EFFECTS OF INTERMITTENT MODELLING ON OBSERVATIONAL LEARNING¹

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A large research literature suggests that modelling in the absence of reinforcement for either the model's or the observer's behavior is a potent source of social learning. This literature is based entirely, however, on experiments using models that always display the critical behaviors. It is possible, therefore, that results obtained in these experiments would not generalize to natural settings in which modelling is intermittent. The effects of intermittent modelling were examined using three groups of 15 four- and five-year-old children. Male and female children from middle-income families were individually exposed to an adult model who alternated descriptions of pictures of common objects. With one group, the model used no descriptive adjectives (color or number) in her descriptions after baseline; she used descriptive adjectives with 50% of the pictures with a second group, and 100% of the pictures with a third. Analyses of the data showed that the children substantially increased their use of descriptive adjectives in both modelling groups, but not in the no-modelling group. The fact that there were no significant differences between the 50% and 100% modelling groups suggests that results obtained in studies using consistent modelling can be generalized to natural settings.

DESCRIPTORS: observational learning, modelling, intermittent modelling language, children

The concept of observational learning has assumed increasing importance in applied behavior analysis during the past decade. Intervention techniques using modelling have been effective with a wide variety of problem behaviors, including specific fears (Bandura and Menlove, 1968), social withdrawal (O'Connor, 1972), and language deficits (Brody and Brody, 1976; Lahey, 1971; Lahey and Lawrence, 1974). Moreover, behavioral social learning theorists posit that observational learning is a major factor in the natural acquisition of both socially appropriate and deviant behavior (Bandura, 1969; 1977).

The assertion that modelling is a useful intervention technique is directly testable and has received strong support. The proposition that

models in our natural environment similarly influence our behavioral development, however, is a different kind of hypothesis. It can be tested only indirectly and logically.

In evaluating such a hypothesis, the conditions under which studies are conducted must approximate the naturalistic environment. For example, the home and school environments in which children grow up are seldom as consistent and stable as learning experiments. This is a potential, but not necessary source of concern. A considerable amount of evidence shows that intermittent positive reinforcement, for example, can enhance behavior change under some circumstances (Bandura, 1969), but there are no comparable data on the effects of intermittent models. Studies numbering well into the hundreds attest to the effects of consistent models on observers (*e.g.*, Kirkland and Thelen, 1977), but we cannot be sure that these data are relevant to natural situations in which models are probably less consistent. It may be that little or no observational learning is produced by inter-

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mittent models, thus challenging an untested assumption underlying social learning theory. The present study was conducted to evaluate the effects of intermittent models in a language learning context.

METHOD

Subjects

Twenty-seven white 4-yr-old and 18 white 5-yr-old children were drawn randomly from two preschools. Nine 4-yr-old and six 5-yr-old children were assigned randomly to each of three treatment groups. The experimenter-model was a white female graduate student; subjects were from middle-income families.

Procedure

Baseline. Subjects were taken individually by the experimenter to a room located near the classrooms at each preschool setting. Each child was then shown a set of eight individual pictures mounted on 21.5- by 35-cm pieces of cardboard. The pictures consisted of line drawings of familiar objects. As part of a "language game", each child was instructed by the experimenter: "We're going to take turns telling all about what we see in these pictures. First, it'll be *your* turn to tell me all about what you see; then it'll be my turn and I'll tell you all about what I see. Then, it'll be your turn again, and then it'll be my turn, and like that, O.K.?" The subject was then shown the first picture and instructed: "Tell me about what you see here." The experimenter said nothing else during baseline trials, except to prompt each child to respond when a new card was presented ("Here's another one."). The same procedure was followed for each of the eight baseline pictures. All responses were tape recorded and then transcribed verbatim in longhand by the experimenter.

Modelling Phases I and II. Following the baseline trials, the children were informed by the experimenter: "Now it's my turn to tell you all about what I see." The experimenter then

described four new pictures. Following the experimenter's performance, the subject was told: "Now it's your turn again. Tell me all about what you see here." The subject was then shown a set of four different pictures, one at a time. On completion of this phase, Modelling Phase II was initiated in exactly the same manner. The experimenter once again instructed the subject: "Now it's my turn to tell you all about what I see," as she described four new pictures. The subject was then presented with four different pictures and informed: "Now it's your turn again. Tell me all about what you see here." Each modelling phase, therefore, consisted of four descriptions by the model, followed by four descriptions by the subject. The experimenter provided no social or other consequences for the children's responses during any phase of the study. The baseline and two modelling phases typically lasted a total of about 10 min.

Treatment Variations

Consistent modelling group. Subjects assigned to this group observed the model use two adjectives when she described each of the four stimulus pictures in both modelling phases. Each stimulus picture was described by noting the number of objects in the picture and their color. For example: "I see two green trees." Four different colors (yellow, green, blue, red) and three different numbers (1, 2, 3) were modelled during each phase.

Intermittent modelling group. Subjects in this group were exposed to a model who used adjectives when she described only two of the four stimulus pictures during both modelling phases. The descriptions that contained adjectives were randomly determined for each subject. The modelled descriptions that did not contain any adjectives simply consisted of labelling the stimulus picture (e.g., "I see trees"), while the modelled descriptions that contained adjectives were identical to those in the consistent treatment group.

Control group. These subjects were exposed to modelled descriptions that simply labelled

the objects in each stimulus picture during both modelling phases (e.g., "I see trees").

Scoring of Responses

Adjective usage was scored if the subject used one or more adjectives to describe a stimulus picture. Each adjective was given one point and translated into an adjective-noun usage ratio by dividing the number of adjectives by the number of nouns that each subject used during each modelling phase. The adjective-noun usage ratio was used because a few children did not name all the nouns.

A second recorder who was uninformed of the hypotheses and purpose of the study listened to the audiotapes of nine subjects and independently scored adjective and noun usage. Three subjects were drawn randomly from each experimental group and reliability was calculated on the performances of these subjects in each of the three conditions. In addition, the second recorder was exposed only to those portions of the tape that contained the children's responses.

Interrater agreement was calculated by dividing the number of agreements (scoring the same number of adjectives or nouns in a subject's description of a single stimulus item) by the number of agreements plus disagreements. Agreement ranged from 0.75 to 1.00, with a mean of 0.87 for nouns, and ranged from 0.75 to 1.00, with a mean of 0.88 for adjectives.

RESULTS

A 3 (modelling treatment) $\times$ 2 (ages) $\times$ 3 (phases) repeated measures analysis-of-variance design was used to analyze the influence of the treatment groups on adjective usage. Table 1 presents the data on adjective usage by phases for all experimental treatments.

The overall analysis disclosed a significant main effect for the age factor, ($F(1, 39) = 4.21$, $p < 0.04$), as 5-yr-old children used more adjectives than the 4-yr-olds. A significant phase difference ($F(2, 78) = 22.90$, $p < 0.001$) was

also found. The analysis also revealed a significant modelling groups $\times$ phases interaction ($F(4, 87) = 7.90$, $p < 0.001$). Tukey *post hoc* analyses (Kirk, 1968) disclosed that the consistent modelling group increased its adjective usage significantly from baseline levels to modelling phases one and two (both $ps < 0.01$). The intermittent modelling group also increased its adjective usage from baseline levels to modelling phases one and two (both $ps < 0.05$). The *post hoc* analyses further revealed that the adjective usage of the consistent and intermittent modelling groups surpassed the control group during both modelling phases one and two (both $ps < 0.01$), but the two experimental groups did not differ from one another at either modelling phase (all $ps > 0.05$).

Some features of the children's performance are worth noting. Fourteen of 15 subjects in the consistent modelling group increased their adjective usage in modelling phase one over their baseline levels; nine subjects in the intermittent modelling treatment and five subjects in the control group increased their adjective usage. The same pattern reappeared when the number of subjects who increased their adjective usage in modelling phase two over their baseline levels was examined. Thirteen, 10, and five subjects increased their adjective usage over their baseline levels in the consistent, intermittent, and control groups, respectively. A chi-square analysis revealed a significant difference between the groups on the number of subjects improving from baseline to both treatment phases (both $ps < 0.001$), but there were no differences found between the consistent and intermittent modelling groups on this measure (both $ps > 0.10$).

DISCUSSION

As in previous studies (Brody and Brody, 1976; Lahey, 1971; Lahey and Lawrence, 1974), marked changes in the use of descriptive adjectives occurred when they were consistently used by the model in the absence of contingent

Table 1
Mean, standard deviation, and range of adjective-noun usage ratio
by phase for each treatment and control condition.

	Phase								
	Baseline			Modelling I			Modelling II		
	$\bar{x}$	sd	range*	$\bar{x}$	sd	range*	$\bar{x}$	sd	range*
Consistent modelling	0.19	0.38	0-0.91	0.88	1.12	0-1.88	0.88	1.15	0-1.94
Intermittent modelling	0.25	0.40	0-1.0	0.74	0.91	0-1.37	0.66	0.83	0-1.37
Control	0.39	0.45	0-0.97	0.36	0.65	0-1.50	0.31	0.58	0-1.06

*The range statistic presented above indicates the subject with the lowest adjective-noun usage ratio and the subject with the highest adjective-noun usage ratio averaged across all the trials of a given phase.

reinforcement. More importantly, the intermittent model influenced the language behavior of subjects to a similar degree. In fact, no significant differences were found between the 100% and the 50% consistent groups on either changes in adjective usage or the number of subjects that increased adjective usage from baseline to treatment. This finding offers support for the significance of observational learning in the natural acquisition of behavior. Further experimentation is needed, of course, using different parameters of intermittency, different behaviors, and situations that are less structured than the preschool learning exercise used in the present study.

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