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ABSTRACT

An extension of previous attempts at modifying children's cognitive styles is discussed. Specifically, the present study employed sociometric peer models in order to ascertain whether: (1) impulsivity is modifiable through observation of salient models, and (2) sociometrically selected peer models are more effective than unselected models in the reduction of errors associated with increased response times. The 19-item Sutton-Smith and Rosenberg Impulsivity Scale 3 was administered to 98 fourth and sixth grade children (50 in the fourth grade and 48 in the sixth). Fifty children (28 males and 22 females) scored at or above the median of 10 on the IMP3 Scale; 25 of the children were assigned to the experimental condition and 25 to the control condition. The experimental design of the study was implemented in three stages: (1) pretest evaluation of cognitive style, using the Matching Familiar Figures test; (2) training in which the children in the experimental group were individually exposed to a trained reflective model, who was named by the experimental child, and who were not classified as impulsives; the children in the control group were not exposed to models; and (3) children in both groups were individually pretested on nine items of the Matching Familiar Figures test. The study data were subjected to statical analysis. Results indicated that impulsive children showed a change in response style after viewing a reflective model. Generally, males in the experimental condition showed a greater increase in mean response time than did females, as well as a stronger decrease in mean number of errors. (DB)

Modifications in Children's Cognitive Styles: Some Effects of Peer Modeling.[1]

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Research conducted by Kagan and his associates (Kagan, 1965a, 1965b, 1965; Kagan, Pearson, & Welch, 1966a, 1966b) has provided support for the existence of differential thinking or cognitive styles in children. When a number of response alternatives are simultaneously available and uncertainty of the correct response is high, some children (reflective) decide carefully, withholding choice of response until there is a higher probability of their being correct. Conversely, other children (impulsive) choose quickly and with less evaluation of alternative possibilities (Ward, 1968). Research data support a general tendency toward reflective or impulsive responding in children as young as six years of age (Kagan, 1965c; Kagan, Pearson, & Welch, 1966a). In addition, stability of these response patterns has been indicated.

The impulsive child responds to stimulus situations at too rapid a rate to process information correctly. Responses may be made to only the most dominant features of the stimuli, with only limited attention offered to all characteristics of the problem. These children care little about making mistakes and offer answers quickly and without consideration of the accuracy of their response (Kagan, Pearson, & Welch, 1966b). The reflective child, on the other hand, actively considers the alternatives available to him before responding. In addition, he shows greater interest in attaining the correct solution.

Although problem-solving places value on speed, rapid solution is not rewarded at the expense of accuracy. Research on cognitive style (Kagan, 1965a, 1965c; Kagan <u>et al</u>. 1966a) has shown that impulsivity is accompanied by deleterious cognitive performance. Consequently, there have been several attempts at modification of impulsivity in children. Kagan, Pearson, and Welch (1966b) reported that impulsive first grade children could be trained to lengthen their response time after approximately 60 minutes of training with adult trainers. Briefly trainers told the children during a pretraining interview that they (trainer and child) had specific similarities, and then proceeded to train them in reflection. This was called the hi-similarity condition. In a lo-similarity condition the same procedure was followed except that in the pretraining interview the trainer did not indicate that he shared attributes or interests with the child. Results indicated that children in both the hi- and lo-similarity conditions became more reflective by showing a significant increase in decision time. However, there were no significant decreases in errors associated with increased latencies.

Recently, two studies utilized a modeling technique to modify cognitive style. The short-term modifiability of an impulsive response style through observation of patterns of model behavior associated with differing reinforcement contingencies was explored by Debus (1970). Impulsive subjects were randomly assigned to one of four treatment or control conditions. The Matching Familiar Figures Test (Kagan, 1965a) was used in all conditions. In the impulsive model treatment condition, the model demonstrated an impulsive tempo (response latency of eight seconds or less) and only two of the ten items of the Matching Familiar Figures Test were responded to correctly. In addition, the model stated that he was trying to find the right answer as quickly as he could. In the reflective modeling condition the model responded with latencies between 25 and 33 seconds, and made correct choices for eight of the ten items on the Matching Familiar Figures Test. The model also volunteered a statement indicating that he was looking at the standard, all the alternatives, and comparing them. The examiner informed the model when he was correct as well as when he was incorrect. A change model treatment' condition provided a model who first responded in a manner similar to the model in the impulsive condition. From the sixth item of the test the model responded as in the reflective model condition. He also volunteered a statement as to why he thought it best to change his response style. In the fourth tratement condition (dual model) two models were observed in succession. For the first five test items a model in the impulsive model treatment condition was used. This model was followed by a reflective model who responded to the next five items. The subjects in the control condition did not view a model.

Each subject was seen on three occasions. The first testing was for assignment of cognitive style, the second for assessment of the immediate post-treatment effect, and the third (two and one-half weeks later) for assessment of posttest stability. The major finding of this study was that a successful reflective model who experienced positive reinforcement can successfully lengthen the response latencies of impulsive boys and girls. However, the effect was temporary and did not contribute to a significant reduction in errors.

Denny (1972) also used a modeling technique in an attempt to change conceptual style and cognitive tempo. The modeling conditions differed along two cognitive style dimensions: analytic versus relational conceptual style, and reflective versus impulsive cognitive tempo. The results indicated that the conceptual style and cognitive tempo of the model changed the styles and tempos of the subjects, and that these effects generalized to independent tasks. The cognitive tempo of the model had a significant effect upon the response latencies of the subjects. The subjects who observed reflective models lengthened their response latencies and those subjects who observed impulsive models shortened them. However, the accuracy of the subject's performance, as measured by number of errors, was not affected by modeling.

The present study represented an extension of previous attempts at modifying children's cognitive styles. In the Debus (1970) study, third grade children observed sixth grade same-sex models. Denny (1972) had second grade boys observe a videotaped sequence of an adult female model. Neither of these two studies paired experimental subjects with specific models of age-appropriate, familiar, or selected choice. In the current research it was asked whether sociometrically selected models, of similar age, familiarity, and high status, as viewed by the impulsive child, would have a more pronounced effect upon cognitive style. Specifically, the present study employed sociometric peer models in order to ascertain whether: (1) impulsivity is modifiable through observation of salient models, and (a) sociometrically selected peer models are more effective than unselected models in the reduction of errors associated with increased response times.

Method

Subjects

The 19-item Sutton-Smith and Rosenberg Impulsivity Scale 3 (1959) was administered to 98 fourth and sixth grade children attending elementary school in Urbana, Illinois. Of these 98 children, 50 were in the fourth grade and 48 attended sixth grade. They were all of lower middle class socioeconomic status, and according to school records, of normal intelligence. Following administration of the Sutton-Smith and Rosenberg scale, the children were asked to fill out an 8-item sociometric measure developed specifically for this study. Four of the items employed in this scale tapped peer popularity and work partner preference, the remainder consisting of filler items. The subjects were allowed three choices on each of the eight items.

Identification of impulsivity was determined previous to administration of experimental test conditions by scores attained on the Sutton-Smith and Rosenberg (1959) scale. Acoording to established criteria, those children who scored in the upper quartile on the Impulsivity Scale (IMP3) were classified as high impulsives. However, in order to increase the sample size, subjects who scored at or above the median score for the group were also considered as impulsive. Scores on the IMP3 ranged from 1 to 19.

The total number of children who scored at or above the median of 10 on the IMP3 Scale was 50--28 males and 22 females. Twenty-five of these children were randomly assigned to the experimental condition and 25 to the control condition. The experimental condition contained 13 fourth graders and 12 sixth graders, 14 of whom were male and 11 female. The control condition contained 12 fourth graders and 13 sixth graders, 14 of whom were male and 11 female. The mean age of the fourth graders was 9 years, 9 months, and the mean age of the sixth graders was 12 years.

Procedure

The experimental design of the present study was implemented in three stages: (1) pretest evaluation of cognitive style, (2) training of peers models--observational instruction, and (3) posttest evaluation of modifications in cognitive style.

Pretest evaluation. Subsequent to preliminary identification of impulsivity by the IMP3 scale and administration of the sociometric scale, all subjects were individually seen for two additional testing sessions. These sessions served to establish base level, pretest measures of cognitive style, and changes attributable to treatment condition (i.e., posttest evaluation). The measure of cognitive style was the Matching Familiar Figures test (MFF). This measure, developed by Kagan (1965a), has become a standardized instrument for assessing cognitive style. In the present study, the two forms of this test were combined and randomly divided to yield three different submeasures. Administration of each form, however, was standardized according to original test instructions.

Training. After all subjects in both the experimental and control conditions were pretested, children in the experimental condition were individually exposed to a trained reflective model. Models were selected on the basis of the previously administered sociometric scale.

Each experimental subject was paired with a child who he named as a choice on questions pertaining to work preference partner and popularity on the sociometri scale. The child so named served as the model for the child in the experimental condition. For a child to be selected as a model it was necessary for his name to appear as a choice on all four of these questions, preferably as a first choice, but not necessarily. If the child whose name appeared as a first choice on all four questions scored above the median on the Sutton-Smith and Rosenberg Impulsivity Scale, he was classified as impulsive and, therefore, not used as a model. In such instances, the child whose name appeared as a second or third choice on these questions served as the model. Thus, by process of exclusion, all of the children who served as models scored below the median on the Sutton-Smith and Rosenberg Impulsivity Scale and, therefore, were not classified as impulsives. If more than one child's name appeared on all four questions, and these children were not classified as impulsives on the basis of the IMP3 scale, the child whose name appeared most often as a first choice served as the model. The ideal model's name appeared as a first choice on all four questions. Each child was given a list of the names of his classmates to ensure that they considered all children in their class when responding to the sociometric measure.

All models were trained on seven items of the MFF, designated as Form 2, under a three step standardized procedure. First, they were asked by the examiner what they would do upon being shown an item of the MFF. Second, they were trained in "reflective" behavior and told specifically what to do and say. Finally, they rehearsed on the examiner. A total of 20 models were trained and used in this study, five of whom were used twice.

All children were specifically trained as "reflective" models to give both verbal and behavioral cues. Prior to responding to each item they were taught to say the following:

> I think I know the best way to do this. First of all I'll look at this one (standard) and then look very carefully at each of these (variants). I'm going to take as much time as I need, and think before I make my choice.

In addition, the models were instructed to allow a 25 second latency before responding to each item. A prearranged signal was used to tell the model when 25 seconds had elapsed.

After training, the child-model was administered Form 2 of the MFF in the presence of the child-observer paired with him on the basis of the sociometric choice. The children in the control condition were not exposed to models.

Posttest evaluation. All children in both the experimental and control conditions were individually posttested on nine items of the MFF designated as Form 3. The items in this form were different from those used as a pretest and different from those used in modeling. Posttest evaluation was conducted immediately after peer modeling for the experimental subjects, or after a short, comparable period of nonoccupied time in the case of the control subjects. All testing and training was conducted by a female graduate student familiar with psychological testing procedures.

Results

Two independent repeated-measures analysis of variance designs for statistical assessment were employed for response times and errors, respectively. In addition, cell means were analyzed to determine magnitude and direction of differences in terms of pre-posttest latency changes and error scores relative to treatment condition.

Latency

The results of the analysis of variance of latency scores are presented in Table 1. Mean response time scores on the MFF as recorded for male and female subjects, by grade and treatment condition, are reported in Table 2.

Insert Tables 1 and 2 about here

The analysis of variance for latency measures revealed a significant main effect for Treatment Condition ($F = 14.70$, $p < .01$), Sex ($F = 4.41$, $p < .05$), and Pretest-Posttest assessment ($F = 20.0$, $p < .01$). In addition, the Treatment X Pretest-Posttest interaction ($F = 20.38$, $p < .01$) was found to be statistically significant.

A Newman-Keuls test of mean latency scores was performed on these data. The analysis of treatment effects revealed that posttest scores of subjects in the experimental condition represented a significant increase in response time over pretest control scores ($qr = 9.42$, $p < .05$), posttest control scores ($qr = 9.46$, $p < .05$) and pretest experimental scores ($qr = 8.52$, $p < .05$). There were no statistically significant differences across other comparisons, indicating that modeling was likely effective in increasing response latencies.

A further analysis of latency scores, by sex of respondent, indicated that males at both grade levels performing under experimental conditions, demonstrated more pronounced changes, through increases in response times, than female subjects. Evaluation of these scores by the Newman-Keuls procedure revealed that male fourth and sixth grade students showed the strongest increases in response latency under posttest administration of the MFF, both relative to their pretest scores, as well as across comparison control conditions.

Analysis of response latencies on pretest-posttest administration of the MFF across treatment conditions revealed significant increases in response times of subjects performing under experimental versus control conditions. The mean response time of subjects in the experimental treatment on pretest administration of the MFF was 8.82 seconds per response, compared with a posttest mean response time of 17.34 seconds. In contrast, the mean response time of the control subjects on the pretest administration of the MFF was 7.92 seconds, with a mean posttest time of 7.88.

Errors

The analysis of variance of error scores on the MFF is presented in Table 3. Mean error scores associated with Treatment, Sex and Grade are reported in Table 4.

Insert Tables 3 and 4 about here

The analysis of variance for errors revealed a significant main effect attributable to TreatmentCondition ($F = 4.84$, $p < .05$), and a significant Treatment X Pretest-Posttest interaction ($F = 22.59$, $p < .01$). The effect of grade level closely approached statistical significance ($F = 3.81$, $p < .06$).

As evident in Table 4, experimental subjects at both grade levels and across sex demonstrated a discernable reduction in errors in preto-posttest scores on the MFF. In contrast, control sixth grade boys and girls showed little change across administrations of the MFF, while both male and female fourth graders actually performed poorer on subsequent testing. This latter observation was support^d i ''e Newman-Keuls analysis of Treatment X Pretest-Posttest int...ion where a statistically significant difference in error scores was associated with a combined reduction in experimental posttest scores relative to an increase in errors by control subjects at posttest evaluation ($qr = 5.39$, $p < .05$).

Discussion

The present investigation was concerned with the modification of an impulsive response style by means of a sociometrically chosen model who was trained to perform in a reflective manner. Selected models provided both verbal and behavioral cues for the observer. It was assumed that the subjects in the experimental condition who viewed the model would show an increase in mean response time and a decrease in mean errors on the Matching Familiar Figures Test.

The results of this study were in the predicted direction, indicating that impulsive children showed a change in response style after viewing a reflective model. The children who viewed reflective models demonstrated a significant increase in response time and a significant decrease in errors. Regarding the former finding, response latencies on posttest evaluation for subjects in the experimental condition was generally twice that recorded on pretest assessment. In addition, error scores for experimental subjects, at both grade levels and sexes, significantly decreased relative to maintenance of stable performance levels among sixth grade control subjects, and increases in errors by fourth grade control subjects under posttest administration of the

The results of this investigation indicate sex and grade differences in response to treatment condition. Generally, males in the experimental condition at both grades showed a greater increase in mean response time than females under similar experience. Moreover, males in the experimental condition showed a stronger decrease in mean number of errors on the posttest administration of the MFF than females under comparable situation. Specifically, the modeling effect, viewed in terms of error reduction, was most prominent among sixth grade boys. These data appear somewhat relevant to the question of deficit cognitive performance among males as a function of impulsive cognitive style. Since impulsivity has been shown to be a more pronounced problem in boys than in girls, the use of sociometrically selected peer models may be an effective way of altering cognitive deficiency.

The combined increase in latency and corresponding decrease in errors supports earlier findings of an inverse relationship between response time and errors (Kagan, Rosman, Day, Albert, & Philips, 1964). Two previous studies which attempted to modify cognitive impulsivity were conducted by Debus (1970) and Denny (1972). Each demonstrated an increase in response latency but without a significant decrease in error scores. One explanation of differences in findings between these studies and the present inquiry may be attributable to the type of model and modeling paradigm employed. Debus (1970) used sixth grade models for third grade children. Denny's (1972) study employed a videotaped adult female model. The current study utilized age-appropriate peers, of familiar and high status position. In addition, models were selected by the subjects, as well as presented live. Possibly the combination of familiarity and accepted status of the model as instructor enhanced the matching behavior of the observer.

The results of this inquiry suggest that sociometrically chosen peers serving as instructional models may be an effective force in altering impulsive response styles. As Bandura and Walters (1963) have indicated, similarity between model and observer characteristics may enhance the efficacy of the model. By using sociometrically selected peer models we attempted to create an optimal matching opportunity. This condition, combined with model competency in providing appropriate verbal and behavioral cues, appeared to alter children's response styles in a more appropriate direction.

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Footnotes

[1] This paper was presented at the Biennial Meeting of the Society for Research in Child Development, Philadelphia, Pa. on March 29, 1973. Portions of this paper will appear in a forthcoming article in the Journal of Genetic Psychology.

Table 1

Analysis of Variance of Response Time Scores

Source	d.f.	MS	F
Total	99		
Between subjects	49		
Treatments (A)	1	47633.04	14.70**
Sex (B)	1	14273.53	4.41*
Grade (C)	1	2100.06	.65
A X B	1	1.01	.00
A X C	1	117.29	.04
B X C	1	6363.22	1.96
A X B X C	1	1400.33	.43
Error (b)	42	3239.58	
Within Subjects	50		
Pre-Posttest (D)	1	31912.19	20.00**
A X D	1	32517.72	20.38**
B X D	1	1557.34	.98
C X D	1	17.48	.01
A X B X D	1	1056.94	.66
A X C X D	1	549.60	.34
B X C X D	1	205.40	.13
A X B X C X D	1	412.47	.26
Error (w)	42	1595.32	

*p .05

**p .01

Table 2

Mean Response Time Scores on MFF

		Experimental		Control	
		Male	Female	Male	Female
Grade 4	Pretest	7.52	8.32	8.58	7.08
	Posttest	17.38	16.42	8.19	6.08
Grade 6	Pretest	11.28	8.17	9.91	6.11
	Posttest	21.87	13.70	10.54	6.70

Table 3

Analysis of Variance of Error Scores

Source	d.f.	MS	F
Total	99		
Between subjects	49		
Treatments (A)	1	108.45	4.84*
Sex (B)	1	41.67	1.86
Grade (C)	1	85.45	3.81
A X B	1	3.73	.17
A X C	1	8.11	.36
B X C	1	73.97	3.30
A X B X C	1	.91	.04
Error (b)	42	22.42	
Within subjects	50		
Pre-Posttest (D)	1	20.16	2.07
A X D	1	220.38	22.59**
B X D	1	29.86	3.06
C X D	1	23.41	2.40
A X B X D	1	.37	.04
A X C X D	1	16.92	1.73
B X C X D	1	9.97	1.02
A X B X C X D	1	9.62	.99
Error (w)	42	9.76	

*p .05

**p .01

Table 4

Mean Error Scores on MFF

		Experimental		Control	
		Male	Female	Male	Female
Grade 4	Pretest	15.15	13.17	14.25	11.63
	Posttest	9.86	10.50	16.00	18.13
Grade 6	Pretest	12.29	13.60	10.20	14.33
	Posttest	6.71	10.60	10.80	14.33