDIX B

THE RECORD SHEET FOR MATCHING FAMILIAR FIGURES

Matching Familiar Figures
(record sheet)

Name_____ Sex_____ Birth date ___/ /___

Item #	Time to first choice (sec.)	Number of errors
1.	_____.____	_____
2.	_____.____	_____
3.	_____.____	_____
4.	_____.____	_____
5.	_____.____	_____
6.	_____.____	_____
7.	_____.____	_____
8.	_____.____	_____
9.	_____.____	_____
10.	_____.____	_____
11.	_____.____	_____
12.	_____.____	_____
Total	_____.____	
Average	_____.____	

Recorder_____

Date of recording ___/ /___

Note:

APPENDIX C

LONG SENTENCE TASK

(LS TASK)

LS Task 1

Name: _____

1. Write one long sentence describing how you look.

_____

_____

_____

2. Write one long sentence to tell what you do in school.

_____

_____

_____

LS Task 2

Name: _____

1. Write one long sentence to tell how you spend your money.

_____

_____

_____

2. Write one long sentence to tell what you like to read.

_____

_____

_____

LS Task 3

Name: _____

Write a long sentence which tells more about each of the following.

1. Happy look.

_____

_____

_____

2. Smiling face.

_____

_____

_____

LS Task 4

Name: _____

Write a long sentence which tells more about each of the following.

1. Go play.

_____

_____

_____

2. Don't move.

_____

_____

_____

LS Task 5

Name: _____

Write a long sentence which tells more about each of the following.

1. Not me,

_____

_____

_____

2. Find him.

_____

_____

_____

LS Task 6

Name: _____ _____

Write a long sentence which tell more about each of the following.

1. She got gift.

_____

_____

_____

2. He caught fish.

_____

_____

_____

LS Task 7

Name: _____

1. Write a long sentence to show the reason you should keep your hands clean.

_____

_____

_____

2. Write a long sentence to show the reason you like to have fresh air.

_____

_____

_____

LS Task 8

Name: _____

1. Write one long sentence to tell why you have a house.

_____

_____

_____

2. Write one long sentence to tell why you have (or you do not have) friends.

_____

_____

_____

LS Task 9

Name: _____

The words of following sentences are all mixed up. They do not make any sense. Write the sentences in the right orders so that they make good sentences.

1. my father hardworking man is a and a lot of he had energy

_____

_____

_____

2. a lot of she had trouble but give up still did not she

_____

_____

_____

LS Task 10

Name: _____

The words of following sentences are all mixed up. They do not make any sense. Write the sentences in the right orders so that they make good sentences.

1. and blue eyes blond hair good looking ears I have which pretty feel make me

_____

_____

_____

2. cornflakes my I eat when lies he in bed with juice and toast his

_____

_____

_____

APPENDIX D

MULTIPLE ALTERNATIVES TASK

(MA TASK)

MA Task 1

Name: _____

1. Use these six numbers, 1, 7, 6, 4, 8, 3, to make as many as six-digit numbers as you can. Such as:

   (A) 176483

   (B) 687134

   (1) _____

   (2) _____

   (3) _____

   (4) _____

   (5) _____

   (6) _____

2. Change the place of any number in 438496 to show that

   (A) 438496 is different from 483496

   (B) 438496 is different from 494386

   (1) 438496 is different from _____

   (2) 438496 is different from _____

   (3) 438496 is different from _____

   (4) 438496 is different from _____

   (5) 438496 is different from _____

   (6) 438496 is different from _____

MA Task 2

Name: _____

1. 

can be (A) 

can be (B) 

can be (1) 

can be (2) 

can be (3) 

can be (4) 

can be (5) 

can be (6) 

2. 

is not (A) 

is not (B) 

is not (1) 

is not (2) 

is not (3) 

is not (4) 

is not (5) 

is not (6) 

MA Task 3

Name: _____

1. You have five marbles, white, yellow, red, green, and blue. Use three colors at a time. For example:

   (A) white, yellow, green

   (B) yellow, green, blue

   (1) _____

   (2) _____

   (3) _____

   (4) _____

   (5) _____

   (6) _____

2. Jim, Mary, Joe, Bob, and Kathy want to be on spelling team. Only three can be on each team. For example:

   (A) Kathy, Bob, and Mary

   (B) Joe, Mary, and Jim

   (1) _____

   (2) _____

   (3) _____

   (4) _____

   (5) _____

   (6) _____

MA Task 4

Name: _____

1. Mr. James lives in Town A. He has to make two stops, one in each town, in order to get to Town G. What orders of stops could he have? For example:

(A) A-C-D-G

(B) A-B-F-G

(1) A- - -G

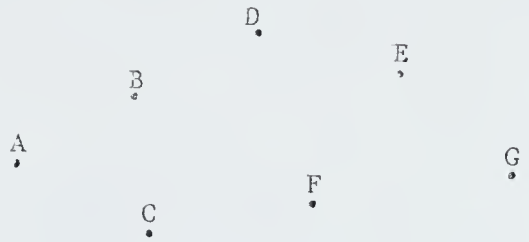
(2) A- - -G

(3) A- - -G

(4) A- - -G

(5) A- - -G

(6) A- - -G



2. Miss Jones is invited to five parties, L, M, N, O, P, on the same day. She plans to attend all the parties in any orders she wants. What orders could she have? For example:

(A) L-M-N-O-P

(B) O-N-P-M-L

(1) - - - -

(2) - - - -

(3) - - - -

(4) - - - -

(5) - - - -

(6) - - - -

MA Task 5

Name: _____

1. Use three Xs and three Os, you can make that

(A) XXXOOO is not XOXOXO

(B) XXOOXO is not XOXOXO

(1) _____ is not XOXOXO

(2) _____ is not XOXOXO

(3) _____ is not XOXOXO

(4) _____ is not XOXOXO

(5) _____ is not XOXOXO

(6) _____ is not XOXOXO

2. Use three 3s and three 8s, you can make that

(A) 388383 is not 333888

(B) 338883 is not 333888

(1) _____ is not 333888

(2) _____ is not 333888

(3) _____ is not 333888

(4) _____ is not 333888

(5) _____ is not 333888

(6) _____ is not 333888

MA Task 6

Name: _____

1. John has to pay 12 cents postage for his letter. He has lots of different stamps, 1¢, 2¢, 5¢, 6¢, 10¢, and 25¢. What stamp(s) can he place on the envelope to make 12 cents?

(A) one 10¢, one 2¢

(B) two 5¢, one 2¢

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

2. Linda wants to pay 16 cents for her ice cream cone. She has lots of pennies, nickles, dimes, and quarters. What kinds of coin may she use to pay for her cone? (She can pay more and get change back.)

(A) one dime, one nickle, and one penny

(B) two dimes and get four pennies back

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

MA Task 7

Name: _____

List as many as six possible uses for following things.

1. A box.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

2. Steel.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

MA Task 8

Name: _____

1. Gary is a little baby. He wakes up and cries. Why does he cry? Write as many possible reasons for his crying as you can.

(A) He is hungry.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

2. Alice is in fourth grade. She is very happy today. Why is she so happy? Write as many possible reasons for her happiness as you can.

(A) She sent five dollars from her savings to a needed friend.

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

MA Task 9

Name: _____

1. There are five letters, A, E, O, P, T. Use any three of them to make as many different words as you can. You should know the meaning of each word you make.

(A) EAT

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

2. There are seven letters, A, E, K, L, M, N, T. Use any four of them to make as many different words as you can. You should know the meaning of each word you make.

(A) TAKE

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

(6) _____

MA Task 10

Name: _____

Fill in following blanks to make complete sentences.

1. (A) I am a pupil.

   (1) I am a _____

   (2) I am a _____

   (3) I am a _____

   (4) I am a _____

   (5) I am a _____

2. (A) I like to be honest.

   (1) I like to be _____

   (2) I like to be _____

   (3) I like to be _____

   (4) I like to be _____

   (5) I like to be _____

APPENDIX E

STATISTICAL DATA

(TABLES 6, 7, 8, 9, 10, 11)

TABLE 6

SEX DIFFERENCES IN ERROR CHANGE

Sex	LS Task		MA Task		Control	
	Boy	Girl	Boy	Girl	Boy	Girl
Mean	-5.67	-4.80	-6.88	-6.27	-2.21	-3.40
S.D.	5.45	3.88	3.40	3.41	4.59	8.32
n	9	10	8	11	14	5

TABLE 7

GRADE DIFFERENCES IN ERROR CHANGE

Grade	LS Task			MA Task			Control		
	3rd	4th	5th	3rd	4th	5th	3rd	4th	5th
Mean	-4.80	-6.57	-4.14	-7.60	-6.71	-5.57	-3.60	-4.43	0.14
S.D.	5.38	2.07	5.27	2.30	4.15	3.21	7.73	3.99	4.85
n	5	7	7	5	7	7	5	7	7

TABLE 8

AGE DIFFERENCES IN ERROR CHANGE

	LS Task Age				MA Task Age				Control Age			
	8	9	10	11	8	9	10	11	8	9	10	11
Mean	-2.50	-6.33	-7.13	-3.00	-8.00	-8.00	-4.60	-6.17	0.00	-5.40	-2.00	-0.50
S.D.	7.78	6.51	2.47	4.73	3.00	3.39	3.58	3.06	7.07	6.58	4.81	7.78
n	2	3	8	6	3	5	5	6	2	5	10	2

TABLE 9

IQ DIFFERENCES IN ERROR CHANGE

	LS Task CTMM		MA Task CTMM		Control CTMM	
	High[1]	Low[2]	High	Low	High	Low
Mean	-5.56	-4.90	-4.71	-7.58	-2.93	-1.40
S.D.	5.50	3.84	2.63	3.32	5.40	6.50
n	9	10	7	12	14	5

[1]CTMM score above median.
[2]CTMM score below median.

TABLE 10

EXTREME IQ DIFFERENCES IN ERROR CHANGE

	LS Task CTMM		MA Task CTMM		Control CTMM	
	Ex. Hi[1]	Ex. Lo[2]	Ex. Hi	Ex. Lo	Ex. Hi	Ex. Lo
Mean	-7.75	-3.00	-5.00	-7.33	-1.83	0.75
S.D.	3.86	4.42	4.20	3.61	6.77	5.06
n	4	5	2	6	6	4

[1]CTMM score above Q_3.
[2]CTMM score below Q_1.

TABLE 11

SOCIOECONOMIC DIFFERENCES IN ERROR CHANGE

	LS Task Soc. eco. Index		MA Task Soc. eco. Index		Control Soc. eco. Index	
	High[1]	Low[2]	High	Low	High	Low
Mean	-4.10	-6.44	-7.09	-5.75	-1.17	-3.15
S.D.	3.96	5.13	3.96	2.19	6.94	5.00
n	10	9	11	8	6	13

[1] Socioeconomic Index above median.
[2] Socioeconomic Index below median.

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BIOGRAPHICAL SKETCH

Mr. Shih-sung Wen was born January 10, 1936, in Hsinchu, Taiwan, China. After attending elementary and junior high schools in his hometown, he entered Hsinchu Normal School. From 1954 through 1959 he taught at an elementary school. In September, 1959, he entered Taiwan Normal University to study Education. He was graduated with the degree of Bachelor of Education in 1964. From 1963 to 1966, he taught Chinese Literature in grades seven, eight, and nine at Wanhua Junior High School in Taipei, Taiwan.

In September, 1966, Mr. Wen was admitted to the Graduate School of the University of Oregon, Eugene, Oregon. He received the degree of Master of Education in Educational Psychology in June, 1968. From January through August, 1969, he was enrolled in the graduate program of Rehabilitation Counseling at the University of Florida, and worked as part-time graduate assistant in the same department.

From September, 1969, until the present time, he has pursued work toward his Doctor's degree in Psychological Foundation of Education at the University of Florida. He has also worked part-time as a graduate assistant in that department.

Mr. Wen is married to the former Alice T. P. Chang, and is the father of a son. He is a member of the American Educational Research Association.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

William W. Purkey, Sr., Chairman
Professor of Educational Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Vynce A. Hines
Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Hannelore L. Wass
Assist. Prof. of Educational Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Dean of the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August, 1971

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Dean, College of Education

Dean, Graduate School

This dissertation was submitted to the Dean of the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August, 1971

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