1974

Vicarious Learning in Group Articulation Therapy

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VICARIOUS LEARNING IN GROUP ARTICULATION THERAPY

(TITLE)

BY

LYNDA C. STOUT

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

MASTER OF SCIENCE

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1974
YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
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ACKNOWLEDGMENTS

Appreciation is extended to Mrs. Sylvia James for her help in locating and scheduling subjects, and to Cleopatra Durham for her assistance throughout the project. Thanks also goes to Dr. Miner for assistance in planning and setting up the study.

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CHAPTER I.

Introduction

Vicarious learning may be defined as "behavior incorporated into the repertoire of an observer as a consequence of imagined or empathetic participation in a model's responses, and the consequences of those responses." (Ritterman, 1970) This concept has been a frequent topic of psychological and behavioral research.

The above definition implies that observational learning consists of certain ongoing processes that are identifiable and measurable. According to Bandura (1965) this definition has developed gradually over time. Late nineteenth century and early twentieth century authors theorized that imitative behavior was an innate tendency prompted by instinct. (Bandura, 1965)

In a review of the literature and theories regarding vicarious learning, Flanders (1968) cites Miller and Dollard (1941) as founders of the empirical study of imitative behavior where it involves one model and one observer. They explained the phenomenon by principles of operant conditioning, and called it "matched-dependent behavior." According to their theory, the observer's first chance imitations of a model were consistently reinforced

over time until the imitator acquired a tendency toward observing the model's responses and matching his own to them. As O'Connell (1965) points out, this theory required that the observer become conditioned to rely on the model's behavior and not the actual environmental stimuli that the model himself responded to. Miller and Dollard did not consider vicarious reinforcement an independent phenomenon; their emphasis was rather on direct reinforcement of the observer for his imitation of the model.

Flanders also recognizes Bandura and Walters (1963) as authors of a school of thought in which vicarious reinforcement is regarded as an independent variable in social learning. Within their "stimulus contiguity" and "mediational" theories of imitative behavior, they present two key processes involved in observational learning: acquisition and performance. They believe that acquisition of imitative responses (or the potential to perform them) results when the model's behavior elicits a sequence of sensory events in the observer that "become centrally integrated . . . " on the basis of past associations. The symbolic responses have "cue-producing properties" that elicit overt matching responses. The performance of these imitatively learned responses is dependent on the reinforcing consequences that follow the model or observer's responses. (Bandura and Walters, 1963; Bandura, 1965) Bandura and Walters propose that the act of vicarious reinforcement, or observed reinforcement to a model, gives the observer information about the reinforcement contingencies and rele-

vant environmental cues.

In recent research the component parameters of vicarious learning have been separated even further and their relevance to behavioral conditioning substantiated. Griffith and Miner have identified from Fellows' work (1968) six major factors influencing vicarious learning. (See Appendix I.) These factors include the processes of attention and discrimination by the observer; the accuracy of the model's performance; the observer's evaluation of the model's performance; the observer's knowledge of the results of his evaluation; the presence of a motor response by the observer in his evaluation; and the presence of signal significance in the stimulus observed.

A review of the literature indicates that recent experimental research has investigated the operation of vicarious processes in various types of verbal conditioning. These have included the study of vicarious learning in complex verbal response acquisition (Moore and Sipprelle, 1971), in which groups of adults were required to imitate a model's story-telling behavior; and studies by Simon, Ditrichs and Martin (1969; 1970) in which observers listened to a model learn lists of paired associates and were then required to do the same task. In Ritterman's study (1970) children both observed a model's practice and were themselves given practice in discriminating between different phonemes of speech. A reported study by Borus, Greenfield, Spiegel and Daniels (1973) comments on the operation

of vicarious reinforcement in therapy to establish imitative speech in a group of emotionally disturbed children.

However, the review also reveals a general lack of research related more directly to the practical application of vicarious learning to speech pathology. Studies in the field of speech and hearing research and in related areas have included conditions in which the processes of vicarious learning were potentially operant, but in which the possible effects of such learning were not measured, or were not reported. For example, a study by Johnston and Johnston (1972) sought to demonstrate a technique for training correct consonant sound usage by teaching two children to respond discriminatively to the correct and incorrect responses of the other. The effects of such monitoring were measured for the child whose speech was being monitored. However, the effects of the process of discriminative evaluation of consonant usage on the observer child's own consonant usage were not separated and measured.

Vicarious processes have been demonstrated to be operant in group discrimination learning; yet its principles have not been thoroughly researched with reference to verbal learning in group speech therapy situations, where they should also be potentially operant.

It has often been a question for public school speech clinicians whether group scheduling of therapy is actually more advantageous than scheduling short sessions of individual therapy with regard to a child's re-

sponse-acquisition rate. The large caseloads and expanding professional responsibilities of the public school speech clinician have long been topics of discussion in the field. Coping with the number of children who need their services within the limited time schedules of a school program have prompted clinicians to turn to group scheduling whenever possible. (Van Hattum, 1966; Brown, 1971) Should vicarious learning processes be found potentially manipulable in group speech therapy situations as the literature suggests, the effects, and possibly the advantages of group scheduling as opposed to individual scheduling might be qualified.

Statement of Purpose

The purpose of this study was to examine the operation of vicarious processes in one type of verbal learning, that of speech-sound acquisition in small-group articulation therapy. Specifically, the influence of vicarious learning was considered with regard to the rate of acquisition of /s/ in words, for small groups of school-aged children exhibiting /s/ distortions or substitutions. For purposes of this study, it was hypothesized that the rate of acquisition of the phoneme would be greater for groups of children receiving systematic vicarious response reinforcement in addition to reinforcement by direct therapy as compared to children receiving only direct response reinforcement, either individually or in groups.

The following questions were examined:

1. For which of the following conditions is the child's rate of acquisition of /s/ in words the greatest, as measured by the ratio of the number of reinforced responses to the total number of responses per session:

   I. Direct response reinforcement in individual therapy.

   II. Direct response reinforcement in group therapy, with continued exposure to the group.

   III. Direct response reinforcement in group therapy, with additional structured vicarious reinforcement through observation of other group members and monitoring of their responses.

2. Is there a statistically significant difference in the rate of acquisition of the /s/ sound among the three groups?

3. How do the rates of phoneme acquisition compare for children placed in conditions I. and III. above, where each child receives the same amount of time allowance for direct reinforcement of responses, with specific regard to the type of scheduling: group versus individual therapy.

4. For each child placed in group III. above, how does his performance in observing and monitoring other children's responses compare with his performance for acquisition of /s/ in words?

CHAPTER II.

Review of the Literature

The literature concerning the process of vicarious learning supports the notion that such learning does take place in conditions involving a model and one or more observers. The literature also indicates that the process can be broken down into component factors involving the model, the observer and the performance of each. These factors include attention and discrimination; the accuracy of the model's performance; the observer's evaluation of the model's performance; knowledge of results; a motor response by the observer; and the presence of signal significance.

Processes of Attention and Discrimination

In a study of the interaction of vigilance, arousal and habituation, Mackworth (1968) notes that the brain is constantly responding to incoming stimuli, comparing them with past events and making predictions concerning future events or stimuli. A certain level of arousal is necessary to maintain a state of vigilance or readiness to detect and respond to small changes that are occurring in the environment. Mackworth implies that attention is necessary before stimuli may be observed and integrated into the

system.

Bandura (1965) points out that simple exposure to a sequence of modelling stimuli does not ensure that the observer will learn from them. In his experiment, groups of children were shown films of a model using aggressive behavior that was followed by rewarding consequences, punishment, or no consequences. He reports that most children did not acquire all the behaviors shown them. Bandura concludes that attention and discriminative observation of relevant cues are necessary for vicarious learning to occur.

MacDavid (1962) did a study that involved training preschool children to imitate an adult in choosing an object of one of three colors. The model's response coincided with a certain color at three levels of consistency. He found that children acquired the imitative response most readily when the model's choice of color was most consistent. This indicates that attention to both the model's behavior and to environmental cues is an important part of learning by imitation.

Bandura (1965) suggests that procedures to augment the distinctiveness of relevant stimuli in a model's behavior will facilitate observational learning by facilitating the processes of attention and discrimination. Several studies have supported this notion. Paschke, Simon and Bell (1967) report a study of discrimination learning in retardates. Subjects watched a film of a model learning a discrimination problem; later, they were re-

quired to do the same task. One group of subjects was told that the model would be shocked for an incorrect response. The authors found that the aversive stimulus given the model produced a high drive state in the observers and facilitated acquisition of the discriminative response. They found that observers who did not view a model given an aversive stimulus also acquired the discriminative response; their learning increased proportionally with the number of observational trials.

Ritterman's investigation of vicarious learning of speech-sound discrimination by second-grade children (1970) concurs with the above data. Ritterman found that vicarious experience produced discriminative responses in acquisition of phonetic distinctions, and was possibly as effective as direct practice. Of especial importance was the attention of the observer. Attention was maintained by giving the observer a "vested interest" in the model's performance; the observer was given the same number of reinforcers that the model he viewed was given.

Accuracy of the Model's Performance

Kanfer and Marston (1963) found that observing a consistent pattern of responses made by a model, even if the model was not reinforced, increased the observer's imitation of those responses. The greater the percentage of correct responses made by the model, the greater the learning shown in the observer.

Simon, Martin and Ditrichs' data (1970) supports this finding. "For the observational learner, rate of response acquisition is a direct function of the accuracy of the model's performance. If the model responds correctly, the observer essentially receives an additional presentation trial." They point out that an incorrect response or no response to the stimulus from the model may supply misleading information to the observer, which may then interfere with learning.

Kanfer and Marston also noted however, that the addition of reinforcement to the model caused an even greater increase in the observer's learning. Rosenbaum and Tucker (1962) define competence as the "degree to which an individual receives, in reaction to his behavior, evidence of correctness . . . ". They found that when the model's apparent competence was high, as measured by the correctness of his responses, the observer imitated his responses much more readily than when his competence was low. It appears that reinforcement (or lack of it) following a model's responses may aid the observer in perceiving the accuracy of the model's performance.

Observer Evaluation of the Model's Performance

Miller and Dollard (1941) determined that "the behavior of the model and reinforcement to the model are initially discriminative stimuli that enable the observer to imitate the model and . . . obtain reward." Bandura

and Walters (1963) state that observation of reinforcing consequences to the model's behavior informs the observer of the controlling stimuli and reinforcement contingencies of the learning situation, and activate him to perform the same responses. Both of these statements imply that the observer must discriminate between the model's various responses, or evaluate them in some way, in order to learn the correct response himself.

Simon, Martin and Ditrichs (1970) offer supporting evidence. Evaluative responding, defined as "detected discrepancies . . . between the responses an observer believes to be correct, and the responses emitted by a social model," was found to facilitate observational learning. In their study, subjects listened to a tape recording of a model learning fifteen lists of paired associates (words). Some subjects were required to evaluate the model's responses, and to indicate their judgment of a correct or incorrect response. Other subjects were simply required to listen to the model. When the subjects were then asked to perform the same task as the model they had observed, greater learning was seen in subjects who had been required to evaluate the responses they heard.

As was also implied in the statement by Miller and Dollard, reinforcement to the model facilitates the observer's discrimination or evaluation of correct and incorrect responses. Bisese (1966) found that reinforcement of the model for correct responses, or vicarious reinforcement of the observer, increased the observer's imitation of the model. The greater the percentage

of reinforced responses to the model, the more the observer imitated the responses. Ditrichs, Simon and Greene (1967) determined that increasing the percentage of vicarious reinforcement to responses over observational trials sensitizes the observer to the reinforcement contingency, thereby increasing imitation.

Moore and Sipprelle (1971) also studied the effects of knowledge of response-reinforcement contingency to vicarious verbal conditioning in college-age males. They found that only the observation of selectively reinforced responses resulted in acquisition of the target responses in the subjects. Phillips' study (1969) indicated that noncontingent vicarious reinforcement actually impedes later learning by direct reinforcement. That is, observation of noncontingent reinforcement to a model provides misleading information and obscures identification of the correct direct response reinforcement contingency.

Knowledge of Results

Kanareff and Lanzetta (1960) found that observers will show increases in imitation of a model for a reward in the form of knowledge of correct "task-success outcome." Throughout their experiment, observers were given continued feedback of their own success or failure in choosing a specific response. The observers' knowledge of their correctness whenever they imitated the model's response increased their tendency to imitate the

model.

In an investigation of different processes involved in imitation completed by Luchins and Luchins (1961), knowledge of the results of their responses was sufficient reinforcement to cause the observers to imitate the model's responses. A study by Hillix and Marx (1960) found that observers who received only information concerning the correctness of their responses exhibited more learning than those who received an additional reward for correct responses.

Mackworth's thesis (1968) supports this data with observations concerning the physiological mechanisms involved in learning. She reports that although the brain is constantly sorting incoming stimuli, repeated stimulation causes habituation, or response decrement. Knowledge of results concerning responses made to the stimuli will delay habituation by increasing the detectability of the signal stimulus.

Effects of Observer Motor Response

Mackworth (1968) stated that requiring a discriminative motor response to a stimulus will delay the habituation or decrease in the evoked responses. The motor response aids the organism in orienting to and detecting stimulus changes.

Simon, Martin and Ditrichs (1970) also investigated the orienting reflex as a component of the vicarious learning process. An orienting reflex

was defined as "a complex behavioral and physiological response to stimulus change, the results of which facilitate perception and learning." In their experiment, observers imitated a model's performance in speaking lists of paired associates. One group of subjects was required to press a key to indicate judgment of a correct response by the model; another group was required to press a key for an incorrect response; a third group pressed two keys, one to indicate a correct response, and one for an incorrect response. A fourth group was required to make no motor response to the model's performance, but merely to observe. Their results determined that requiring an overt motor response during observation results in differentiated and sometimes augmented orienting responses to the model's behavior, and thus increases vicarious learning.

Signal Significance

In another study of the orienting reflex, Germana (1968) refers to the orienting reflex as a "nonspecific reaction that occurs in response to changes of at least 'just noticeable' value in a stimulus of any modality." In order for a stimulus to evoke an orienting response, it must be "new" or "novel" to a noticeable degree. The orienting reflex selectively decreases or habituates in response to a repetitive stimulus. However, association of behavioral responses with a stimulus produces greater orienting reflexes than the stimulus alone.

Simon, Martin and Ditrichs (1970) found that by conferring "signal significance" on a stimulus, or by pairing it with behavioral responses, the observer's orienting responses can be heightened and maintained for longer periods. Thus, an overt motor response to the model's performance, requiring discriminative evaluation of the stimulus, gives that stimulus signal significance and aids learning.

Summary

A survey of the literature warrants the following statements regarding vicarious learning:

1. Attention to the model's behavior and to environmental cues is necessary for vicarious learning to take place.

2. Discrimination of the relevant stimuli and reinforcement contingencies takes place in vicarious learning.

3. The accuracy of the model's performance functions in the rate of response acquisition for the observer.

4. The observer's perception of the model's competence affects his learning.

5. Evaluative observation of the model's behavior facilitates learning.

6. Reinforcement to a model for correct responses increases vicarious learning in the observer.

7. Knowledge of the results of his responding increases the obser-

ver's imitation of a model.

8. The orienting reflex occurs in response to perceptible changes in the stimulus, and is a component of the vicarious learning process.

9. A motor response by the observer increases the orienting reflex and delays habituation of the response to the stimulus.

10. Presence of signal significance heightens orienting responses to the model's behavior and facilitates observational learning.

CHAPTER III.

Methods and Procedures

This study was designed to include three experimental groups. The members of Group I. received therapy individually. Members of Group II. met together and were reinforced only for direct responses to the stimulus words. The children in Group III. received reinforcement for direct responses to stimulus words, and also received structured vicarious reinforcement through listening to the active learner and monitoring his responses.

Each therapy session lasted ten minutes per child for Group I., and a total of 30 minutes for Groups II. and III. Each group met for seven weeks or fourteen sessions during the project. The children in Group I. received a total of 140 minutes of therapy; children in Groups II. and III. met in therapy sessions for a total of 560 minutes. However, as will be explained in the following sections, each child in the project received a total of 140 minutes of direct stimulus response and reinforcement therapy.

Subjects

The study involved nine first- to fourth-grade children from Jefferson

School in Charleston, Illinois. Potential participants were administered the Griffith and Miner Phonetic Context Inventory for the /s/ sound. This test assesses the child's production of the sound according to its position in a syllable, and also according to the syllable's accented or unaccented position in a word. The child is asked to repeat the test words after the examiner. The nine children who were chosen exhibited an /s/ distortion or substitution in 62-92% of the 55 contexts on the test.

The children were assigned to three groups of three members each. Assignments were made according to the times available for speech therapy within each child's regular classroom schedule. Group I. was composed of one fourth-grade girl, one third-grade girl and one first-grade boy. Two of the children displayed /th/ for /s/ substitutions, and the third a lateral distortion of the /s/ phoneme. Group II. consisted of one fourth-grade boy and one third-grade girl who displayed sibilant distortions of /s/, and one third-grade boy who had a /th/ for /s/ substitution. Group III. consisted of two first-grade girls who had /th/ for /s/ substitutions, and one first-grade girl who had a sibilant distortion of the /s/.

Stimulus Word Selection

The stimulus items consisted of words containing the /s/ sound. Selection of items to be used was based partly on the frequency of occurrence of phonetic contexts for /s/ within the 1000 most frequently occurring words

at grade levels one and two. (Thorndike and Lorge, 1944; Griffith and Miner, 1973) Contexts for the /s/ sound were defined according to Keenan's system (1961). The sound was classified according to its position in a syllable, initial or final, and according to that syllable's accented or unaccented position within the word. Schneider (1973) used this classification system in a study looking at percentage of correct production found among children for the various contexts of /s/. Her data resulted in a rank ordering of /s/ contexts as a function of syllabic stress, according to the subjects' percentages of correct production.

For the present study, the rank ordering for the most frequently-occurring contexts was altered to take into account the rank ordering for percentage of correct production. The resulting list was assumed to contain an ordering of phonetic contexts for /s/ according to facilitation of correct production. Stimulus words were chosen from this list. Whenever possible, two words per context were presented during therapy. The children were not all given the same stimuli, but rather were presented words according to the contextual errors they demonstrated individually on the Phonetic Context Inventory.

Equipment and General Procedures

The stimulus words were presented auditorially by means of prerecorded tape on cards, using the Bell and Howell Language Master, Model no. 717.

A repeat control allowed the clinician to replay the words as often as desired. The Bell and Howell Reinforcer/Counter unit was used both to record and to reinforce responses. The Reinforcer/Counter unit included two tabulators to record the number of total responses and the number of reinforced responses each child made per session. Connecting accessory units for each group member included a light which illuminated to indicate reinforced responses. The Reinforcer/Counter unit also contained an override control for the clincian, making it possible for observer members' lights to be illuminated only when their judgment of a correct response coincided with the clinician's tabulation of a reinforced response.

The child responding directly to the stimulus was instructed to press the button on his unit to signal that he wanted to listen to the stimulus. This activated the light on the clinician's unit. Each child was allowed to listen to the stimulus as often as he wished before attempting to imitate the stimulus. He was allowed as many responses and as many repetitions of the stimulus between responses as he desired. For each successive approximation to the stimulus, or for each correct response, a light appeared on the child's unit.

Observer children in Group III. were instructed to press the button on their units whenever they believed they heard the active learner make a better response or a correct response to the stimulus. If the child's judgment was correct, i.e. if the clinician also recorded the response as correct or

as a better approximation, a light appeared on the observer's unit. Incorrect judgments were indicated by the absence of the light on the observer's unit.

The equipment also included the Progress Plotter, a small graph that is accessory to the Bell and Howell Language Master Articulation Therapy Program. After every ten responses, the active learner plotted the number of correct or reinforced responses he had just made. In this way a graph of his progress for a certain word was visually available to him at all times.

During the therapy sessions the clinician used shaping procedures, reinforcing successive approximations to the stimulus. In Group I. each child responded to one stimulus for a maximum of five minutes, and then listened and responded to a second word for five minutes. They were given a total of ten minutes per session to hear and imitate a stimulus word. In Groups II. and III. the children took turns listening and responding directly to a stimulus word. They were allowed two turns or trials of five minutes each during the session, which totalled ten minutes per session of listening and responding directly to a stimulus word.

The criterion for responding on one word was eighteen out of twenty reinforced responses or five minutes. When a child achieved criterion for one word before he finished the five minutes allowed him during one trial, he was given a second stimulus word having the same context, or a word with a new context for /s/. If a child did not achieve criterion quickly, he

spent five minutes responding to one stimulus word, but was given a second word to practice during his second five-minute trial for the session. In this way, each child listened and responded to at least two stimulus words per session.

The criterion for acquisition of the /s/ sound in a single word was eighteen out of twenty correct responses for three sessions.

In Group III. the observers' monitoring responses were recorded by a student aide, using the Esterline Angus Eight Event Chart Recorder. A "minigraph," which moves continuously at the rate of one-half inch per minute, recorded the input from an attached unit containing numbered keys or buttons, one through eight. Each of the three children in the group was assigned a number, one through three. The aide pressed key no. five whenever the child responding to the stimulus made a reinforced response. She pressed key no. six if the child made an incorrect, or unreinforced response. She then also immediately pressed the numbered key for either of the two observer children who pressed the button on his unit of the Reinforcer/Counter unit and indicated that he judged the response to be correct. In this way, data was collected concerning each observer child's judgment of each response made by the active learner.

Prior to the beginning of the study, the clinician and the aide conducted a practice session. This was done to simulate a session with Group III. and to establish a consistent agreement in response-recording between the

aide and the clinician. Three children from another grade school served as subjects. The children all exhibited a distortion or substitution of the /s/ sound, and had been enrolled in speech therapy work in the school. Three five- to ten-minute practice trials were completed, during which one child acted as the direct responder and the other two acted as observers, monitoring his responses. The clinician tabulated total number of responses and the number of reinforced responses made by the active learner, while the aide recorded the responses of all three children on the minigraph recorder. The level of agreement for the number of correct and incorrect responses tabulated for the active learner was first 95%, then 98%, and 100% on the final practice trial.

Individual Group Design and Procedures

Group I.

In this group, the children met with the clinician one at a time. During the session the child listened to a stimulus word on a Language Master card and then attempted to imitate the stimulus. Acceptable responses were indicated to the child by a light on the Reinforcer/Counter unit. After every ten responses, he graphed the number of reinforced responses for the trial. Each session lasted ten minutes. When the ten minutes were completed the child marked off his total number of reinforced responses for the session on a daily chart, and took the chart home with him to color.

Group II.

This group was conducted along "traditional" group therapy procedures. All three children were in the room at the same time with the clinician. The children took turns listening and responding to the stimulus words on a Language Master card. Each child was allowed five minutes to respond in one turn, and five minutes to respond to a stimulus in his second turn, or a total of ten minutes of responding time during the session. The child directly responding was reinforced by a light on the Reinforcer/Counter unit. After every ten responses, he graphed the number of reinforced responses for that trial.

When each child finished one turn, he marked off and colored on his daily chart the number of figures representing the number of reinforced responses he had just completed. No other activity was structured for the two children not responding during a given moment.

In order to prevent the second and third members of the group from hearing the stimulus words more often than the first child did before responding, the order in which the children took turns was randomized over the fourteen sessions. Each session lasted 30 minutes.

Group III.

All three members of this group were present at once during each session, with the clinician and an aide. The children took turns listening and

responding to the stimulus words on Language Master cards. Each child was given five minutes to respond in one turn, and five minutes in his second turn, or a total of ten minutes per session of direct responding to a stimulus. Successive approximations to the stimulus were reinforced by a light on the Reinforcer/Counter unit. After every ten responses, the active learner graphed the number of reinforced responses he had just made.

While the active learner responded directly to the stimulus, the other two children monitored his responses. They were reinforced for correct discrimirations by a light on their extensions of the Reinforcer/Counter unit. The observers sat facing the aide, with the backs of their chairs against the table at which the active learner and the clinician were working. The arrangement was designed to help the children concentrate on their specific monitoring tasks.

The order in which the children took turns responding was randomized over the fourteen sessions. Each session lasted 30 minutes. At the end of that time, the children marked off on a daily chart the total number of reinforced direct responses they had made. They were allowed to take the charts home to color.

Data Analysis

For each child's direct responses to the stimulus words, the ratio of the number of reinforced responses made per session to the total number of

responses per session was computed and plotted on a graph in a learning curve. The figures for the three members of each group were then averaged and plotted on a graph in an average learning curve for each of the three groups.

The ratio of the total number of reinforced responses to the total number of responses made during the fourteen sessions was used for the statistical analysis. The Kruskal-Wallis H Test was used to determine whether significant differences in performance existed among the three experimental groups.

For Group III. the children's observational responses were also examined. For each child, the percentage of correct judgments made was computed for each session and plotted on a graph with the curve of the percentage of reinforced direct responses made by the same child during each session. In other words, each child's observational response curve and his curve for acquisition of the /s/ sound in words were compared.

CHAPTER IV.

Results and Discussion

The ratio of the number of reinforced responses to the total number of responses per session was computed for the subjects in each of the three groups. Learning curves for acquisition of /s/ were then plotted. The figures for the three subjects in each group were averaged and plotted on a graph in average learning curves. The ratio of the total number of reinforced responses to the total number of responses made during the project was also computed. A statistical analysis was made to determine whether significant differences in performance existed among the three groups. For children in Group III., the percentage of correct observational judgments made during each session was graphed and compared with each child's acquisition curve for the /s/ sound.

Influence of Vicarious Reinforcement

The individual learning curves for acquisition of /s/ in words are shown in Figures 1, 2 and 3. Figures 4, 5 and 6 depict the average acquisition curves for each of Groups I., II. and III. A comparison of the average performance curves for the three groups appears in Figure 7.

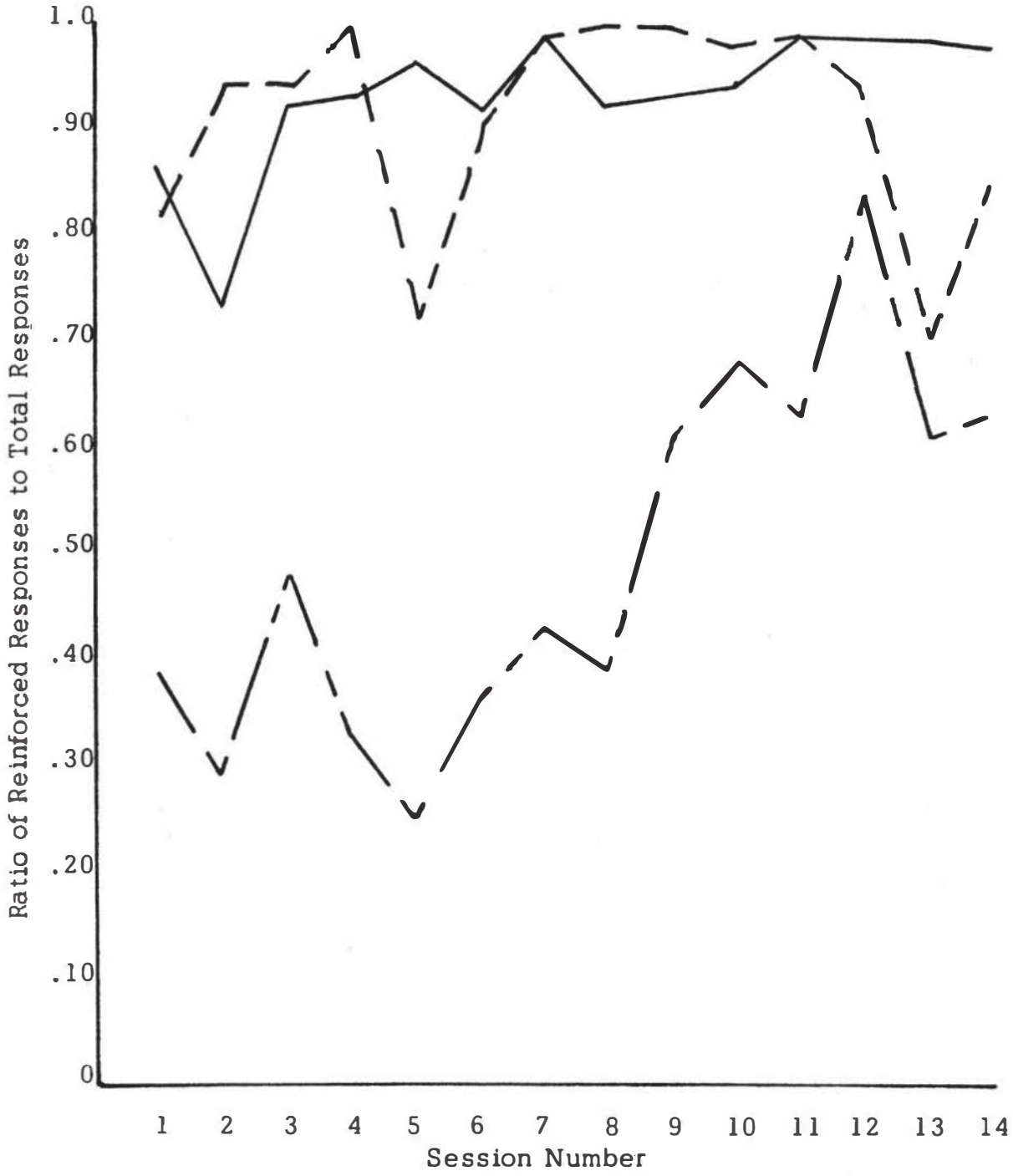

Figure 1--Group I: Acquisition curves for /s/ for Child 1 (——), Child 2 (— –) and Child 3 (– –).

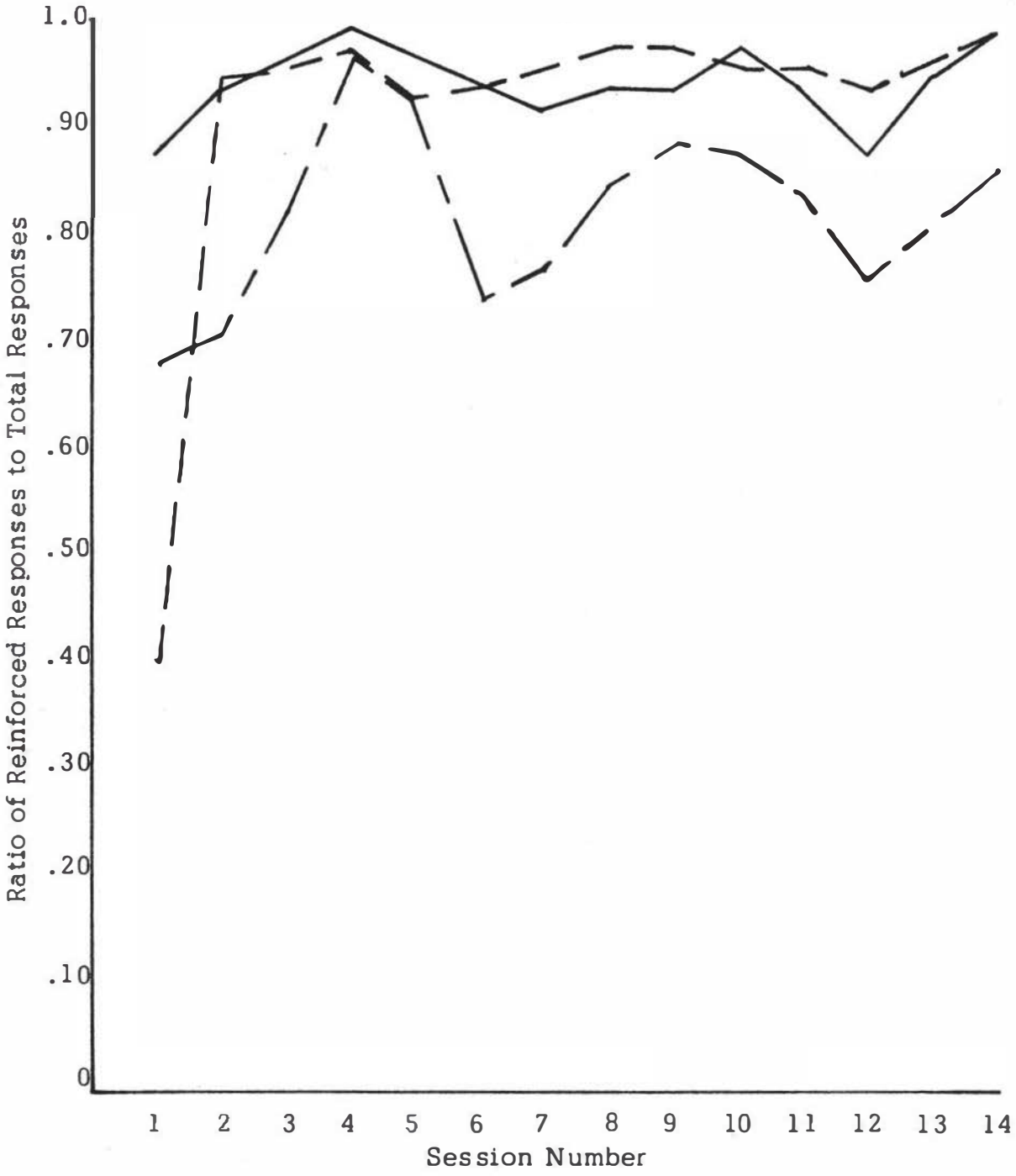

Figure 2--Group II: Acquisition curves for /s/ for Child 4 (——), Child 5 (— -) and Child 6 (– –).

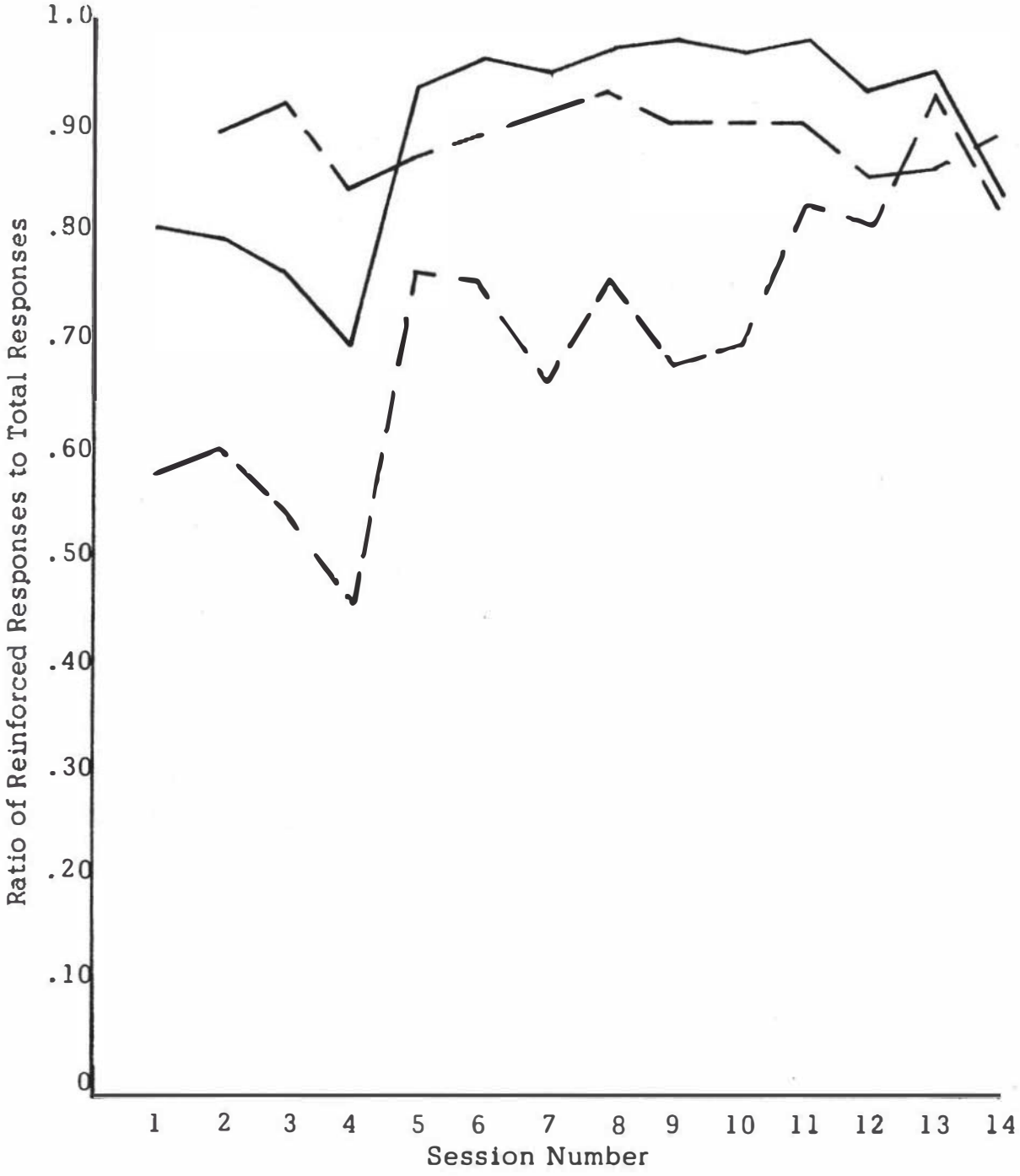

Figure 3--Group III: Acquisition curves for /s/ for Child 7 (——), Child 8 (— –) and Child 9 (– –).

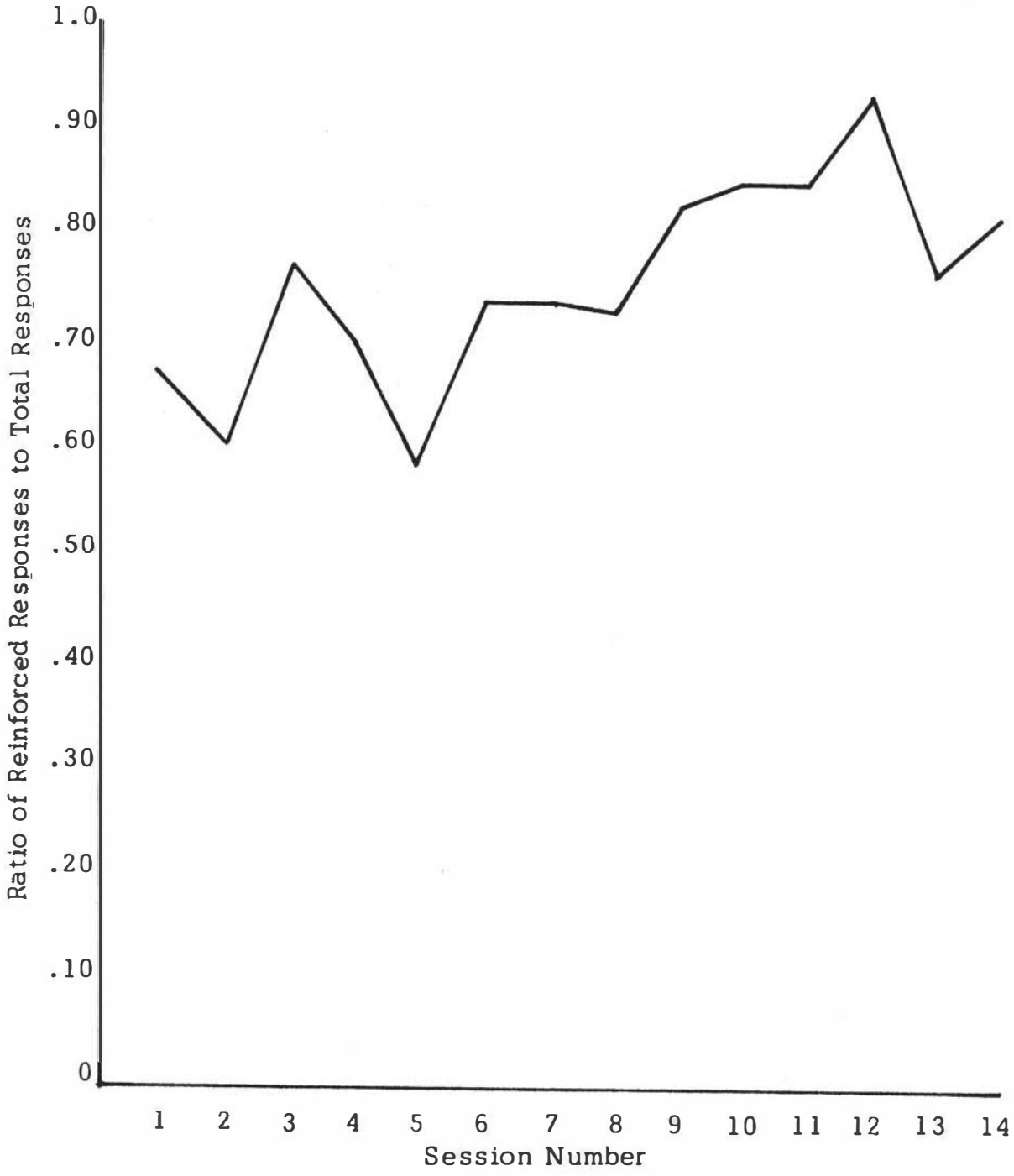

Figure 4--Average Learning Curve for Group I

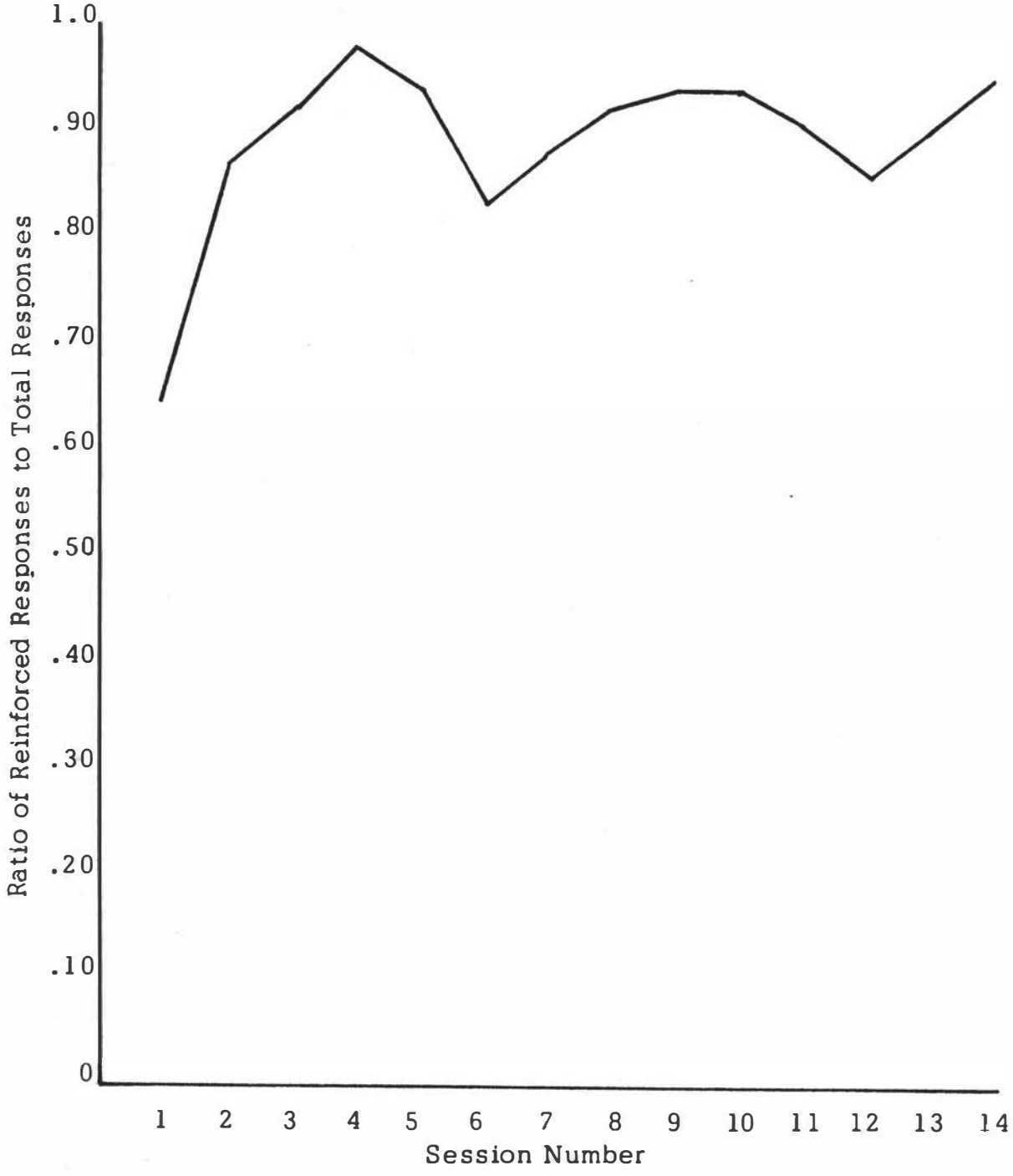

Figure 5--Average Learning Curve for Group II

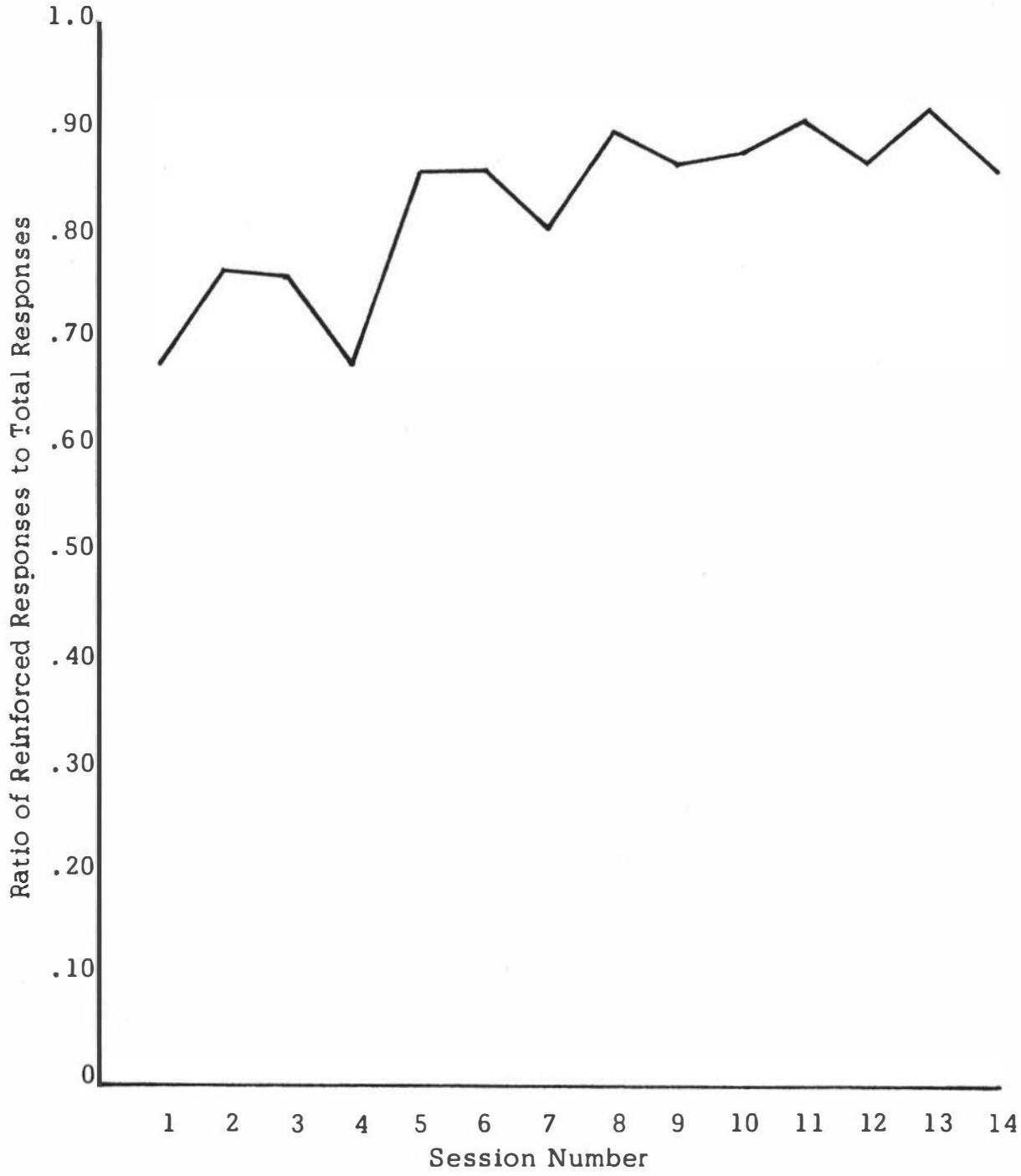

Figure 6--Average Learning Curve for Group III

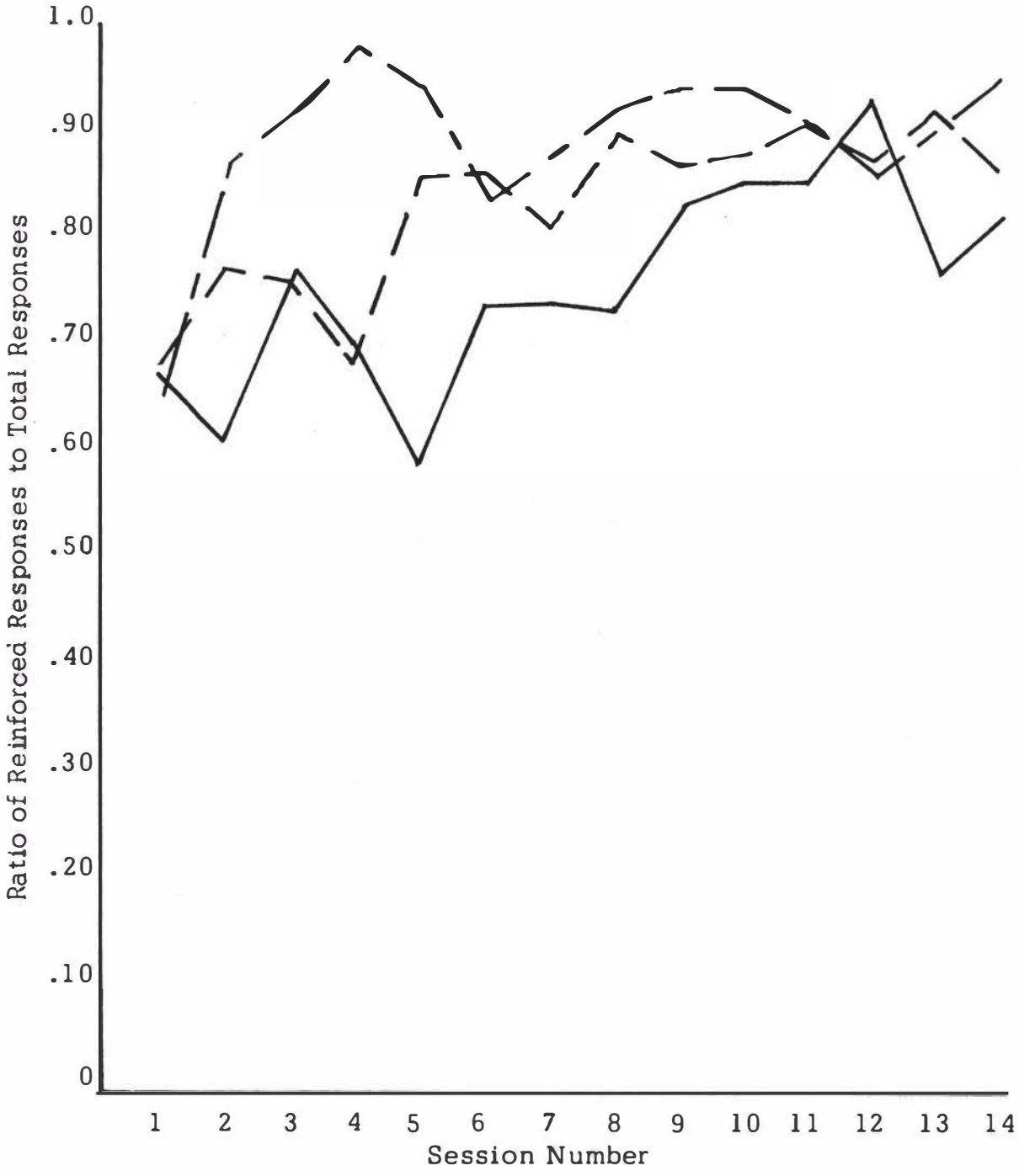

Figure 7--Comparison of average learning curves for Group I (——), Group II (— –) and Group III (— —).

For each child in each group the ratio of the total number of reinforced responses to the total number of responses made during the fourteen sessions was computed. The results were as follows:

Group I.	Group II.	Group III.
0.941	0.949	0.908
0.499	0.830	0.896
0.963	0.947	0.712

The Kruskal-Wallis H Test was applied to this data. The resulting value of H was 1.077, which was not significant at the .05 level. (Appendix L, Downie and Heath, 1970) These results suggested that there were no significant differences in the acquisition rates among the three experimental groups. This would indicate that structured vicarious practice of the type used in this study does not significantly aid direct practice in correct response acquisition for the /s/ phoneme in words.

Effect of Scheduling

With regard to the type of scheduling, i.e. group versus individual therapy, there appears to be no significant difference in the rate of phoneme acquisition when subjects receive the same amount of time for direct responding. According to this data it appears that group therapy is at least as advantageous as individual therapy, which is consistent with the expectations of this study.

Comparison of Observational Performance and Response Acquisition

For the children in Group III., the percentage of correct observational judgments made during each session was computed and graphed with each child's learning curve for acquisition of the /s/ sound. The graphic comparisons of the percentage of reinforced responses for the two behaviors are shown in Figures 8, 9 and 10. At the outset of the study it was hypothesized that the children who were the best observers or monitors of their peers' direct responses would also show the greatest rate of learning for acquisition of /s/. However, the three children did equally well in observational behavior, regardless of verbal performance. (See Figure 10) According to the graphs, observational performance appears to be consistently equal to or better than production of the sound. It should be noted however, that while monitoring their peer's responses, the observers were allowed only auditory information; they were unable to see the clinician or the child who was responding directly. Thus the curves for observational behavior actually represent performance for auditory discrimination. Figures 8, 9 and 10 show that the monitoring method used was effective in producing good auditory discrimination of correct production. Yet it appears that auditory vicarious experience did not significantly affect discriminative production of the /s/ sound. These results suggest that other parameters of the stimulus, e.g. visual cues, must also be made available to the observer if vicarious experience is to aid direct practice in acquisition of /s/ in words.

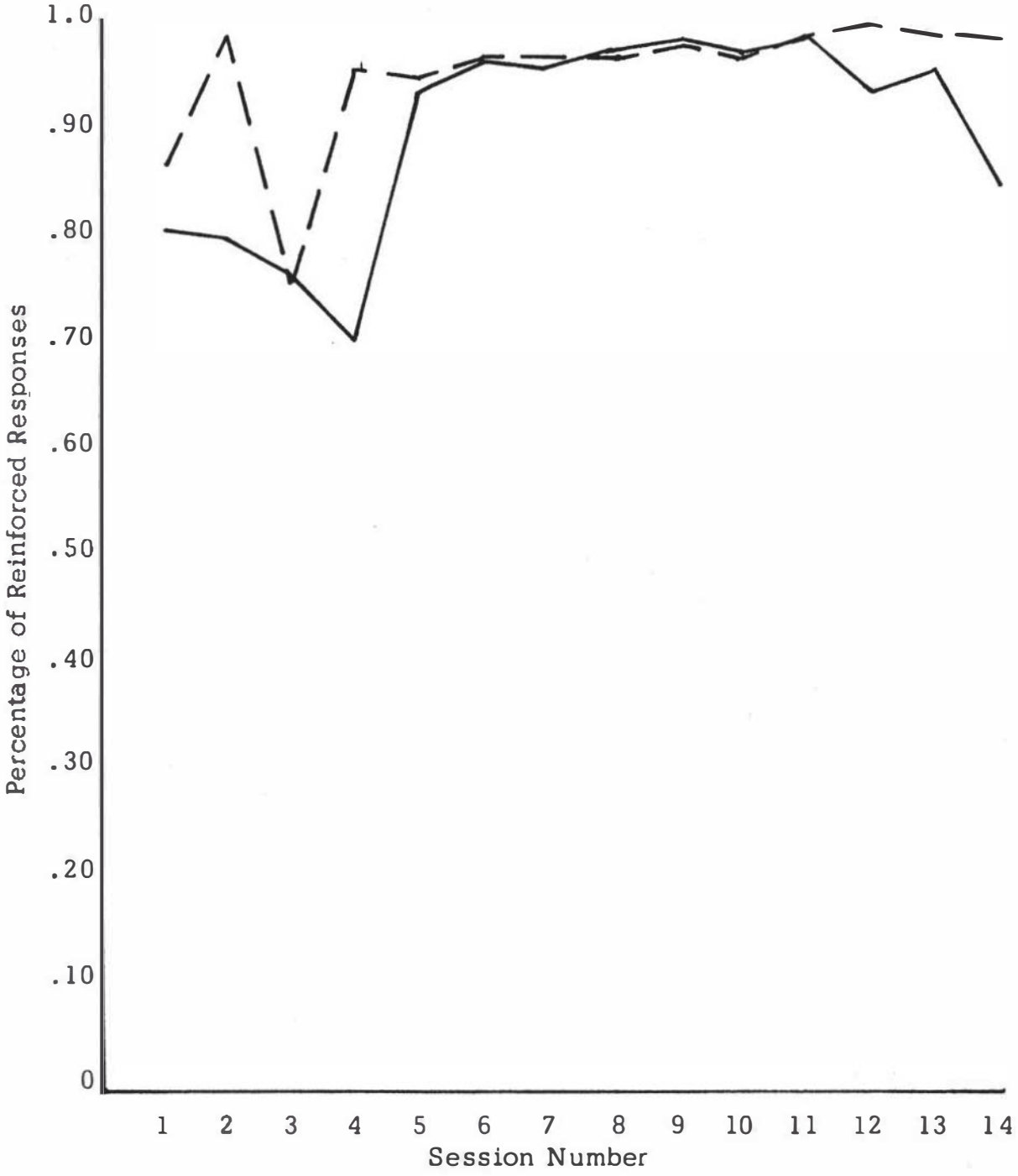

Figure 8--Comparison of observational performance (— —) and response acquisition curves (——) for Child 7 in Group III.

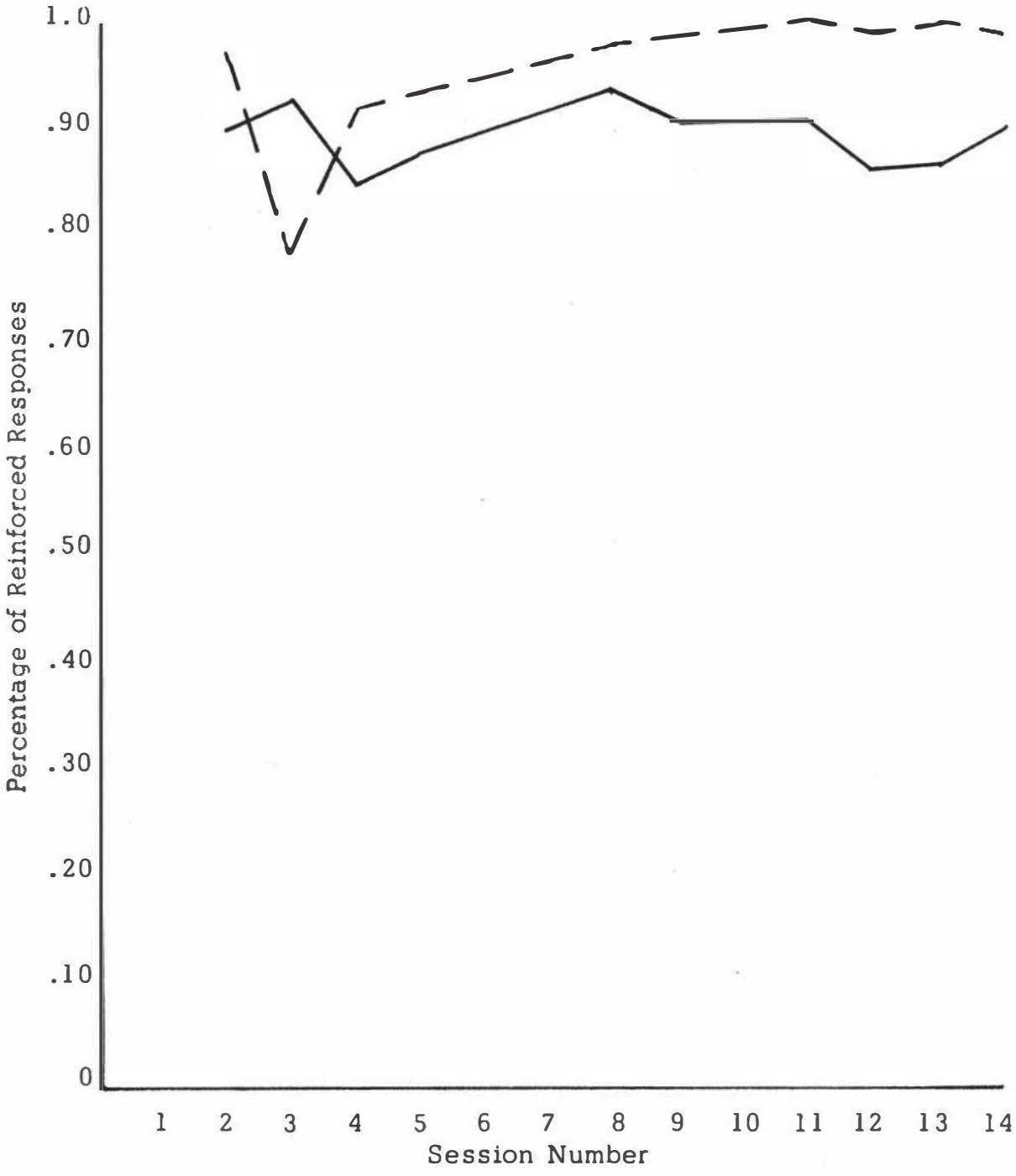

Figure 9--Comparison of observational performance (— —) and response acquisition curves (——) for Child 8 in Group III.

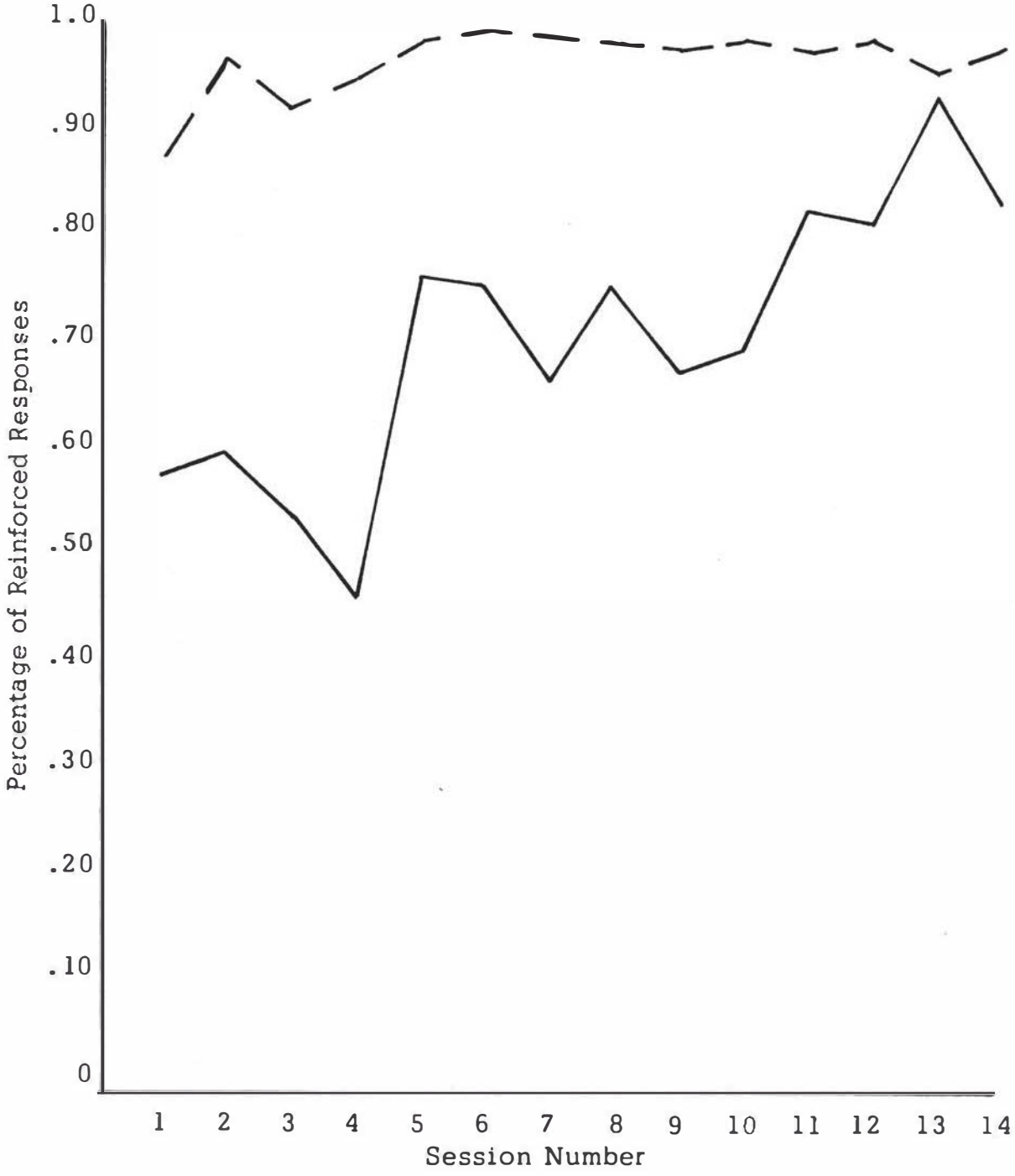

Figure 10--Comparison of observational performance (— —) and response acquisition curves (——) for Child 9 in Group III.

It is possible that some vicarious learning was also taking place in Group II. These children were directed to color their charts while one child responded; observational practice was not structured. However, they were free to listen as they colored, and were able to see the child who was responding. Visual cues, which were not present in the vicarious experience of the children in Group III., were potentially available to children in Group II.

Other factors involved in the project may have obscured the effects of vicarious learning in Group III. The effects of prior speech therapy were not controlled. Children 1, 2 and 3 in Group I., and 4 and 5 in Group II. had had previous therapy for correction of /s/ production. Children 1, 2, 3 and 5 had received four to six months of therapy directly involving production of the /s/ sound. Therapy included auditory discrimination and placement work. Child 4 had received one year of therapy to correct laterality in /s/ production, and another nine months of work on excess lip movement and nasality. When tested for this study he exhibited a moderate distortion of the /s/ sound. Two children in Group I. had had previous experience with the Language Master and the Reinforcer/Counter unit. These children exhibited faulty articulation of the /s/ on the pretest, which was presented outside a therapy setting. However, when placed in the therapy situation, they adapted readily to behavior shaping. Previous therapy included instruction in teeth and tongue position for /s/,

which may also have facilitated learning. None of the children in Group III. had received previous therapy, and none were acquainted with the method or equipment used.

The age difference between the children placed in each group may also have influenced results. Due to the limited scheduling times available for children in each grade level, it was not possible to schedule more than one group of first-grade children, or to mix the age levels of the children in Groups II. and III. Thus, children in Group II. were all at least two years older than those in Group III. Prolonged attention to a task requiring fine discrimination, as well as tolerance for the continued sameness of the procedures may have been more difficult for the younger children.

The differences in type of articulation error exhibited may have affected results, particularly for Group I. Child 2 in that group demonstrated a particularly low acquisition rate for correct production of /s/. (See Figure 1) Her performance was lower than that of any child in the group or in the project. This child was also the only participant who exhibited a lateral distortion of the /s/ sound, as opposed to a sibilant distortion or a /th/ for /s/ substitution. Since type and severity of misarticulation of the /s/ were not controlled in this study, it was not possible to ascertain whether the lateral distortion would have responded similarly to group therapy or to the addition of vicarious experience.

In summary, it was found that there were no significant differences in response acquisition among the three experimental groups. For these subjects, under the conditions of this study, auditory vicarious practice did not appear to aid direct practice. No significant difference was found in rate of response acquisition with regard to group versus individual scheduling of therapy. For the members of Group III., in which vicarious reinforcement was structured, observational performance was found to be consistently equal to or better than performance for acquisition of the /s/ phoneme.

CHAPTER V

Summary and Conclusions

The purpose of this study was to investigate the operation of the processes of vicarious learning in small-group articulation therapy. Three groups of grade school children participated in the project. The children in Group I. received individual therapy. Those in Group II. met as a group and took turns responding actively; each child was reinforced only while responding directly to the stimulus words. The children in Group III. also took turns directly responding to the stimuli; while not verbally responding, the other group members listened to and monitored the active learner's responses, and were reinforced for correct evaluations of those responses. Thus, vicarious reinforcement was structured additionally for Group III. Behavior shaping was used for all three groups. Therapy sessions for each group were held twice a week for seven weeks, or fourteen sessions.

The study compared the learning curves of the three groups for the acquisition of the /s/ phoneme in words involving ordered phonetic contexts. It was hypothesized that the rate of acquisition of the phoneme would be greater for children receiving systematic vicarious response reinforcement

in addition to reinforcement by direct therapy, as compared to those receiving only direct response reinforcement, either individually or in groups. The questions to be answered were as follows:

1. For which of the three groups was the child's rate of acquisition of /s/ in words the greatest?

2. Was there a statistically significant difference in the rate of acquisition of the /s/ sound among the three groups?

3. How did the rates of phoneme acquisition compare for children placed in Groups I. and III., where each child was allowed the same amount of time for direct response reinforcement, with specific regard to the type of scheduling: group versus individual therapy?

4. For each child placed in Group III., how did his performance in observing and monitoring other children's responses compare with his performance for acquisition of /s/ in words?

For each child's direct responses to the stimulus words, the ratio of the number of reinforced responses made per session to the total number of responses per session was computed. The figures for each group were averaged and plotted on a graph in an average learning curve for each of the three groups. For the statistical analysis, the ratio of the total number of responses made to the total number of reinforced responses made during the fourteen sessions was also computed. The Kruskal-Wallis H Test was applied to this data to determine whether significant differences

in performance existed among the three experimental groups.

For Group III, the children's observational responses were also examined. For each child, the percentage of correct judgments made during each session was computed and graphed. The resulting curves for observational performance were compared with each child's learning curve for acquisition of the /s/ sound in words.

Conclusions

1. There were no significant differences among the three experimental groups for the rate of acquisition of the /s/ phoneme in words. Under the therapy conditions of this study, auditory vicarious practice did not influence the rate of acquisition of the phoneme.

2. There was no significant difference in the rate of phoneme acquisition with regard to individual versus group scheduling, when the subjects received the same amount of time in direct response reinforcement.

3. For those subjects who received structured vicarious reinforcement through listening to and monitoring the responses of other group members, observational performance was consistently equal to or better than performance for phoneme acquisition.

4. Because the performance for auditory discrimination in monitoring responses was consistently better than performance for phoneme acquisition, it appears that other relevant parameters of the stimuli, such as vi-

sual cues, must be made available to the observer if vicarious experience is to aid direct practice in learning correct production of the /s/ sound.

The findings of this study must be left open to additional discussion and experimentation. Extraneous variables such as the age differences of the children, the effects of previous therapy for some subjects, and the differences in type and severity of articulation errors may have influenced the results. The results of the study cannot be generalized to other subjects, different therapy techniques or to other methods of vicarious practice in speech-sound acquisition. Further research is needed to demonstrate the nature of the variables involved in vicarious learning in group articulation therapy.

Implications for Further Research

Further research might investigate the following questions:

1. When age of subjects, effects of previous therapy, and type of misarticulation are controlled, how does vicarious practice affect the rate of phoneme acquisition?

2. Does the addition of systematic vicarious reinforcement aid direct practice when the observer's attention is focused on both visual and auditory aspects of the model's behavior?

3. Can vicarious learning be demonstrated in subjects who receive no direct practice in production of a phoneme, but who observe and monitor the learning responses of a model?

APPENDIX I

Some Factors Influencing Observational Learning

1. Whether learning is vicarious or direct, the processes of attention and discrimination are operative. (Paschke, Simon and Bell, 1967; Simon, Ditrichs and Martin, 1969)

2. For the observational learner, rate of response acquisition is a direct function of the accuracy of the model's performance. If the model responds correctly, the observer essentially receives an additional presentation trial. (Simon, Martin and Ditrichs, 1970)

3. Correct evaluation of the model's performance is of fundamental importance in observational learning. (Simon et at, 1970)

4. Knowledge of results facilitates detectability. (Mackworth, 1968)

5. Requiring an overt motor response during observation results in differentiated and sometimes augmented orienting responses to the model's behavior. (Simon et al, 1970)

6. Conferring "signal significance" on stimuli results in persistent and elaborated orienting responses. (Simon et al, 1970)

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