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Modeling: A Cognitive Approach in Ameliorating Impulsivity in Hyperactive Children

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ABSTRACT

Two experiments were implemented in which hyperactive children were exposed to models of their own age level. It was hypothesized that modeling treatments designed to demonstrate reflective problem-solving strategies would improve the problem-solving ability of both normal and hyperactive children, and that, concomicantly, children's ability to sustain attention to visual stimuli would improve. Results demonstrate the effectiveness of a cognitive modeling procedure in reducing impulsivity and increasing attention span, despite claims that cognitive style is a fixed, unmodifiable dimension of behavior. Whether cognitive modeling techniques can be used for problem-solving tasks in classrooms remains uncertain; research evaluating such techniques in the school setting is needed. (Author/CS)

Modeling: A Cognitive Approach in Ameliorating Impulsivity in Hyperactive Children[1]

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Modeling: A Cognitive Approach in Ameliorating Impulsivity in Hyperactive Children

One of the hyperactive child's basic problems is an inability to sustain attention over long periods of time (Douglas, 1972, 1974, 1976). This attentional deficit is generally manifested in a number of ways, including restlessness, distractibility, and impulsivity (Brown & Quay, 1977; Brown, 1980; Sprague & Gadow, 1976). In fact, Douglas (1976) has suggested that impulsivity is a behavioral characteristic of hyperactive children which is in great need of regulation. Epstein, Hallahan, and Kauffman (1975) have cautioned that impulsive behavior is debilitating to academic success because an impulsive disposition generalizes to many cognitive tasks and influences faulty performance. Furthermore, they suggested that impulsivity results in a social handicap. As Kagan (1966) pointed out, "Most teachers do not have a high tolerance for incorrect replies, and the peer group is prone to jeer at the child who impulsively blurts out obviously incorrect answers."

According to Douglas (1976) problems with impulse control permeate and impair the functioning, not only of hyperactive children, but also of children with a wide range of learning disabilities. Keogh (1971) stated that hyperactive children actually represent extreme examples of impulsive children: They make decisions too rapidly, fail to pause to consider possible alternatives, fail to reflect on possible consequences of a decision, and seize on the first response that comes to mind. Teachers perceive the classroom behavior of impulsive children more negatively than the classroom behavior of their reflective peers (McKinney, 1975).

Kagan's Matching Familiar Figures Test (MFF) is now considered to be the primary index for the assessment of impulsivity in children and has been used in an impressive body of empirical research (Messer, 1976) especially research involving hyperactive children (Messer, 1976; Sandaval, 1977). In the measurement of reflection-impulsivity the MFF yields two measures, a latency measure (which means the duration of time between the presentation of the stimulus and response) and an error measure, with impulsive children having latency measures below the median and error measures above the median and reflective children having latency scores above the median and error scores below the median. That the impulsivity so characteristic of hyperactive children is accurately revealed by Kagan's (1965, 1966) test has been verified empirically by several investigators (Brown & Quay, 1977; Campbell, Douglas & Morgenstern, 1971; Campbell, 1974).

Kagan's notion of reflection-impulsivity has been found to have generality to a variety of measures including reading recognition (Kagan, 1965), serial learning (Kagan, Rosman, Day, Albert, & Phillips, 1964), inductive reasoning (Kagan, Pearson, & Welch, 1966) and intelligence (Brown & Quay, 1977; Eska & Black, 1971; Lewis, Rausch, Goldberg, & Dodd, 1968). Keogh and Donlon (1972), in fact, have recommended that the school psychologist consider the presence of impulsivity to be necessary in the diagnosis of hyperactivity and that Kagan's Matching Familiar Figures Test (MFF) be included in their assessment battery.

It is assumed that successful modifaction of impulsive behavior may result in correlated improvements in a number of very important related areas such as reading. One approach which has been prevalent in the treatment of hyperactive children is an attack upon the impulsivity with the use of stimulant drug therapy (Whalen & Henker, 1976). In fact, stimulant drugs have been found to decrease impulsivity as measured by the MFF (Brown & Sleator, 1979; Campbell, Douglas & Morgenstern, 1971; Cohen, Weiss, & Minde, 1972; Schleifer, Weiss, Cohen, Elman, Cvjic, & Kruger, 1975). Possible hazards and side effects, however, have been encountered with the use of stimulant drug therapy (Safer & Allen, 1975; Werry & Sprague, 1970). Thus, an increasingly active search is under way to develop cognitive and behavioral treatment approaches aimed at regulating the impulsivity in hyperactive children in order to avoid the deleterious side effects of drug therapy.

Many techniques involving the modification of impulsive cognitive styles, however, have been successful in altering only response latency on the MFF test of children characterized as impulsive, while error scores remained unchanged (Kagan, Pearson, & Welch, 1966; Yando & Kagan, 1968). Meichenbaum and Goodman (1971) employed an instructional procedure in which they taught impulsive children from a normal population to verbalize various problem solutions such as planning ahead, stopping to think, being careful, and correcting errors calmly. Although the findings indicated that the instructional treatment alone slowed down a child's performance (latency), it did not reduce errors. Those instructional techniques which do alter error scores can hardly be considered satisfactory.

Although operant techniques have been utilized in numerous attempts to eliminate the disruptive and impulsive behaviors of hyperactive children (Aylion, Layman, & Kandel, 1975; O'Leary, Pelham, Rosenbaum, & Price, 1976; Quay, Sprague, Werry & McQueen, 1967; Rosenbaum, O'Leary, & Jacob, 1975) recent findings have suggested that hyperactive children respond very differently to reinforcement contingencies than do normal children. Douglas and her colleagues (Douglas, 1975; Firestone & Douglas, 1975; Parry & Douglas, in press) have empirically demonstrated that positive reinforcement actually increased impulsivity and attracted the hyperactive child's attention away from the central task and toward the reinforcing agent.

Although several methods for changing impulsive behavior have been suggested, modeling is the method which has been repeatedly employed and has been demonstrated to be successful for impulsive children from normal populations. For example, several investigators have found that impulsive children from normal populations became more reflective after observing reflective models (Debus, 1970; Ridberg, Parke, & Hetherington, 1971; Yando & Kagan, 1968).

Studies of the influence of modeling on Matching Familiar Figures Test (MFF) scores of children diagnosed as hyperactive have not been conducted. However, Siegelman (1969) and Drake (1970) through their work with normal children, have provided valuable clues about the types of strategies that impulsive children can be taught through the process of modeling. They suggested that impulsive and reflective normal children use different search strategies in their responding to the Matching Familiar Figures Test. That is, reflective children tend to scan stimulus details, while impulsive children tend to view only the global picture.

That training in the area of attention maintaining behavior is necessary for the modification of cognitive styles has been suggested by Siegelman (1969), since the MFF test requires attention to stimulus details (Heider, 1971; Kagan, 1965; Kagan, et al., 1964).

Modeling has also been effective in modifying other behavior disorders such as social withdrawal (O'Conner, 1969), aggression (Csapo, 1972; Fechtner, 1971), and speech disorders (Dykman, Ackerman, Clements, & Peters, 1971). These previous findings have suggested that modeling may also be an effective procedure for changing the impulsive responding of hyperactive children.

The major purpose of the two experiments presented was to evaluate the efficacy of two modeling treatment procedures on several groups of severely impulsive hyperactive children. For the first experiment, it was hypothesized that modeling treatments designed to demonstrate reflective problem solving strategies would produce improved scores for both normal and hyperactive children on tasks requiring sustained attention to problems such as those encountered on the Matching Familiar Figures Test, a primary index of impulsivity. For the second experiment, it was further hypothesized that concomitant improvement would occur on a frequently utilized achievement measure requiring sustained attention to visual information.

Experiment 1

Subjects. The normal subjects were thirty white males, fifteen from the fifth grade and fifteen from the tenth grade from two suburban city schools. The hyperactive group consisted on the entire fifth and tenth grade male population, twenty-three white males from a nearby residential treatment center. The hyperactive children were placed into the treatment center after a rigorous diagnostic examination by qualified psychologists and a history of difficulty in coping with the regular school program. Of this group, eight of the male hyperactive children were of fifth grade age level, while fifteen of the hyperactive males were of tenth grade age level.

Interviews with the parents and detailed information from the schools as well as classroom observations by trained observers all pointed to the presence of the hyperkinetic syndrome. Each child's pediatric examination must have been negative for other major diseases and obvious physical defects. All children selected scored two standard deviations above the means on the MFF error measure for normal, non-impulsive children, which were obtained in a previous investigation (Brown & Quay, 1977).

All children in this study were from middle class families. The mean ages and SES for the two young and two old groups of children were similar. The mean IQ scores, derived from the Peabody Picture Vocabulary Test (Dunn, 1965) did not differ significantly for the four groups when analyzed by a one-way analysis of variance.

Modeling Procedure. Two separate videotapes were prepared showing a 10-year-old white male and a 16-year-old white male responding to MFF items (Form 1) in a reflective manner. The models were trained to observe a covert signal from the experimenter given after 25 seconds, during which the model was looking closely at the standard and the various response alternatives, thereby providing behavioral clues of the reflective tempo. The models were requested to verbalize their strategy during the interval after responding. Both model's verbalizations stressed: (a) responding slowly, (b) avoiding selecting the first figure that appeared correct without checking the remaining stimuli, and (c) providing a description of the strategy (e.g., the model described how he checked back and forth with the comparison standard frequently). The models also used a scanning strategy whereby they pointed to the standards, then pointed carefully to the other stimuli, and compared the stimuli with each other and with the standard before arriving at a correct decision. Each model explained how he arrived at his correct decision. All children in the study were exposed to the model of their respective age level.

Test Administration. The MFF was administered approximately one month prior to the modeling training procedure (pre-test) and one month after the training session (post-test). Two parallel forms of the MFF were constructed by rearranging the variants for each of the stimulus pictures, thus changing the position of each correct variant. Standard test administration procedures were followed during each testing session.

Results

The means and standard deviations for pre- and post-modeling training scores on the MFF error and latency measures are presented in Table 1.

Insert Table 1 about here

A 2 (Age) x 2 (Behavioral Condition) analysis of variance with repeated measures was carried out for both MFF error and latency measures. The independent variables were age (young and old) and disorder (normal and hyperactive). The repeated measures were pre- and post-test modeling MFF error and latency scores. The results of this analysis of variance revealed that a significant difference F (1, 49) = 28.55, $p < .001$, existed between the pre- and post-modeling MFF error scores. An inspection of the mean MFF error measures indicated that the modeling treatment procedure significantly altered errors for both age groups of hyperactive children and the tenth grade normal children. No significant differences occurred on the MFF latency measure for any of the groups.

To ascertain whether the modeling procedure differentially influenced children of the two age levels and two behavioral conditions a 2 (Age) x 2 (Behavioral Condition) multivariate analysis of covariance, using the post-test error and post-test latency measures as dependent variables, and the pre-test MFF measures as covariates, was carried out. No significant differences were obtained indicating no differential responding to the modeling treatment.

Experiment 2

Method

Subjects. Subjects were 24 hyperactive children from the fifth grade from a suburban city school. All of these children were placed into self-contained classrooms for learning disabilities due to impulsivity and severe attentional problems. Interviews with their teachers as well as diagnostic reports from qualified school psychologists indicated that impulsivity was a severe problem for each of these students.

Subjects were randomly assigned to a modeling experimental therapy group and a control condition. The mean ages and SES for the two groups were similar. The mean IQ scores derived from the Wechsler Intelligence

Scale for Children - Revised did not differ significantly for the two groups when analyzed by a one-way analysis of variance. Subjects were 19 males and five females. The two groups were equated for sex.

Modeling Procedure. The treatment consisted of a series of modeling sessions designed to illustrate the importance of reflective problem solving strategies. A series of puppet shows were presented to the students in the experimental treatment condition. Each presentation stressed those difficulties encountered when problem situations were resolved in an impulsive manner. In one presentation, for example, the characters failed to locate a correct geographical point due to their impulsive decision making. Each presentation highlighted the importance of planning ahead, stopping to think, and attending to details. Each of the puppet demonstrations were followed by an oral discussion in which the impulsive students participated in a dialogue emphasizing the value of reflective problem solving strategies. Later, the students were required to re-enact the puppet shows in which they were instructed to stop and think about the directions at hand, look over the problem carefully, and plan ahead prior to responding to the task, thus emphasizing the reflective problem solving strategy. During the period in which the training took place, teachers emphasized careful reflective problem solving strategies when the subjects were completing classroom assignments.

For the children in the control condition, no treatment designed to reduce impulsivity was administered.

Test Administration. All children were administered the Matching Familiar Figures Test (MFF), (Kagan, 1966). A subtest of the Detroit Tests of Learning Aptitude was also administered to each of the children.

This subtest was chosen for the present study due to its relevance to school achievement. Error measures were obtained from each administration.

All children were tested individually one week following the series of modeling therapy sessions and again one month following the psycho-educational sessions. Alternative forms of the MFF were constructed by rearranging the variants for each of the stimulus pictures, thus changing the position of each correct variant.

Results

Post-test analysis. Due to random assignment of subjects, pre-testing was not necessary therefore, a post-test design was utilized. The means and standard deviations for the experimental and control groups for each of the dependent measures are presented in Table 2.

Insert Table 2 about here

The results of a one-way multivariate analysis of variance comparing each of the dependent measures was significant for the main effect of treatment, F (1, 22)= 7.71, p < .001. Therefore, separate one-way univariate analyses of variance were performed for each of the post-test dependent measures. The results of these univariate analyses of variance indicated that those children receiving the psychoeducational modeling treatments performed significantly better than those children in the control condition receiving no such treatment. This significant difference occurred for each of the dependent measures. The F ratios and significance level for each of the dependent measures are also presented in Table 2.

Delayed post-test analysis. The means and standard deviations for the experimental and control groups for the post-test measures are presented in Table 3.

Insert Table 3 about here

The results of a one-way multivariate analysis of variance comparing each of the dependent measures in the delayed post-test analysis was significant for the main effect of treatment, F (1, 22)= 13.62, $p < .001$. Therefore separate one-way univariate analyses of variance were performed for each of the post-test dependent measures. The results of these univariate analyses of variance indicated that those children receiving psychoeducational modeling treatments performed significantly better than those children in the control condition receiving no such treatment. The significant difference occurred for each of the MFF Measures. The subtest of the Detroit Test of Learning Abilities approached significance. The F ratios and significance level for each of the dependent measures are also presented in Table 3.

Discussion

The results presented here have demonstrated that a cognitive modeling treatment procedure proved to be effective in eliciting improved performance on impulsivity in hyperactive and normal children. This finding supports the argument presented by Douglas and her colleagues (Douglas, 1975; Firestone & Douglas, 1975; Parry & Douglas, 1977) which suggests that an approach emphasizing self-management and the development of self-control, rather than the control by outside agents such as stimulant drug therapy and operant techniques, is a productive therapeutic strategy for ameliorating impulsivity in hyperactive children. The present findings also offer an alternative treatment approach to those instructional techniques (Kagan, et al., 1966; Meichenbaum & Goodman, 1971; Yando & Kagan, 1968) which have not proved to be successful in altering MFF error measures of children identified as impulsive.

The results further indicated that an impulsive cognitive style can be ameliorated by modeling techniques despite claims by Kagan and his colleagues (Kagan, 1965, 1966; Kagan, Rosman, Day, Albert, & Phillips, 1964) that cognitive style is a fixed unmodifiable dimension of behavior. Following the modeling treatment in the second experiment, the impulsive children showed a significant increase in response time and more important made significantly fewer errors. The children in the experimental treatment group continued to perform less impulsively on each of the measures even one month after treatment terminated.

One interesting finding obtained in the first study was that no significant change in latency occurred on the MFF whereas errors were reduced as a function of the cognitive modeling procedure. The cognitive performance in this experiment appeared to be independent of latency.

Although the finding that the cognitive modeling procedure was only effective in altering MFF error measures of the tenth grade normal children may be interpreted to suggest that the MFF error measures of the younger normal children were not amenable to change, an alternative explanation for this finding might simply be that for the normal impulsive children in this study, only the adolescents were capable of being influenced by models of their own age level. In fact, that research which has utilized modeling as a successful treatment approach in altering other undesirable social behavior in normal children has been primarily with adolescent populations (Csapo, 1972, Fechtner, 1971).

In contrast to previous research with normal children (Debus, 1970; Kagan, Pearson, & Welch, 1966; Meichenbaum & Goodman, 1971; Yando & Kagan, 1968) in which only latency measures were altered, both latency of response and error rate were successfully modified in the second study.

That the modeling training in the second experiment further produced collateral improvement on a widely utilized psychometric measure requiring sustained attention to visual stimuli is quite encouraging. This finding suggests that training children to rehearse various problem solutions such as planning ahead, stopping to think, being careful, and attending to details is a productive therapeutic strategy for ameliorating impulsivity in hyperactive children.

Whether the generalization of modeling techniques can be extrapolated to problem solving tasks encountered in classroom settings still remains uncertain. The need for research for the purpose of evaluating the efficacy of such techniques to diverse problem solving situations encountered in the school situation cannot be overstated.

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Table 1

Means and Standard Deviations for Pre-and Post-Modeling MFF Error and MFF Latency Scores of Normal and Hyperactive Children

	Pre-Modeling Measures				Post Modeling Measures			
	Error		Latency		Error		Latency	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Subjects								
Normal								
9-year-olds	6.47	4.29	161.87	88.00	6.27	3.52	163.13	71.34
15-year-olds	6.13	2.62	142.20	105.72	2.93	3.09	142.47	43.46
Hyperactive								
9-year-olds	19.00	13.29	104.38	41.32	12.00	11.76	107.13	59.66
15-year-olds	6.53	3.87	157.13	68.70	3.20	3.57	173.93	90.66

Table 2

Means and Standard Deviations for Post-MFF Latency, MFF Error, and Detroit Test of Visual Abilities of Impulsive Hyperactive Children

	Treatment Conditions					
	Treatment		Control			
Dependent Measures	Mean	SD	Mean	SD	F ratio	Significance
MFF Error	7.00	5.26	14.50	6.22	10.19	.004
MFF Latency	252.00	93.24	83.75	32.82	34.77	.001
Detroit Test	22.92	8.42	29.33	5.96	4.65	.04

Table 3

Means and Standard Deviations for Delayed Post-MFF Latency, MFF Error, and Detroit Test of Visual Abilities of Impulsive Hyperactive Children

	Treatment Conditions					
	Treatment		Control			
Dependent Measures	Mean	SD	Mean	SD	F ratio	Significance
MFF Error	5.17	3.01	14.00	6.27	19.71	.001
MFF Latency	294.42	153.17	88.33	41.75	20.22	.001
Detroit Test	21.33	4.23	25.67	6.98	3.38	.07