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ABSTRACT

The effects of three types of pretraining in the use of syntactical verbal mediators on subsequent paired-associate performance were investigated. Subjects were 40 Negro and 40 white first graders randomly assigned to one of four groups. Condition 1 consisted of pretraining in both "mediation" instruction (experimenter gave subjects a sentence with pairs) and of "induced mediation" instruction (subjects made up sentences with pairs). Condition 2 consisted of "mediation" pretraining, Condition 3 of "induced mediation" pretraining, and Condition 4 of no pretraining. All subjects were given a paired-associate task with no instructions. Significant condition and treatment effects were found for combined groups such that provision of mediators and induced mediators resulted in superior performances compared to controls. While white first graders were superior to Negro first graders under conditions of "no mediation" or "induced mediation" instructions, there were no significant differences under "mediation" and "mediation plus induced mediation" conditions. No significant differences appeared between groups under the three treatments. It was concluded that while Negro first graders were deficient in the production of effective mediators, they were not deficient in the use of mediators given their production. Tables and references are included. (Author/MS)

Abstract

The Effects of Verbalization on the Learning of Paired Associates

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The effects of three types of pretraining in the use of syntactical verbal mediators on subsequent paired-associate performance was investigated in groups of predominantly lower class Negro and white first graders. Forty Negro Ss and 40 white Ss were randomly assigned to each of the four experimental groups (10 Ss per group). Subjects in condition 1 were given pretraining on two paired-associate lists: First under "mediation" instructions (E gives S sentence with pairs) and second, under "induced mediation" instructions (S makes up sentence with pairs). Condition 2 consisted of pretraining under the "mediation" instructions, while condition 3 consisted of pretraining under "induced mediation" instructions. Following pretraining Ss were given a standard paired-associate task involving no instructions. Condition 4 consisted of presentation of the standard paired-associate task with no instructions to mediate. Significant condition and treatment effects were found for combined Negro and white groups such that provision of mediators and induced mediators resulted in superior performances as compared to the control groups. In addition, it was found that while white first graders were superior to Negro first graders under conditions of no mediation instructions and "induced mediation" instructions, there were no significant

differences between the two groups under the "mediation" and "mediation plus induced mediation" conditions. Furthermore, there were no significant differences between the two groups under the three treatments. Thus it is concluded that while Negro first graders appear to be deficient in the production of effective mediators, they are not deficient in the use of mediators given their production.

The Effects of Verbalization on the Learning of Paired Associates

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Certain political, economic, and social factors have combined in recent years to bring the conditions and problems of the underdeveloped and disadvantaged segment of our population to the center of our attention (Coleman, 1966; Jensen, 1968b, 1969a; Moynihan, 1968; U.S. Commission on Civil Rights, 1967). There is general agreement that in the United States, a country of great wealth and abundance, there exists an unusually large number of individuals living in a subsociety of social, economic, and educational impoverishment (Coleman, 1966, 1968; Deutsch, 1964). Estimates of the size of this segment range from 20 to 40% of the total population (Deutsch, 1964). In addition, certain ethnic or "racial" groups appear to be somewhat disproportionately over-represented in this segment of the population (Coleman, 1966; Jensen, 1969a). A major problem of concern to the behavioral scientist as well as the professional educator is the failure of most of these disadvantaged children to acquire the basic knowledge and skills that are necessary for assimilation into a highly technical and industrialized society (Deutsch, Katz, and Jensen, 1968).

Coleman's (1966) comprehensive survey of public educational facilities in the United States revealed that about 85% of Negro elementary and high school students scored below white averages on tests of scholastic ability and achievement in every region of the country. In addition,

Coleman's survey showed that rural, southern Negro children scored below all other groups on these measures.

Within the past several years, certain Judicial decisions as well as other Federal and Administrative maneuvers have resulted in large scale integration of many southern schools based typically on hastily devised plans of desegration with very little regard for the educational welfare of the individual child.

Faced with large-scale integration in most areas of the country (particularly the South), educators are becoming increasingly concerned with ascertaining the types and patterns of abilities which the disadvantaged Negro child brings to the learning situation and how these abilities differ from those of white children. In addition, given specific ability deficits, a major question becomes what training procedures can best overcome these deficits.

The present investigation is based on the postulates and hypotheses put forth in a series of articles by Arthur Jensen (1968a, 1968b, 1969a, 1969b, 1969c) in which he argues that Negro-white differences in intelligence and scholastic achievement are due largely to genetic rather than environmental factors, and that future educational policies should reflect the true nature of these differences. Jensen hypothesizes two broad categories of mental abilities: Associative abilities and cognitive abilities. He further contends that Negro children have relatively well developed associative but not cognitive abilities as compared to white children. Jensen's associative-cognitive dimension can be characterized in terms of the relative amount of self-initiated activity required of the testee. That is, moving from associative to cognitive

tasks, the testee must spontaneously produce more covert mental activities such as deduction, induction, verbal mediation, and hypothesis testing, in order to perform successfully.

Paired-associate learning tasks lend themselves well to measuring cognitive abilities. Previous research has shown that the paired-associate learning of young children and mentally retarded adults is greatly facilitated by some form of verbal mediational process (Jensen, 1962; Jensen & Rohwer, 1963a, 1963b, 1965, 1968; Rohwer, 1966). Jensen has suggested that individual differences in children's threshold for spontaneous verbal mediation appears to be correlated with age, intelligence, and social class and argues that future research should focus on determining the degree to which individuals from different social classes differ in the kinds of verbal mediators they bring to the learning situation. Jensen (1968b) has described "syntactical mediation" as one of the most powerful variables affecting the speed of paired-associate learning. That is when the pairs of items are presented in the context of some kind of syntactical structure, such as a meaningful sentence, the association is made almost at once.

The principle objective of the present investigation is concerned with an examination of the verbal mediation tendencies which are brought to the learning situation by groups of predominately lower class Negro and white first graders, as well as an examination of the effects of three types of pretraining in syntactical verbal mediation on the subsequent paired-associate learning of these two groups.

The hypotheses of the present study are as follows: 1.) It is expected that since performance on a paired-associate task is largely dependent on the richness of the individual's early verbal experience,

white first graders will have higher scores (in terms of total number of correct responses) on paired-associate tasks involving no mediation instructions than will lower class Negro first graders. 2.) Both Negro and white first graders will show increased performance on a paired-associate task under conditions of "induced mediation" (subjects asked to make up sentences with pairs of nouns) and under conditions of "mediation" (subjects given short but complete sentence using the noun pairs) as compared to the groups receiving no mediation instructions. 3.) While it is assumed that Negro children are relatively deficient in ability to produce effective mediators (even when instructed to do so), it is expected that Negro performance on the paired-associate task under the "mediation" conditions will not differ significantly from that of whites. In other words, providing subjects with an effective mediator should erase any ethnic group differences.

The above three hypotheses are based on comparisons of the two groups of first graders on the initial pretraining trials under the three conditions (mediation, induced mediation, and no mediation). In addition, the following hypotheses are based on comparisons of the two two groups' performances on a subsequent paired-associate task involving no mediation instructions. Thus these hypotheses are based on four comparison groups: Negro vs. white under pretraining with two lists accompanied by mediation and induced mediation instructions respectively, pretraining with one list accompanied by mediation instructions, pretraining with one list accompanied by induced mediation instructions, and the control group given just the subsequent paired-associate list with no pretraining.

4.) Based on these comparisons, it is expected that all three pretraining conditions (mediation plus induced mediation, mediation alone, and induced mediation alone) will result in increased performance on a subsequent paired-associate task for both Negro and white groups as compared to the control group. 5.) It is expected that pretraining with lists involving mediation instructions (mediation plus induced mediation and mediation alone) will result in similar (not significantly different) performances on a subsequent paired-associate task involving no mediation instructions for both Negro and white groups, while pretraining with the induced mediation only will result in significantly different performances on a subsequent paired-associate task (involving no mediation instructions) for the Negro and white groups. Thus, hypotheses 4 and 5 state that pretraining involving mediation should erase Negro-white differences on a subsequent paired-associate task.

METHOD AND PROCEDURE

Subjects

Eighty Ss, 40 white and 40 Negro with equal numbers of males and females in each group, were selected from the first grade classes of two public elementary schools in Jackson and Chatham county, Georgia. Both schools serve rural, working class communities. The age range for both Negro and white Ss was 77 to 102 months, with a mean of 85.8 for the Negro Ss and a mean of 85.7 for the white Ss. Ten Ss from each population were randomly assigned to the four experimental groups.

Design and materials

The variables of "race" (Negro vs. white), "groups" (4 experimental conditions), and trials (5) were combined in a three-factor mixed design, with repeated measures on one factor (trials).

Three paired associate lists consisting of 10 pairs each were constructed from a set of colored pictures of common nouns commercially available from Ideal School Supply Company. With one exception ("spoon") the nouns were rated AA or A in the Thorndike-Lorge frequency ratings. These pictures were photographed onto colored transparencies in pairs which suggested simple but complete declaratory sentences. A complete list of the materials used appears in Table 1. A Kodak Carousel (Model '650') slide projector with automatic slide advancer was used to present the materials. A pilot study had shown that the three lists were roughly equivalent in terms of ease of learning for Negro and white first graders.

Insert Table 1 about here

Procedure

The paired-associate tasks were administered to each S individually using the standard anticipation method. Testing conditions were kept relatively uniform in that Ss were tested in a quiet semi-darkened room set apart from the other classrooms.

Experimental condition 1 consisted of pretraining each S in this group first on a list with mediating sentences provided by E, followed by pretraining on a list with instructions to use mediators (make up sentences), followed by presentation of a third list with no instructions. Experimental condition 2 consisted of pretraining with on list under "mediation" instructions (Ss provided mediating sentences by E), followed by presentation of a second list under no mediation instructions. Experimental condition 3 consisted of pretraining with one list under

Picture Pairs		Sentences (when used)
List 1:		
1.	LAMP-STAIRS	The LAMP fell down the STAIRS
2.	HORSE-LOG	The HORSE tripped over the LOG
3.	MATCHES-PENCIL	The MATCHES burned the PENCIL
4.	BROOM-NAIL	The BROOM swept the NAIL
5.	CAR-HAT	The CAR ran over the HAT
6.	CLOCK-WAGON	The CLOCK rode in the WAGON
7.	COW-WHISTLE	The COW blew the WHISTLE
8.	HAND-DRUM	The HAND played the DRUM
9.	BIRD-WINDOW	The BIRD flew in the WINDOW
10.	FISH-KEY	The FISH swallowed the KEY
List 2:		
1.	SPOON-NEST	The SPOON fell out of the NEST
2.	CAKE-TRUCK	The CAKE rode in the TRUCK
3.	CAT-SWING	The CAT played on the SWING
4.	TIE-BRUSH	The TIE was wrapped around the BRUSH
5.	TIRE-CLOWN	The TIRE ran over the CLOWN
6.	PLIERS-BELT	The PLIERS squeezed the BELT
7.	SHOE-CHAIR	The SHOE was under the CHAIR
8.	COMB-CUP	The COMB was in the CUP
9.	FIRE-TREE	The FIRE burned the TREE
10.	LION-PIPE	The LION smoked the PIPE
List 3:		
1.	SKATE-SPIDER	The SKATE ran over the SPIDER
2.	RING-TENT	The RING was lost in the TENT
3.	MAN-ROPE	The MAN tied the ROPE
4.	SCISSORS-LEAF	The SCISSORS cut the LEAF
5.	HAMMER-WATCH	The HAMMER smashed the WATCH
6.	SOCK-GATE	The SOCK was hung on the GATE
7.	RULER-BOX	The RULER measured the BOX
8.	KITE-BUS	The KITE flew over the BUS
9.	FLAG-BASKET	The FLAG was stuck in the BASKET
10.	PUPPY-BELL	The PUPPY rang the BELL

Table 1
Materials Used

"induced mediation" instructions (sentences made up by S), followed by a second list under no mediation instructions. Experimental condition 4 consisted of presentation of one list under no instructions to mediated.

The initial exposure to each list under all conditions consisted of presentation of each stimulus and response pair separately and having each S name it, followed immediately by presentation of the nouns in pairs. The initial exposure to the pairs for all lists was kept roughly equivalent at about 12 seconds. During the testing trials, the stimulus pictures appeared for 6 seconds and was followed immediately by the slide showing both the stimulus and response pictures for 6 seconds. This procedure was repeated for each list for five trials or one errorless trial, whichever came first.

RESULTS AND DISCUSSION

Two analyses of variance were performed on the data. The first analysis of variance involved performance on the final or "transfer" list (the only list under condition 4) of each of the four conditions; that is the list not accompanied by instructions to use mediators. In addition, a 3 x 2 analysis of variance was carried out using initial performance of the two groups under each of the three treatments: Mediation, induced mediation, and no mediation. Raw data used in the analyses were total number of correct responses for each trial (with a square root transformation) in the first analysis, and mean number of correct responses over all five trials (without transformation) in the second analysis.

The summary table of the first analysis of variance ("two-between-one-within-mixed") appears in Table 2. The most surprising finding is

the lack of significance of the main effect for "race". However, individual comparisons of means using Duncan's Multiple Range Test (see Table 3) reveal that white first graders were superior to Negro first graders under conditions of no mediation, and induced mediation ($p < .05$ and $p < .01$ respectively), but not under conditions of mediation and mediation plus induced mediation (Experimental conditions 2 and 1 respectively). These data are depicted graphically in Figure 1.

Insert Tables 2 and 3 and Figure 1 about here

Thus hypotheses 4 and 5 are supported. That is, pretraining involving explicit instructions to use mediators tended to erase Negro-white differences on a subsequent paired-associate task with no instructions to use mediators.

The summary table of the second analysis of variance (2 x 3-"race x treatments") appears in Table 4. Again, the surprising finding is the non-significant main effect for "race". Individual "race" comparisons of means also revealed no significant differences. However, individual comparisons of combined Negro and white groups, as in the first analysis, revealed that provision of explicit mediators as well as instructions to make up mediators significantly increased the number of correct responses on the paired-associate lists as compared to the groups receiving no mediation instructions. These data are plotted in Figure 2. As can be seen in Figure 2, Negroes were slightly but not significantly superior to whites under treatment 3 (Ss given mediators by E). Thus the first hypothesis; that whites would be superior to Negroes under treatments involving no mediation instructions is not supported, while the second

Source	df	MS	F	p
Between Subjects	79			
Treatments (B)	3	4.01	5.49*	.005
Race (C)	1	2.37	3.25	n.s.
B x C	3	.30	1	n.s.
$Error_b$	72	.73		
Within Subjects	320			
Trials (A)	4	10.08	366.00**	.001
A x B	12	.22	7.33**	.001
A x C	4	.03	1.00	n.s.
A x B x C	12	.04	1.33	n.s.
$Error_w$	288	.03		
Total	399			

*p < .005
**p < .001

Table 2

Two-Between-One-Within-Mixed

Analysis of Variance

	16.60	16.91	17.66	18.19	18.30	18.32	19.06	19.76
A 16.60		.32	1.06	1.59	1.70	1.72	2.46	3.16
B 16.91			.75	1.28	1.39	1.41	2.15	2.85
C 17.66				.53	.64	.66	1.40	2.10
D 18.19					.11	.13	.87	1.37
E 18.30						.02	.76	1.46
F 18.32							.74	1.44
G 19.06								.70
H 19.76								

	.05	.01	.001
	.88	1.15	1.46
	.87	1.14	1.45
	.86	1.13	1 44
	.85	1.11	1.42
	.83	1.09	1.40
	.80	1.06	1.37
	.76	1.02	1.32

Where A= Negro-condition 4
B= Negro-condition 3
C= White-condition 4
D= White-condition 3
E= Negro-condition 2
F= White-condition 2
G= Negro-condition 1
H= White-condition 1

H > A ($p < .001$)
H > B ($p < .001$)
H > C ($p < .001$)
H > D ($p < .001$)
H > E ($p < .001$)
H > F ($p < .001$)
H = G
G > A ($p < .001$)
G > B ($p < .001$)
G > C ($p < .01$)
G > D ($p < .05$)

G = E
G = F
F > A ($p < .001$)
F > B ($p < .01$)
F = C
F = D
F = E
E > A ($p < .001$)
E > B ($p < .01$)
E = C
E = D

D > A ($p < .001$)
D > B ($p < .01$)
D = C
C > A ($p < .05$)
C = B
B = A

Table 3

Duncan's Multiple Range Comparisons of Mean Number Correct Responses Across All Five Trials For "Race" Effects

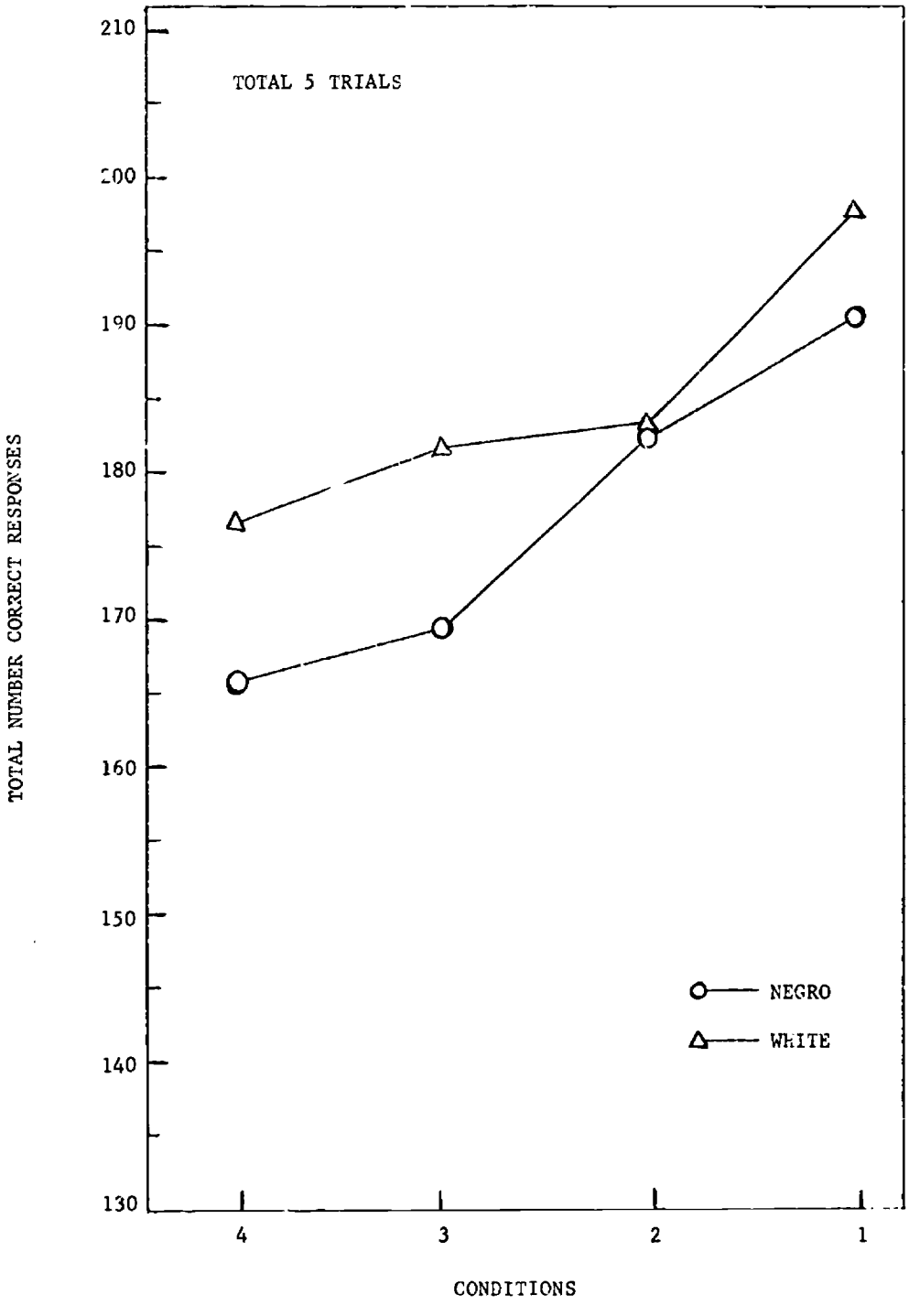

Figure 1
Total Number Correct Responses Under Four Conditions

hypothesis; that both Negro and white groups would perform significantly better under treatments involving mediation and induced mediation is supported.

Insert Table 4 and
Figure 2 about here

The finding that pretraining under mediation instructions facilitates subsequent performance has significant educational implications. The data from this study suggest that predominately lower class Negro first graders are deficient in the ability to spontaneously produce effective mediators, but given their production, these children are not deficient in the ability to use them. These results are consistent with those of Elkind and Deblinger (1969), Osborn (1968), and Corsini (1969, 1970).

Source	df	MS	F	p
Race	1	74.82	1.38	ns
Treatments	2	1564.80	28.75*	.001
Treatments x Race	2	92.47	1.70	ns
Error	54	54.43		
Total	59			

$p < .001$

Table 4

Race by Treatments Analysis of Variance

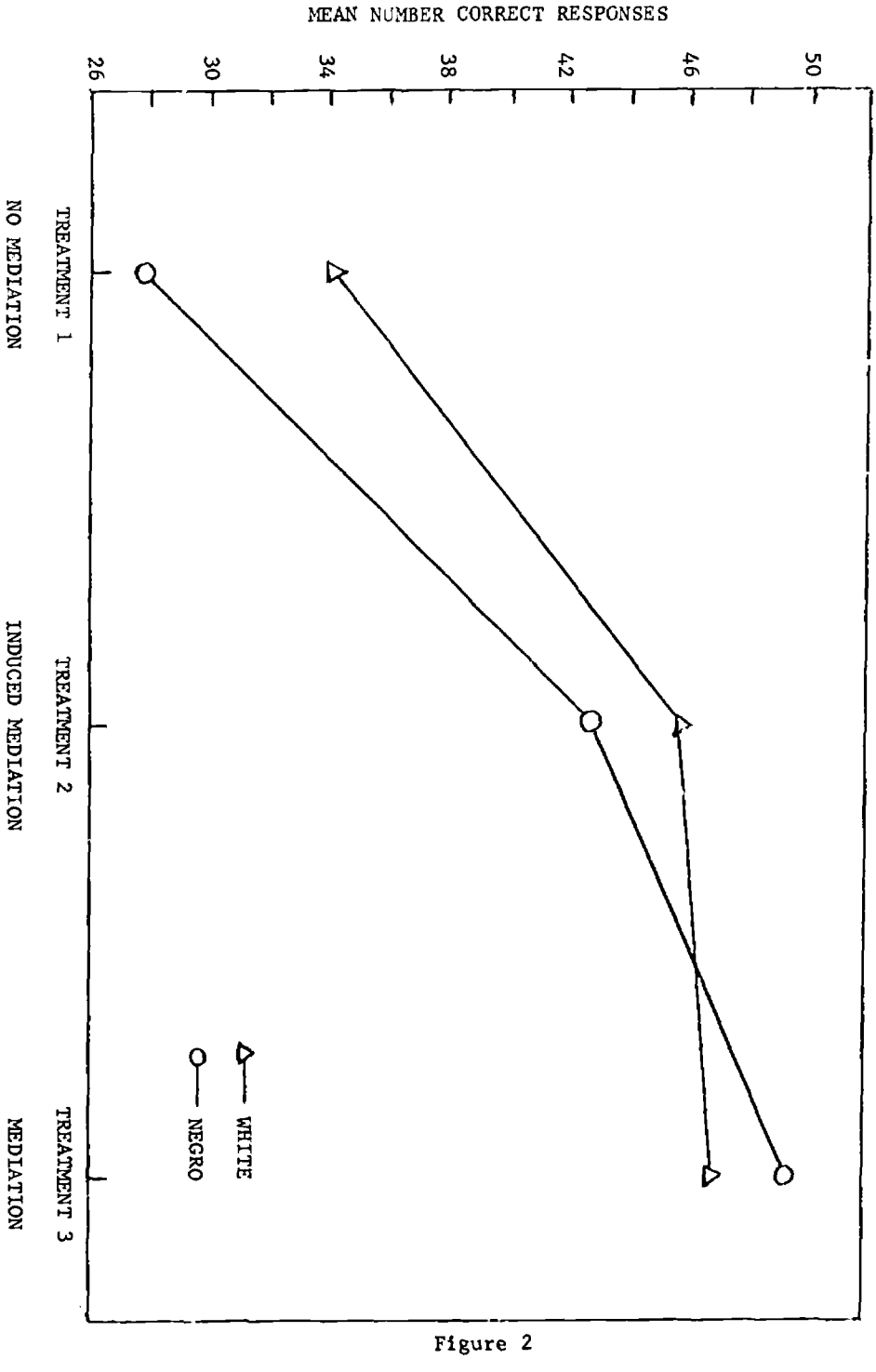

Figure 2

Mean Number Correct Responses Under
Three Treatments

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