EFFECTS OF MODELING ON CHILDRENS' PERFORMANCE IN A REFERENTIAL COMMUNICATION TASK

by

William Delbert Spaulding

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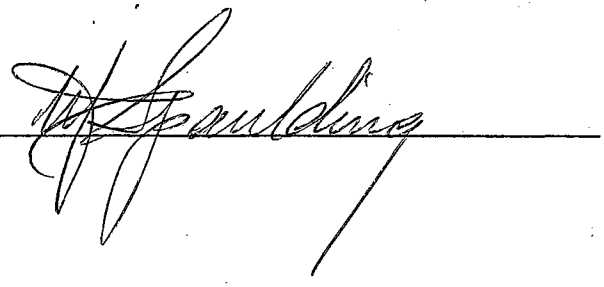
SIGNED: 

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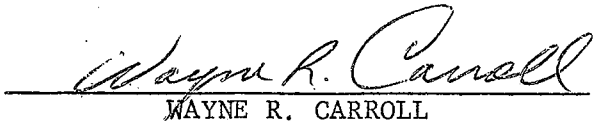

WAYNE R. CARROLL
Associate Professor of Psychology

4/14/75
Date

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ABSTRACT

The social learning literature has shown that children can abstract mediational rules from modeling displays; for example, after observing a model using specific grammatical transformations the child is more likely to use those transformations in his own verbalizations. In this study, children's performances on a referential communication task was measured before and after exposure to a model who displayed the mediational rule of role-taking or self-editing. Although the children imitated the specific responses used by the model, their performance on the task did not significantly improve. It was concluded that either the self-editing or role-taking rule was not imitated, or that the use of the rule was not critical in task performance at the developmental level of the subjects tested.

INTRODUCTION

Investigations of the development of the content of language have encountered many conceptual and technical problems. Language content has necessarily involved many questions concerning semantics--the "meaning" of linguistic units or the functional implications of the usage of particular words. Much confusion exists even in philosophy about the nature of those implications, not to mention the operationalized conceptualizations of experimental psychology.

Since the philosophical work of Wittgenstein (1922, 1927), language has gradually come to be seen as less a system of abstract relationships between linguistic elements and their referants in the physical world, and more as a non-physical means of manipulating the behavior of organisms through the communication of consensual information. The "meaning" of a word lies not in its associational implications within one person, but in the way the use of that word influences another's behavior. The use of a specific phrase must be considered as the representation of an individual's conceptual schema only in a secondary sense; the semantic space in which language units are embedded serves only to support the primary function of language, which is to communicate.

Flavell et al. (1968) have approached this point in showing that "role-taking" is an important component skill in language use; to communicate adequately, the child must be able to anticipate to some degree

the meaning of his words for his listener. In turn, anticipation of meaning in a listener can be a cognitive route toward behavioral prediction of the effect of a word or phrase.

A paradigm recently developed to study the use of communicative language as a function of anticipated meaning to a listener is the referential communication task of Krauss and his colleagues (Glucksberg, Krauss and Weisberg 1966; Krauss and Rotter 1968). Typically, two children (a "speaker" and a "listener") are seated at a table, separated by an opaque screen. Both have a set of blocks, each block bearing a nonsense design. The speaker's blocks are arranged in a dispenser, and he is instructed to tell the listener, whose blocks are randomly scattered on the table, what order the blocks are to be arranged. By recording the errors made by the listener in arranging his blocks according to the speaker's instructions, a measure of communication adequacy is established.

Krauss and Glucksberg (1969) have shown that communication adequacy in the task is a function of grade level for subject pairs in kindergarten and grades 1, 3, and 9. Independent analysis of speaker and listener competence showed a differential development; transmission of referential information gains in adequacy more slowly than reception.

The general improvement with age was interpreted as the combined effects of an expanding associative repertoire and increasingly more sophisticated (or less egocentric) editing processes; as the children grow older, there is a greater probability that the nonsense designs resemble some object that they have encountered, and they are better

able to discriminate between associations that would be familiar to most people and those that have only idiosyncratic significance.

The differential development of speaker and listener competence can be interpreted as the result of increased difficulty of the speaker's task, due to the additional required editing process. The speaker must generate a referential phrase from his associative repertoire and then decide whether it is appropriate to the specific communication context (i.e., whether it is egocentric), while the listener need only match the phrase to elements in his associative repertoire. Nachmani and Cohen (1969) have pointed out that this difference is essentially analogous to that between a recall and a recognition task. One might argue, then, that the speaker's task is more complex and difficult by its nature, whether or not the principle of egocentricity is a crucial variable in communication adequacy in this paradigm.

On the other hand, Flavell et al. (1968) further argue that non-egocentricity is a process that is woven throughout the individual's total cognitive "fabric," and there seems no reason at this juncture to assume a basic difference between processes involved in overcoming egocentricity and those involved in performing recall-type tasks in general. The ultimate criterion for declaring a construct valid is its utility; it follows that a test of the usefulness of the egocentricity explanation of communication adequacy is to facilitate the development of non-egocentric communication (i.e., of a self-editing or role-taking process) and measure concomitant improvement in communication adequacy. The functional implications of the egocentricity construct are, then, in

the question, "Can children's communication be effectively improved by specifically cultivating the self-editing or role-taking process?"

Braine (1963, 1966) has shown that children can apparently abstract useful rules to mediate language use simply through exposure to the language. It has been repeatedly demonstrated (Bandura and Harris 1966; Odam, Liebert and Hill 1968; Carroll, Rosenthal and Brysh 1972) that exposure of children to a model using correct grammatical manipulations will engender in those children more frequent use of the modeled manipulations; these demonstrations have also been interpreted as the result of a mediational rule being learned by the child by observing its use by the model. It seems that if syntactic and transformational rules can be vicariously learned or facilitated, a "non-egocentric" or "self-editing" rule can be similarly modeled or facilitated. If this hypothesis is valid, the result of that facilitation would be a general increase in communication adequacy.

In the present study, children performed on a modification of the "speaker" phase of Krauss' referential communication task, before and after exposure to a model. The model performed the same task, demonstrating the use of non-egocentric referential phrases. To maximize modeling efficiency, a "coping model" format was used (Bandura 1969); two of the model's referential phrases were egocentric, and were not accepted by the experimenter until the model corrected herself with non-egocentric phrases.

Two measures are used to measure modeling effects: "rote imitation" and "communication adequacy." In rote imitation, modeled phrases

used by the subjects were simply counted. In communication adequacy, each phrase generated by the subjects was measured by the ability of college student listener/judges to match it to the design to which it referred.

The task consisted of three phases: pre-modeling, post-modeling, and generalization. In the generalization phase, a new set of designs was introduced to provide a measure of generalized changes in communication adequacy.

If the assumptions about the effects of modeling on language use and the importance of self-editing in communication are valid, it would be expected that subjects exposed to modeling will show an increase in use of rote-modeled phrases (relative to a non-modeling control group) in the post-modeling phase, and that modeling groups will show relative increases in generalized communication adequacy, due to the internalization of modeled self-editing processes. Further, since the presence of self-editing processes appears to be established by grade 9 (Krauss and Glucksberg 1969), modeling effects on communication adequacy should be relatively stronger at lower grade levels.

METHOD

Subjects

The subjects were elementary school students (N = 120) in grades 2 (N = 40), 5 (N = 40), and 7 (N = 40). An equal number of male and female subjects in each grade level were assigned to experimental or control conditions. According to the school principals, none of the grade levels differed significantly in intelligence.

Materials

The experiment utilized 12 nonsense designs similar to those used by Krauss and Glucksberg (1969). Each design was rendered on a 6" x 10" card. The designs were randomly assigned to one of two groups of six. The first was presented to subjects in the pre-modeling and post-modeling phases, and the second was presented in the generalization phase. A group of four cards bearing animal pictures was used for preliminary task demonstration.

Procedure

Upon entering the experiment room, the subject was introduced to the experimenter and the model. The experimenter was a male graduate student and the model was a female undergraduate. The subject was seated at a small table before a microphone, with the experimenter seated beside him and the model seated about six feet behind. The subject was instructed by the experimenter.

Here are some cards with pictures of animals on them. See the microphone? At the other end is another person with some more cards just like these, but his cards are in the wrong order. Your job is to tell the other person what order your cards are in by telling the names of the animals on your cards.

All subjects performed the task without error. The animal cards were removed, and the first group of nonsense-design cards were presented in a stack. The subject was again instructed.

Now here are some more cards with pictures on them, but these pictures don't have names, and you'll have to think of things to call them. Your job is to tell the other person what order your cards are in by calling them things he'll understand.

Subjects' responses were recorded verbatim in the pre-modeling phases. After completion of this phase, subjects in the control condition were requested to perform the task again, and their responses were recorded in the post-modeling phase. Subjects in the experimental condition were instructed.

Now, Marcy (the model) will do the game, and you can take her seat and watch while she does it.

The demonstration proceeded.

Experimenter: OK, Marcy, tell the other person what order your cards are in by calling them things he'll understand.

Model: This one looks like the motor from a motor boat.

Experimenter: OK.

Model: This one looks like the arms of a windmill. This one looks like my mother's hat.

Experimenter: Now, that's not a good thing to call it, because only you know what your mother's hat looks like.

Model: OK, it looks like the sail on a sailboat.

Experimenter: Good. Everyone knows what that would look like.

Model: This one looks like a mushroom. This one looks like a picture I have.

Experimenter: Now, that's not a good thing to call it, because nobody knows what your picture looks like.

Model: OK, it looks like a horse's head.

Experimenter: Good. Everyone knows what that would look like.

Model: The last one looks like half a house.

After the modeling phase, the subject was returned to the microphone and requested to repeat the task. If the subject asked if he should use the modeled phrases, he was told, "It's up to you." The subject's responses were recorded in the post-modeling phase.

All subjects were then shown the second stack of nonsense design cards, the instructions were repeated, and the subject's responses were recorded in the generalization phase. He was then thanked and escorted back to his classroom.

Data Analysis

Rote modeling effects were measured by counting the incidence of the modeled phrases (excluding the two inadequate referents) in the

pre-modeling and post-modeling phases. Subject's rote modeling score in each phase was defined as the total number of modeled phrases appearing in that phase. Since the generalization phase used different stimuli, a measure of rote modeling was, of course, inappropriate for that phase.

Communication adequacy was measured by the ability of a group of 50 college students to match each phrase generated by the subjects to its referent nonsense design. Each student was given an illustration of the six designs in the two groups, and all phrases were read to the students, one by one. Each student marked on an answer sheet which figure he thought the phrase was referring to. The percent of students correctly matching a phrase to its correct referent design was defined as the communication adequacy score of that phrase. The communication adequacy of each subject in each phase was defined as the mean communication adequacy score of the six referential phrases that subject gave in that phase.

The six phrases used by the model in the demonstration (again, excluding the inadequate referents) all scored above 90 percent correct matches. The phrases generated by the subjects ranged from 0 to 100 percent communication adequacy.

RESULTS

Rote Modeling Effects

Analysis of variance of rote modeling scores show a significant main effect for phase ($F = 19.63$, $df = 1/54$, $P < .01$) and experimental condition ($F = 18.11$, $df = 1/54$, $P < .01$). A significant interaction appears for phase-by-condition ($F = 21.26$, $df = 1/54$, $P < .01$). The main effect for phase indicates the use of modeled referential phrases significantly increased in the post-modeling phase; the main effect for condition indicates experimental groups used the modeled phrases more than control subjects. The interaction signifies that modeling groups showed significant gains over control groups across phases (Figure 1). No other significant effects appeared.

A non-significant trend appears for a phase-by-condition-by-grade level interaction, suggesting a tendency toward differential rote modeling effects at different grade levels ($F = 2.52$, $df = 2/54$, F required for $P < .05 = 3.1$). However, the group means are not arranged in a linear order; grade 2 shows the strongest rote effect, while grade 5 shows the weakest.

Communication Adequacy

Analysis of variance of communication adequacy scores shows a significant main effect for phase ($F = 24.97$, $df = 2/216$, $P < .01$) and grade level ($F = 6.50$, $df = 2/216$, $P < .01$). The phase effect appears

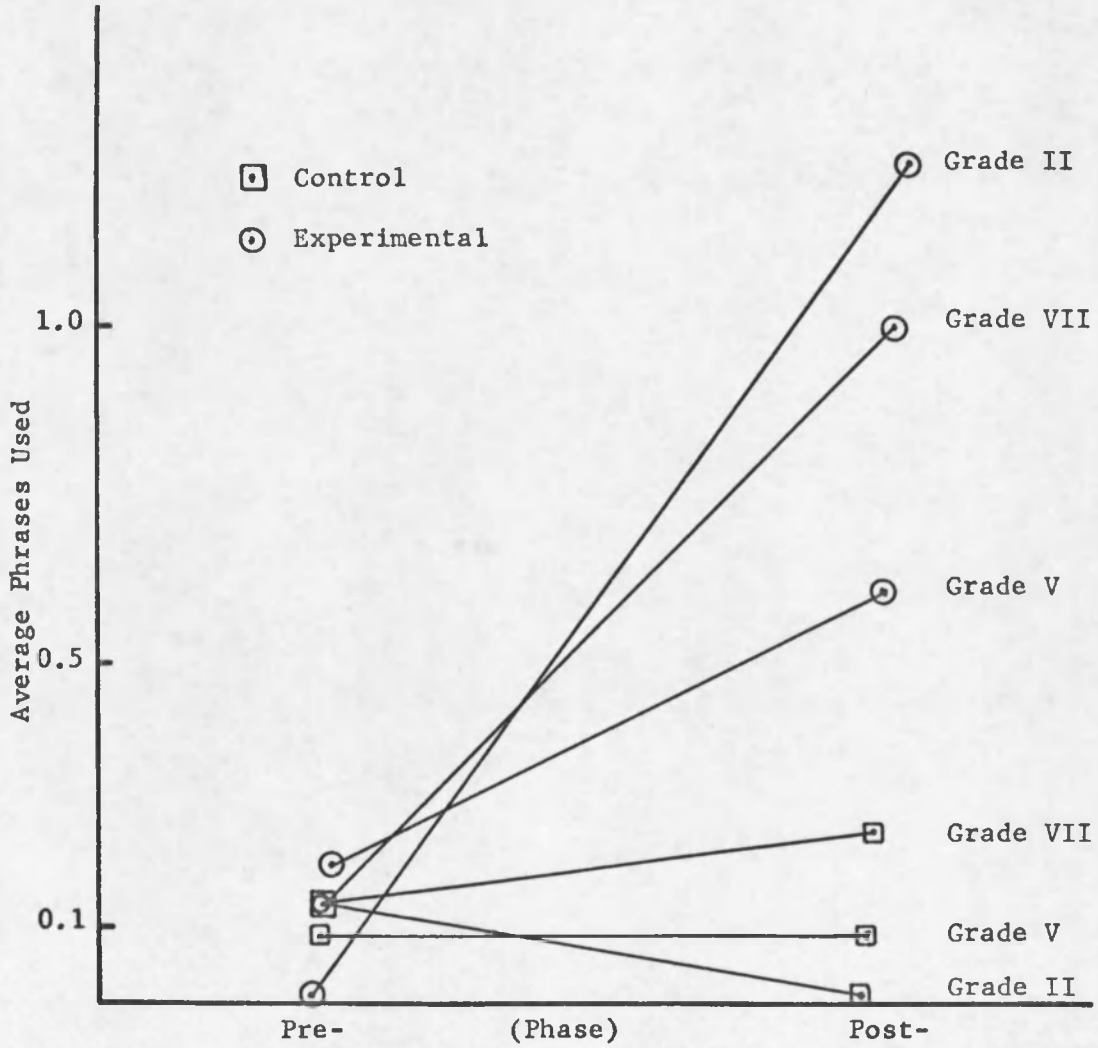

Figure 1. Average use of modeled phrases in pre- and post-phases, experimental and control groups, grades II, V, and VII.

to reflect a pronounced drop in communication adequacy in the generalization phase for all groups, while the grade level effect represents generally higher adequacy scores for higher grade levels (Figures 2, 3, and 4).

A significant four-way interaction appears for phase, sex, condition, and grade level ($F = 5.62$, $df = 4/216$, $P < .01$). A four-way interaction is difficult to interpret, but a plotting of the cells involved reveals a single discrepant trend across phases for the grade V experimental male subjects; whereas all other groups show little difference between pre-modeling and post-modeling phase scores and a marked drop in the generalization phase. The discrepant group shows a decrease in performance on the post-modeling phase with a recovery in generalization almost to the level of pre-modeling phase performance. This observation defies theoretical explanation; it seems best explained as statistical artifact.

Because the grade II subjects were expected to show the strongest modeling effects, an independent analysis of variance was performed on their communication adequacy across all phases. Again, a significant main effect appears for phase ($F = 12.67$, $df = 2/72$, $P < .01$), apparently representing the marked decrease in adequacy in the generalization phase (Figure 2). There is also a significant three-way interaction for phase-by-sex-by-condition ($F = 5.91$, $df = 2/72$, $P < .01$), with the experimental male subjects showing a discrepant gain in the post-modeling phase (Figure 5). No other significant effects appear in the grade 2 analysis.

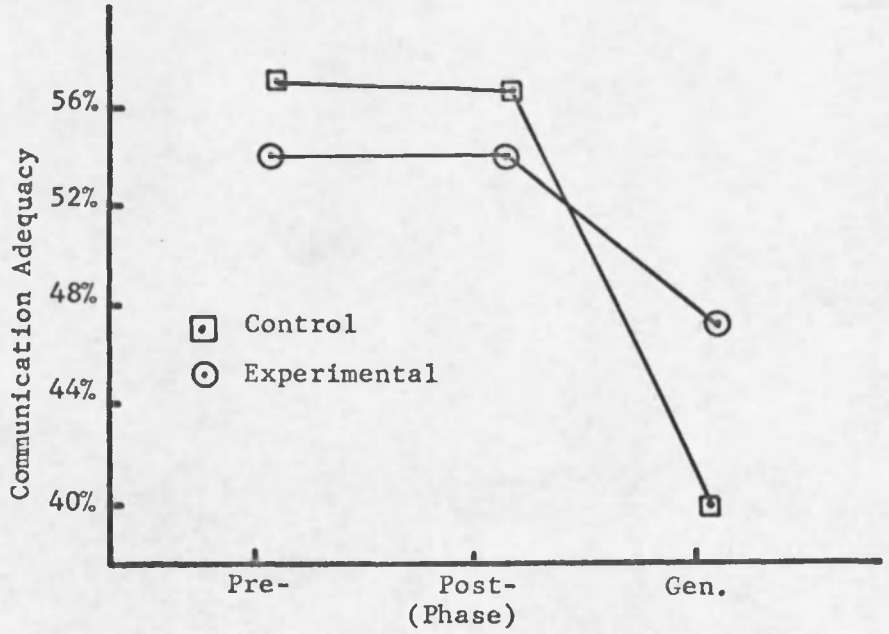

Figure 2. Performance on all phases, grade II, experimental and control conditions.

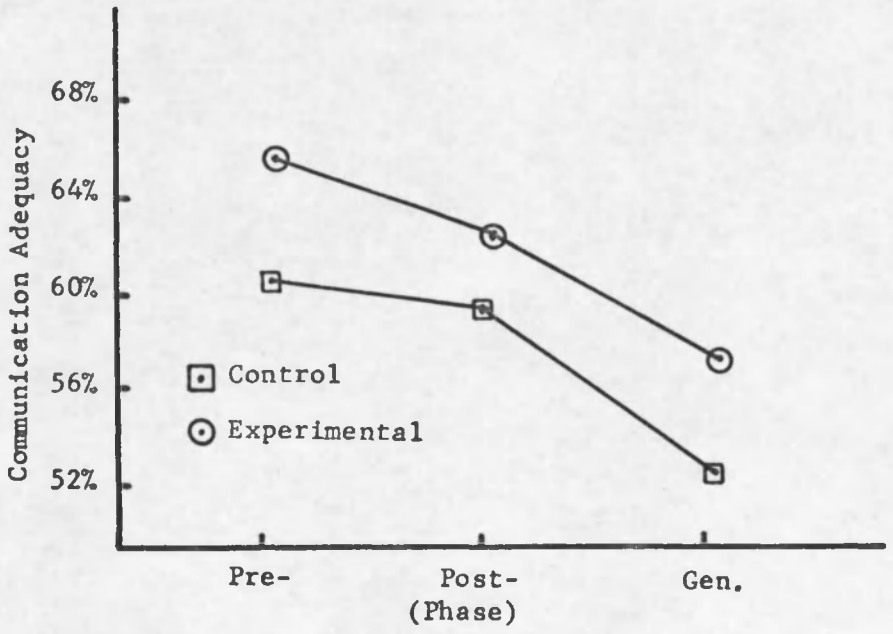

Figure 3. Performance on all phases, grade V, experimental and control conditions.

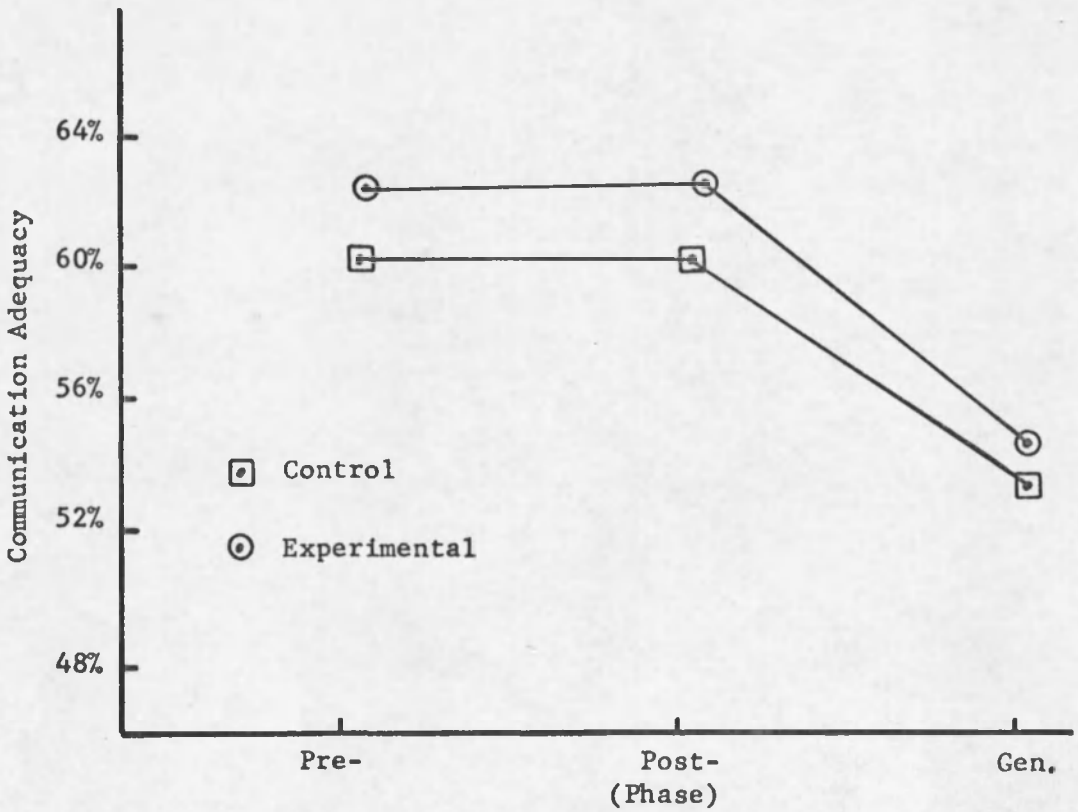

Figure 4. Performance on all phases, grade VII, experimental and control conditions.

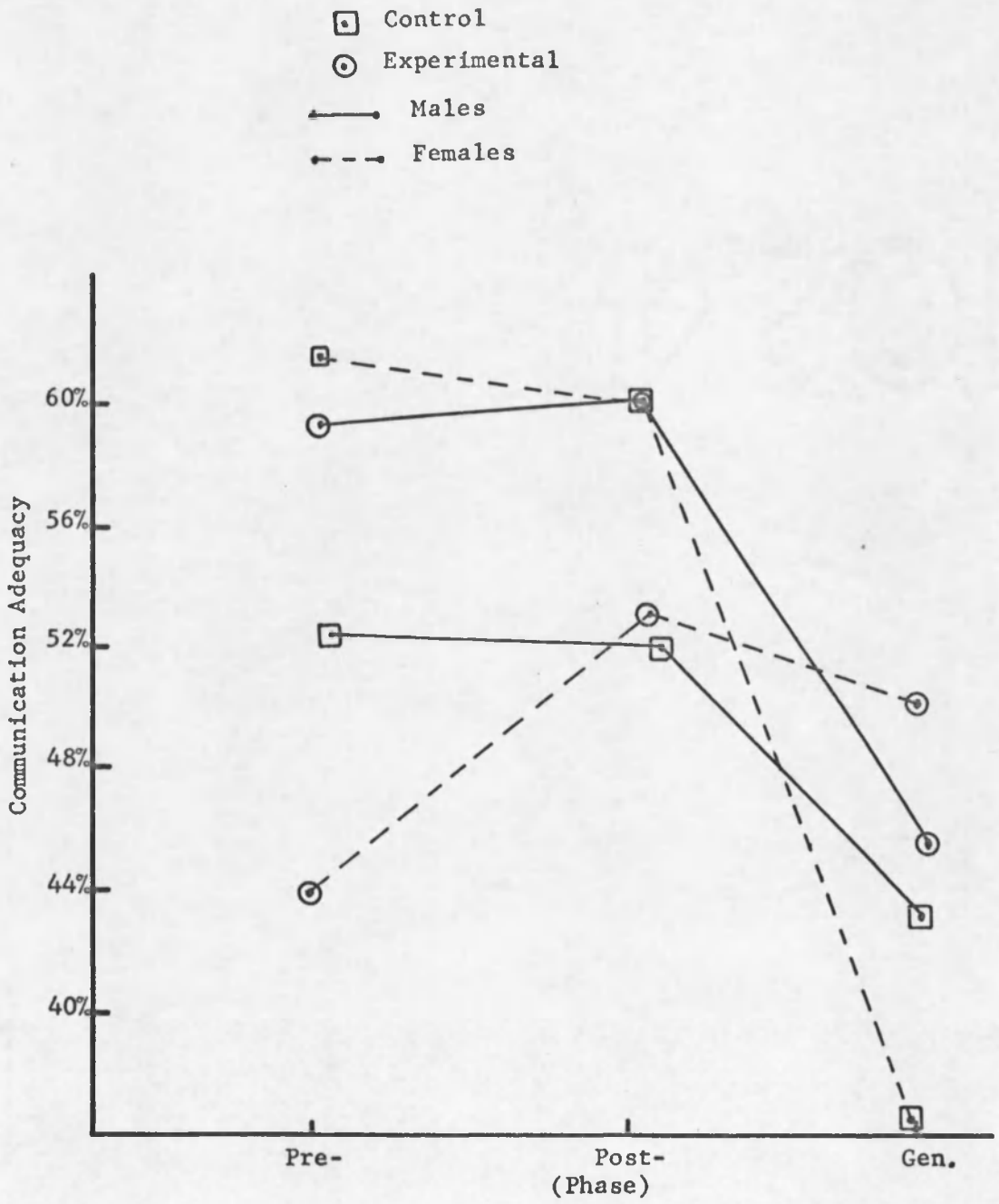

Figure 5. Performance of grade II males and females, experimental and control groups, in all phases.

A non-significant trend appears in the grade 2 analysis for a two-way phase-by-condition interaction ($F = 3.03$, $df = 2/72$, F required for $P < .05 = 3.1$). The configuration of group means (Figure 2) strongly suggests the predicted modeling effect in the generalization phase, although the experimental group shows no increase in the post-modeling phase.

A third independent analysis of variance was performed on all groups in the generalization phase, to remove the confused initial effects of the pre-modeling and post-modeling phases from consideration. The generalization phase is assumed to represent generalized changes in communication adequacy, and is therefore the pre-potent measure of facilitation of task performance.

In the generalization phase analysis a significant main effect for grade level appears again ($F = 8.25$, $df = 2/108$, $P < .01$). Modest non-significant trends appear for condition main effects ($F = 2.50$, $df = 1/108$, F required for $P < .01 = 3.9$) and a sex-by-condition interaction ($F = 3.18$, $df = 1/108$, F required for $P < .01 = 3.9$). The configuration of group means (Figure 6) again suggests predicted relationships; a large difference appears between experimental and control groups in grade 2, which diminishes as grade level increases.

In summary, measures of rote modeling show a significant increase in use of modeled phrases between the pre-modeling and post-modeling phases. A non-significant trend suggests differential modeling effects at varying grade levels, but the trend is not linear or theoretically predicted.

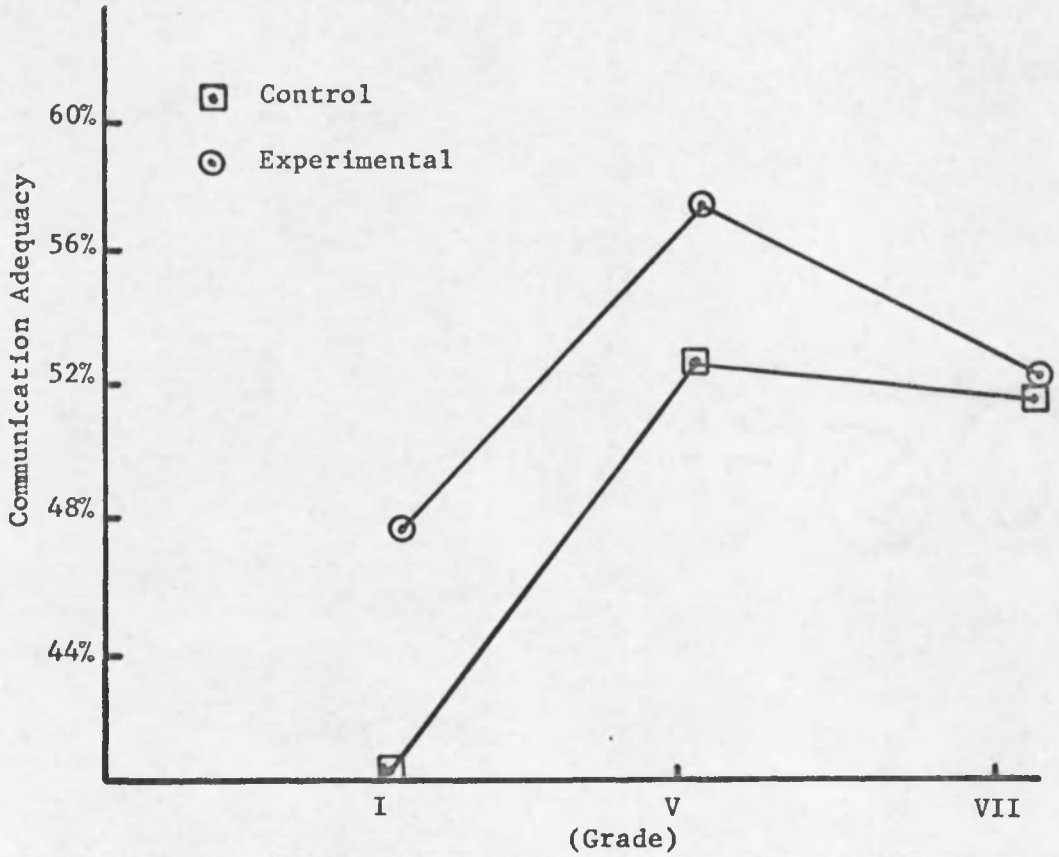

Figure 6. Performance of all groups in the generalization phase.

Measures of communication adequacy show a distinct grade level effect; scores in all groups increase with grade level. All groups show a marked drop in scores in the generalization phase, reflected by a significant main effect for phase. Modeling effects do not reach significance, but a strong non-significant trend appears in the predicted direction in an independent analysis of grade 2 subjects. Generally, the configurations of group means conform to prediction, but the relevant effects and interactions fall below significant levels.

It must also be noted that a striking and unexpected drop appears in communication adequacy in the generalization condition--in most cases, to a level below pre-modeling. This might represent boredom on the task or a differential difficulty of the two sets of nonsense designs. It was expected that randomization of the elements assigned to the sets would prevent such a differential, but the presence of just one particularly "easy" design in one of the sets may have caused the drop. In any case, the artifact may be masking an improvement that would have appeared had a correction for task difficulty been employed.

DISCUSSION

The significant increase in use of modeled phrases by modeling groups demonstrates that the children's performance was influenced by exposure to the model. However, it appears that although the children could process the rote modeled information, they did not imitate the use of mediational principles to the extent that it significantly improved their ability to communicate referential information. It must be concluded that the brief exposure to modeled mediational rules in this procedure is not a powerful way to facilitate communication skill.

On the other hand, the effects of the modeling procedure should not be entirely discounted. The grade 2 group did show a very strong trend toward significant improvement in communication--enough at least to suggest the possibility of a type II error--and since the effects in higher grades was expected to be relatively weaker, it seems overly conservative to conclude that no rule abstraction occurred whatsoever. In fact, it is very possible that with a more extensive modeling procedure the effect would have reached significance, at least in the grade 2 group. A comparison of modeling procedures for facilitation of performance on various tasks further suggests the extreme variance in amount of modeled information required. Carroll et al. (1972) obtained significant effects on expanded use of grammatical transformations in children with a rather brief modeling format, while Meichenbaum and

Cameron (1974) used an extensive program of graded displays to fully modify the attentional behavior of schizophrenics. In that sense, a conclusion that can be drawn from the present data is that simple exposure to mediational rule is not sufficient to fully predict its quantitative influence on the behavior it mediates.

The variables which could interact with the efficacy of a mediational rule modeling effect include the degree to which the children are familiar with the information being modeled. Efforts to modify grammar are influenced by the fact that such transformations are already known to the child, as evidenced by the Odam et al. (1968) findings that children selectively imitate only grammatically correct sentences. In the present study, it is likely that the associative information implicit in the display was unfamiliar, and therefore established a limit to the effectiveness of using a mediational rule. In other words, the children were not familiar enough with the process of scanning an associative repertoire for possible referential terms to even think about whether or not to edit when they had found one. This factor represents the second developmental process identified by Krauss and Glucksberg (1969)--the child's associative repertoire itself expands with development. Until his repertoire is large enough to present more than one possibility for a referential term, a more sophisticated editing process is gratuitous.

A more precise understanding of the relationship of associational repertoire and the self-editing process in this paradigm might be gained by an experimental design presenting different modeling formats restricted to either mediational or associational information, or both.

It would be interesting to know whether the weak and restricted (at best) effect of mediational modeling would be potentiated by preliminary training designed to expand the child's associational repertoire. Perhaps the optimal procedure is one in which associative possibilities are provided simultaneously with information about the degree to which the child should expect others to respond to his perceptions.

The interaction between association to ambiguous stimuli and mediation of information about those stimuli is one that has been considered in various ways throughout history; perhaps the popular notion that the difference between genius and insanity is very ephemeral indeed is a reaction to the fact that both require heavy reliance on unusual or creative associations to ordinary situations. In that sense, a procedure which simultaneously facilitates development of a more expanded associational repertoire and a sophisticated social editing process could be considered a course in "tempered creativity," teaching the child to use his generative or projective faculties, while also teaching a discrimination between artistic and speculative mentation and the functional communication skills required of an individual in society.

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