IMITATION AND LANGUAGE TRAINING IN RETARDED CHILDREN

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PREFACE

(To have) learned the explicit contingencies associated with each response being modelled may be necessary for discriminative imitation, but it is not sufficient to produce it. Instead, several studies suggest that subtle but remarkably powerful, social and instructional influences are operating within the procedures to create and maintain the non-differential behaviour observed. (Steinman, 1976 1, p 85)

We do,
Doodley do, doodley do doodley do,
What we must,
Muddily must, muddily must, muddily must;
Muddily do,
Muddily do, muddily do, muddily do,
Until we bust,
Bodily bust, bodily bust, bodily bust.
(Vonnegut, 1975, p 24)

ABSTRACT

In the literature relating to correcting speech deficiencies there are divergent views held on the value of training the response of imitation before attempting to train verbal imitation.

Six young retarded children with limited verbal ability were exposed to either non-verbal imitation training or to a task involving similar exposure to the experimental conditions but not involving imitation. All subjects were then exposed to a verbal imitation procedure. The subjects who had previously been exposed to imitation did not progress more rapidly on the verbal imitation task as might have been predicted from some of the literature.

This suggests that there is no value in training non-verbal imitation before moving into basic speech training using imitation.

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CHAPTER I
INTRODUCTION

The acquisition and development of language behaviour has been a topic of study and dispute since the scientific study of human development began.

Piaget (1926) concluded from his study that in the period from two to four years of age, a child acquires and develops 'symbolic functioning' and words, which initially have a concrete meaning, develop over this period their true symbolic form. Piaget draws no conclusion however on the process by which the words are initially acquired. Modern linguistic theorists suggest that there are endogenous self-regulatory mechanisms which ensure the organism's adaptation to its environment and one such mechanism is a propensity for learning speech (Huxley & Ingram 1971). Lenneberg (1971) has suggested a purely biological foundation for the learning of speech; that language is a manifestation of species specific cognitive propensities due to the unique, genetically determined, physiological and anatomical peculiarities of the human animal. This basic language capacity develops ontogenetically during maturation, but only if appropriate environmental stimuli, such as adult speech, are present as releasers for the language synthesizing process.

Allport (1924) first suggested that interaction with environmental determinants, particularly imitative interaction, was an important feature in the acquisition of language for the developing child, and this has recently been intensively followed up, particularly by researchers who approach the question from a learning theory perspective.

Skinner (1957) proposed that imitation accounted for the child's acquisition of many behaviours, language being only one of them. Lovaas (1977) suggested that the basic process involved is that of the child learning to discriminate what stimulus conditions give rise to verbal utterances and what further behaviour will result from that utterance. For example, a baby who feels hungry, cries and this is followed by feeding behaviour by its caretaker and so the baby learns what one stimulus function crying has. Lovaas goes on to suggest that, whether this view of language acquisition is correct or not, it is a convenient viewpoint as it involves a well-known and proven principle of learning theory, that of discrimination learning, and it can be reliably used to predict behaviour.

Brigham and Sherman (1968) followed Lovaas et. al. (1966) in their research on non-reinforced verbal imitation. The details of this experiment will be given as it is a fairly typical example of reserach in this area. Brigham and Sherman presented their three subjects with specific English words and they reinforced accurate imitation of these words. In the sessions following the initial imitation training, Russian stimulus words were added as probes. The Russian words were presented on randomly selected trials and with all the same environmental cues (discriminative stimuli) as the English words but no reinforcement was delivered on these trials. The purpose of the probe trials was to test the likelihood of the subjects imitating the non-reinforced words. All of the subjects did so to a greater or lesser extent. Following the reinforcement of the English word imitations, a schedule of differential reinforcement of behaviour other than imitation of English words (DRO) was used.

During the DRO procedure none of the subjects' imitation was reinforced. Instead, reinforcement was delivered at least five seconds after the imitation of an English word. No reinforcement was delivered after the Russian words. The actual time between response and reinforcement varied from 5 to 20 seconds with a mean of approximately 10 seconds. During DRO new Russian words were added to test acquisition of new words under DRO conditions. The accuracy of imitation of both kinds of words was high when reinforcement was contingent upon accurate imitation of English words. It dropped during the DRO procedure and new words were not accurately acquired. Imitation returned to the previous levels when reinforcement was once again made contingent upon accurate imitation of the English words. Brigham and Sherman concluded that the subjects had learned a set of discriminative cues for imitation which were beyond the immediate control of the reinforcers they had delivered and the training of imitation had generalised beyond the trials on which it would be reinforced. Generalisation of imitation occurs whenever an individual imitates stimulus responses which lie in topographically different areas of behaviour from that in which imitation has previously been reinforced, or in response to new stimulus persons, or in localities not previously paired with imitation.

Many divergent views on language acquisition are held by the wide variety of disciplines which study verbal behaviour. Psycholinguists tend to view imitation as a characteristic of early language behaviour which is not a prime determinant of language development. Social learning theorists suggest that 'modelling' (observation of others without necessarily rehearsing or performing the behaviour) accounts for all types

of social learning including acquisition of language (Aronfreed 1969). Some of the variation in these viewpoints may be attributed to the variety of definitions of language acquisition as such, and imitation in particular, which are held by the various disciplines. The resulting confusion is such that in a recent review of research in the area, Prutting and Connelly (1976 p 450) were forced to conclude that although 'the use of elicited imitation is especially attractive to speech clinicians due to the precise control which can be maintained over the input and predictive output of the child .... at this time, the evidence regarding elicited and spontaneous imitation and child language is at best inconclusive, if not conflicting. In light of the present review therefore, it seems inappropriate to suggest guidelines for the clinical use of imitation'.

All the same, there is a mass of evidence, both clinical and experimental which supports the initial statement concerning the value of imitation in the clinical situation due to the degree of control which is available to the clinician. Some of these authors have used imitation to develop language structures and semantics in linguistically delayed children but the majority have dealt in the area of basic speech acquisition, particularly with the specialised populations of aphasic and mentally retarded children. Snyder et. al. (1975) in a review of behavioural studies of language training for the severely retarded report on nine successful studies which were concerned with the acquisition of the ability to imitate specific words or phonemes (speech sounds). Lovaas (1977), one of the noted researchers in this field, advocates the use of imitation as an important component of the speech acquisition process and thus consequently important in speech therapy.

Hewett (1965), initially using spontaneous vocalisations which his subject had made while learning motor imitation tasks, taught new words and phonemes using vocal imitation with the same sets of cues and reinforcers as he had used for the motor tasks. In an experimental investigation of this situation Baer and Sherman (1964) reinforced imitation of head nodding, mouthing and 'strange vocalisations" and a fourth area of behaviour, bar pressing, was introduced but not reinforced. This topographically different behaviour was imitated despite the lack of reinforcement so it can be said that the phenomenon of generalisation of imitation took place. From this Sherman (1965) took the implication that establishing a repertoire of various non-verbal imitative behaviours might result in an increased probability of occurence of imitative vocal and verbal behaviour in speech delayed children. His mute psychotic subjects were required to imitate various non-verbal behaviours for reinforcement. Gradually the behaviours to be imitated progressed to behaviours associated with vocalisations, (mouth movements etc.) and then to actual vocalisations. The procedure of delivering reinforcers not contingent upon correct imitation (DRO) introduced a plateau in language learning which suggests that it was maintained by some other non-tangible reinforcer although reinforced imitation was required for acquisition.

Lovaas suggests this technique as an adjunct to the operant shaping and fading of verbal behaviour in which he specialises for teaching basic speech to his autistic patients. As Lovaas points out, and following the research of Sherman, et.al. (1965), who also used this technique, the transition

from motor to verbal imitation may not always be a smooth one, and may not occur at all in some subjects.

Garcia, Baer and Firestone (1971) trained four severely retarded children to imitate three topographically different responses types; small motor, large motor and short vocal. Unreinforced imitative generalisation was continually measured by four types of probes; small motor, large motor, short vocal and previously unreinforced long motor. Generalisation of the imitation training was observed; that is probe responses were imitated, but this generalisation was restricted to the topographical type of imitation currently receiving training or having previously received training. That is, the untrained long vocal responses were not imitated, an apparent contradiction of the results of the previous studies and a result which indicates doubt as to the value of motor imitation training in the speech therapy setting.

The process occurring when imitation training does carry over from one topographical area to another is generalisation of imitation. Strong experimental data exists to support this phenomenon and various theoretical accounts have been put forward for this process.

Baer et. al. (1967) and Lovaas et. al. (1966) suggested that the behavioural similarity with the model of the imitated behaviour has acquired conditioned reinforcing properties through being closely associated with reinforcement. However Peterson (1966 and 1968) found that behavioural similarity was not important in the maintenance of unreinforced responses. He interspersed trials for previously trained non-imitative responses in a set of reinforced imitation trials.

The non-imitative tasks were controlled by the reinforcement applied to the imitations.

Bandura (1969) and Gewirtz and Stingle (1968) suggest that imitation generalisation occurs because the subject has difficulty discriminating which of the tasks will be reinforced since they lie in a common functional response class which has been acquired by intermittent reinforcement of some members of that class. This would explain why some researchers eg. Garcia et. al. (1971), have found imitation generalising within distinct topographical categories but not across them.

Steiman (1970) considers that generalisation is under the control of stimuli other than those directly involved with topographical similarity. He suggests that it is under social controls such as experimenter's instructions, continued surveillance by the experimenter, and the child's previous history of reinforced compliance with adult's instructions. As well as this, experimenter presence or absence, instruction manipulation and presentation of choice trials have all been found to support this theory to some extent, eg. (Steinman and Boyce (1971), Bufford (1971), Peterson and Whitehurst (1971). As well as the experimental evidence in support of the generalisation of the imitative response set, there is a wealth of clinical evidence to support this as a therapeutic technique.

Several earlier authors have used simple shaping techniques with contingent reinforcement to teach imitation of speech sounds, (Lovaas et. al. 1966; Lovaas 1968, Vasta and Novak 1975, Kent 1974). Other authors have extended this to include time out from adult attention to extinguish inappropriate and incompatible behaviour, eg. Risley and Wolf (1967)

and for inappropriate vocalisations, eg. Cook and Adams (1966).

Sloane et. al. (1968) and Metz (1965), supported by clinical evidence, suggest motor imitation training before verbal imitation training as a technique for speech therapy. The former authors outline a ten step program going from simple gross motor imitation tasks, to imitation of placement of vocal musculature and associated structures, through lip placement and shaping specific sounds under imitative control (ie. 'Do this') until the patient is imitating speech sounds immediately on cue. At this juncture the verbal cue is dropped, more complex sounds and words are introduced and finally speech structures, phrases and sentences can be taught. The stimuli for imitation are faded further and the language ability is then carried into the broader environment of the patient.

From the evidence presented it can be deduced that although causal factors in the process of generalisation of imitation are not clear, given the correct circumstances this phenomenon does occur. That is to say, although there is not the evidence to ascertain the actual process the phenomenon is real, and taking the lead already quoted from Lovaas (1977), it has value in that it has predictive validity in therapeutic situations. It also is shown by the clinical evidence cited that there is value in using imitation in basic language training, especially with retarded and autistic children.

However, the evidence in the literature reviewed does not indicate whether there is therapeutic benefit in the combination of these two techniques. That is, training the response set of imitation in some other, simpler, topographically

different group of behaviours and using the generalisation of the imitative set to enhance the learning of verbal imitation. In fact the literature in this area is somewhat confused, if not contradictory.

AIM AND RATIONALE:

In the introduction it was mentioned that the value of teaching imitation before verbal imitation in speech training is in doubt. Prutting and Conally (1976) from the point of view of linguists, even question the value of imitation at all. Part of the reason for this wider dispute is the difficulty and differences in defining what imitation is. For the purposes of this study, and following Baer, Peterson and Sherman's (1967) definition, imitation is any behaviour which temporally follows that of the experimenter and which has its topography functionally controlled by the topography of the experimenter's behaviour. This control is such that an observer will note a close similarity between the behaviour of the imitator, ie. the subject, and the experimenter's modelled behaviour.

The aim, then was to determine whether the pre-learning of imitation in one topographical category, motor imitation, would generalise to, and thus increase the rate of acquisition of a new imitative repertoire in a second, topographically different category, verbal imitation. This has important implications in the area of speech training with speech deficient people; a characteristic of the mentally retarded and the primary reason for investigating this population.

Two groups were used, one of which received motor imitation training, through the technique of shaping and fading, and then verbal imitation. The other group was exposed to a task similar to that of motor imitation in that it involved nearly equal amounts of reinforcement and exposure to, and interaction with the experimenter and the experimental setting, but did not involve any imitation training. This latter group will then be exposed to the same verbal imitation situation as the former. Thus one group was expected to learn, in the first phase, a response set for imitation, while the second group, although familiar with the experimental setting would not have developed this imitative set. In both the motor and verbal imitation settings, stimulus items were presented concurrently, 3 at a time, rather than in a single series as Schroeder and Baer (1972) found that this increased generalisation of learning to outside the training situation.

As the theoretical assumption is that learning the response set imitation will increase the rate at which subjects will acquire new imitative responses, the cumulative rate of acquisition of verbal responses was the critical measure of the difference in the value of the two approaches. A secondary measure was to record the level of vocalisations and speech use outside the experimental setting, both before and after the experimental phases, so as to consider generalisation of speech training.

CHAPTER II

METHOD

SUBJECTS:

Six moderate to severely retarded subjects, three males and three females, were selected from the population of two villas at Templeton Hospital and Training School. Selection criteria were such that subjects -

1) Had no known sensory or physical disability that could impair performance of various motor actions in response to visual and/or auditory cues.

2) Had limited verbal ability; limited to a few words or sounds.

3) Did not frequently engage in behaviours which were incompatible with those to be established or which could be disruptive in the experimental situation.

4) Had limited previous experience of formal educational or therapeutic situations in which they might have been exposed to extensive imitation conditions.

5) Responded to simple and cheap items selected as reinforcers.

Subjects 2 and 4 were initially able to imitate a few words; subject 4 could also follow the intonations of a phrase and reproduce the intonations although not necessarily reproduce the words. None of the other subjects had a repertoire of more than a few words.

Table I shows those sounds on a pre-selected list of words which each subject produced in the pretest situation. All subjects would follow simple instructions given in a normal tone of voice.

Subject 1:

This subject was an 8 year old boy, moderately retarded and on the Stanford Binet Intelligence Scale he had an IQ of 31 (M.A. 2yrs 9mths). On the Peabody Picture Vocab. Test an M.A. of 2yrs 8mths. He was capable of vocalising but no clear words were evident, and he used vocalisations and gestures to communicate with others. He was capable of following quite complicated 2 and 3 part commands.

Subject 2:

Also male, this subject aged 6yrs 8mths had an IQ of 30 (M.A. 2yrs 4mths) on the Stanford Binet Intelligence Test and an M.A. of 2yrs 2mths on the Peabody Picture Vocabulary Test. He had 3 to 4 clear words in his vocabulary and made use of vocalisations and gestures to express his needs. He could follow simple commands especially for simple social reinforcement, praise and hugs. On the Reynell Developmental Language Scale he had a level of 2yrs 5mths when tested two months before the experiment.

Subject 3:

This subject was an 8 year old girl, severely retarded, who had limited vocal expression, a few sounds, and often would only scream in response to people. She had not scored on the Peabody Picture Vocabulary Test, the only test which had been attempted. She would not respond to solids as reinforcers, eg. chocolate, and had earlier been given the label autistic.

Subject 4:

A 3 year 11 month old developmentally delayed, moderately retarded female, she came from a home deprived of stimulation. She was not trained to eat solids, was of diminutive stature and resisted contact with others. She had very few vocalisations which she uttered only occasionally and even her screams were restrained. On the Bayley Scales of Infant Development she had a developmental age of 16 months and on the Stanford Binet Intelligence Scale an IQ of 65 (M.A. 2yrs 6mths).

Subject 5:

This female subject aged 3yrs 11mths, had several distinct words which she occasionally joined in two and three word phrases; she could imitate a few sounds but only occasionally did so. She had a developmental age on the Bayley Scales of Infant Development of $17\frac{1}{2}$ to $18\frac{1}{2}$ months on the Mental Scale and $20\frac{1}{2}$ to $21\frac{1}{2}$ on the Motor Scale.

Subject 6:

Aged 4 years 10 months, this moderately retarded boy had, as measured on the Bayley Scales of Infant Development (Mental Form), a developmental age of $15\frac{1}{2}$ to $16\frac{1}{2}$ months. On the Fairview Behaviour Evaluation Battery Developmental Scale he scored $16\frac{1}{2}$ months. He was able to say a few clear words but these were not used appropriately and he frequently spoke in jargon.

This particular subject population was selected because of the extensive research already conducted in this area and because any research into language acquisition and teaching would have major therapeutic benefits in this area.

SUBJECTS' ABILITIES AND ARRANGEMENT OF SUBJECTS IN GROUPS:

Following the initial selection of subjects, they were arranged in matched pairs such that the pairs contained those subjects most similar in their response to the experimenter in the pretest situation. In this pretest session subjects were presented with a list of sounds, each preceded with the statement "N., say _____ ". The list of sounds and subjects' responses appears in Table I. Each sound was presented twice unless the subject correctly reproduced it on the first trial, in which case it was not repeated. At the same time the subjects' verbal ability in a more general setting was assessed by asking a member of the hospital staff who had close contact with the patient to assist in filling out the categories of the Bzoch-League "Receptive-Expressive Emergent Language Scale" for all subjects.

This test was not intended to define linguistic ability in specific age grouping, as is its use with normal infants, but to act as a guide to changes in the Verbal expression of subjects outside the experimental situation.

TABLE I

	Subject					
Sound	1	2	3	4	5	6
Lulling	–	–		–		
Ma	–	–		–	–	–
i (feet)	–	–	–	–		
ʔ (door)	–			–		
u (moon)	–	–				
a (hard)	–	–		–		–
ɓ (sang)	–					
bay	–			–		
bee						
out						
eat						
look						
baby				–		
head						
hard				–		
drink						
sleep						
dinner						

Figure I: This shows the sounds used in the pre-test session and the response of the subjects.

TABLE II

Pair	Group	
	I	D
A	S1	S2
B	S6	S4
C	S5	S3

Table II: Showing the arrangement of Subjects in Groups and Pairs.

Both of these tests were re-administered following the final experimental sessions in Phase 2.

The members of each pair were then randomly assigned to either the Imitation Learning Group (Group I) or the Discrimination Learning Group (Group D). Table II shows this arrangement in pairs and groups.

EXPERIMENTAL SETTINGS:

Two different settings were used since the subjects were in two different villas about one kilometre apart. Setting A, the setting for subjects 1, 2 and 3, was a carpeted staff room occupied by three tables and 15 chairs. One of the tables was set aside from the others in an alcove and the subject and experimenter sat facing each other between this table and the wall, with the table on the experimenter's right. A third chair was placed behind the experimenter's

end of table to support, out of the subject's line of sight, the stimulus materials and reinforcers. Record sheets were held in a clipboard on the table top.

Setting B, for subjects 4, 5 and 6, was in a room 2.5 metres by 4 metres, carpeted and containing a table, 4 chairs and a hand basin and mirror. In one corner there was an unpainted plywood time-out box (approximately 1m x 1m x 1.5m) which none of the subjects had been placed in and which bore no resemblance to the larger time-out in which subject 4 was placed contingent upon her occasional screaming behaviour in other parts of the villa. 3 of the chairs were used for the experimenter, the subject and the experimental materials, as in Setting A.

Subjects were seen individually in one session on each week day, usually in the morning, lasting approximately 15 minutes although sometimes less if the subject's attention span was low. If the subject left the chair he/she was returned to it gently but firmly by the experimenter and, if necessary, was temporarily restrained there by the experimenter gripping the child's knees with his own; a technique used by Lovaas et. al. (1966).

APPARATUS AND MATERIALS:

Total materials required were few. For the discrimination task two plastic balls 12.9 cm in diameter, one blue and one red, were used as the discriminative stimuli. A set of four white cards, each 30 cm by 21 cm, with a coloured shape (green rectangle, green square, red circle or red triangle) centred

on it. A different card was used each day so that subjects did not produce a specific response for one card.

For the imitation tasks in both Phases 1 and 2, the prepared lists of responses to be demonstrated and imitated were all the materials required apart from materials required for both tasks which consisted of data record sheets, an example of which is addended in the appendix, and reinforcers. The reinforcers for four of the subjects consisted of a mixture of Chocolate Chips and small pieces of Jelly Beans; subjects 3 and 5 were reinforced using a variety of drinks; Rosehip Syrup, Pinto, Thriftee and Milo, delivered in one cc amounts from a plastic Monoject 12 cc syringe. Each subject had her own syringe which was rinsed after each session. A wrist watch with a sweep second hand was used for timing.

DISCRETE TRIAL PROCEDURE AND CRITERIA FOR PERFORMANCE:

Group D, Phase 1 -

Trials for the discrimination task were each fifteen seconds long. Five seconds were used to record the previous response, change if necessary the discriminative stimulus (the coloured ball), and to give the cue "Touch the card, N. _____ ". Reinforcement occured either at the end of the following ten second trial period, if there was no active response, or immediately following an appropriate card touching response. The touch had to be made with either hand and to appear to be a deliberate touch, not an incidental occurence relating to some other movement the subject made. Any other movements were ignored, as were any vocalisations the subject might have made.

Group 1, Phase 1 -

Similarly, 15 seconds were allowed for each response in the imitation trials. This allowed time for the verbal cue "N., do this", followed by the experimenter performing the particular task to be imitated, 10 seconds in which the subject could respond, and time following that for the reinforcement and recording of the response. Only three successive tasks were being presented at any one time, each of these being replaced with the next task in order from the prepared lists (see Table III and Table IV) when it had reached the performance criterion of correct imitation on three successive trials of that task.

Criteria for correct performance of each task were that it was reproduced by the subject within the allowed 10 seconds and that it was reproduced such that the orientation of the hand, arm or facial muscles was the same as the experimenter's stimulus response and that it would be recognisable as such by an independent observer, and that no prompt was required.

Both Groups : Phase 2 -

The discrete trial procedures were the same for Phase 2 as those for Group 1, Phase 1. That is, 15 seconds were allowed for each trial including time for the verbal cue, "N., say _____", the spoken stimulus response, 10 seconds for the subject to respond and then time for reinforcement, if appropriate, and recording of the response. Three tasks were presented concurrently, starting with tasks 1, 2 and 3, and each of these was replaced with the next sound or word from the prepared list (see Table V) when the criterion of three successive correct performances had been reached.

Criteria for the performance of the tasks were that it was reproduced by the subject within the allowed 10 seconds and that it was reproduced with sufficient accuracy such that it would be recognisable to an independent observer as matching the stimulus response. There was no criterion for the correct placement of mouth parts or tongue; the sound alone mattered. If a particular word was not correctly reproduced within the first three trials, it would be presented as two or three component parts. After three trials of the word presented in parts, a test trial of the complete word would occur and a return made to the separate component sounds if the subject was again unsuccessful. Over the course of these trials the time between presentation of each of the component sounds would gradually be reduced so that they faded into the complete word. In this procedure, reinforcement was delivered if both component sounds, or the complete sound, reached the criteria of correct performance.

INTRODUCTION OF RESPONSES AND REINFORCERS:

After the initial pretest session, the test sessions proper began. In the first of these the subjects were introduced to the responses and the reinforcers in the following manner:-

Group D, Phase 1 -

The response card was placed across the experimenter's knees and he held the stimulus, the blue ball, in his left hand beside the card. Following the verbal cue already described, with his right hand he held the subject's right hand and placed it on the card immediately following the statement with "Good girl (or boy), N." and delivering the reinforcer. This procedure was continued with the S+ discriminative stimulus being replaced by the S- discriminative, the red ball, when S- trials were indicated on the data sheet, refraining from reinforcing any card touching response on these trials and reinforcing non-card touching. The physical prompt towards card touching was gradually faded over the first session until a light touch of the subject's elbow was a sufficient prompt to produce a response, and then this prompt too was faded until no physical prompt from the experimenter was required; the verbal cue alone was sufficient.

Group I, Phase I -

To introduce the motor imitation responses to Group I, the experimenter demonstrated the response, following the verbal cue, and then guided the subject's limbs into the same position and immediately reinforcing the response and saying "Good girl (or boy) N." The extent of the prompting was gradually faded over the initial and following session until imitation occured without prompting. The prompts were faded by gradually reducing the amount of pressure applied to the subject's arms and the site of the holding was gradually moved from the hands down to the elbows.

TABLE III

List of Responses to be Imitated by Subject 1 in Phase 1:

1. Raise left arm vertically as in 'stop' signal, forearm vertical and palm outward.
2. Tap chest three times with left hand.
3. Left arm forward and horizontal; arm held straight.
4. Right arm held sideways from body and horizontal; arm held straight.
5. Both arms forwards and horizontal; arms held straight.
6. Raise right arm vertically as in 'stop' signal, forearm vertical and palm outward.
7. Tap chest twice with right hand.
8. Tap forehead with left hand three times, can include top of head but must be three taps.
9. Touch nose with left hand.
10. Touch top of head with right hand.
11. Cover mouth with left hand.
12. Both hands on top of head.
13. Both hands covering eyes.
14. Both hands covering ears.
15. Hands on cheeks and mouth open.
16. Open mouth twice; lips placed as in 'b' sound.
17. Teeth on lower lip as in 'f' sound.
18. Purse lips as if to whistle.
19. Mouth open and tongue protruding beyond lips.
20. Mouth open and move tongue up and down as in 'lulling sound".

TABLE IV

List of Responses to be Imitated by Subjects 5 and 6 in Phase 1

1. Raise left arm vertically as in 'stop' signal, forearm vertical and palm outward.
2. Cover ears with hands.
3. Both arms forward and horizontal; arms held straight.
4. Both arms sideways and horizontal; arms held straight.
5. Tap chest three times with both hands.
6. Tap forehead or top of head with either hand but must be same number of taps as experimenter (three).
7. Touch nose with either hand.
8. Both hands on top of head.
9. Cover eyes with hands.
10. Cover mouth with hands.
11. Hands on cheeks, mouth open.
12. Purse lips as if to whistle.
13. Open mouth, tongue protruding beyond lips.
14. Open mouth twice; lips placed as in 'b' sound.
15. Mouth open and tongue up and down as in 'lulling sound'.

TABLE V

List of Responses to be Imitated by all Subjects in Phase 2

1. ee (i) as in 'feet'.
2. oo (u) as in 'moon'.
3. ah (ɑ) as in 'hard'.
4. ay (ei) as in 'day'.
5. f (frictitive f sound).
6. far.
7. fee.
8. tee.
9. feet.
10. heat.
11. me.
12. day.
13. door
14. hard.
15. head.
16. hold.
17. food.
18. hand.

As the finer motor tasks were introduced a similar technique of prompting was used to move the lips and jaw of the subject appropriately. The same technique however was not used on those tasks involving tongue placement due to impracticality in this situation.

Both Groups, Phase 2 -

The verbal imitation responses were introduced to both members of a pair at the beginning of the session following the Group 1 member of the pair reaching the performance criteria on the last item of the list of motor responses. The subject sat in front of the experimenter in the usual way and the experimenter provided the verbal cue "N. say _____", and saying the first of the list of verbal responses. This was followed by the next two items being presented in the same way and these three items continued to be presented until the subject reached the performance criteria for an item three times in succession when it was replaced by the fourth item on the list, and so on. No prompting was used in this phase.

DATA COLLECTION AND SCORING PROCEDURES:

Prepared data sheets for each session for every subject were used, held in a clipboard on the table by the experimenter. During the imitation tasks the list of responses was placed beside the clipboard. The order of S+ and S- trials in the discrimination task was recorded on the data sheet before the session began; the order of these trials having been predetermined in the following way.

A Quasi-randomised order was determined such that no more than two S+ or S- trials occurred consecutively and that in each group of four trials there were no more than two S+ or S- trials. Figure 1 shows an example of what a prepared data sheet might have looked like.

FIGURE I

Trial	Task	Attempted	Reinforced
1	+		
2	+		
3	−		
4	−		
5	+		

Figure 1: An example of a prepared data sheet for Group D in Phase 1.

In the time following the response and before the beginning of the next 15 second interval, a tick or a cross as appropriate was placed in the two scoring columns. Responses were scored in an all or none basis; either they reached the performance criteria, were reinforced and received a tick or score of one, or they received a cross, a zero score. In the motor imitation task a 'P' was placed in the attempted column if the response was prompted and although this was reinforced it was not considered a correct imitation when summing the scores. In the discrimination task every correct discrimination, performance for S+ and non-performance for S- received a score of 1.

The verbal imitation task was scored along similar lines, with a tick for an attempted response and a tick for a correct, reinforced response. A small 'p' was placed in the attempted column, along with the appropriate tick or cross, if the verbal response was demonstrated in parts. The number of each imitation response was put in the task column for each trial before it was demonstrated.

RELIABILITY:

During a total of 18 sessions, an observer conducted a reliability check. Seated behind and to the left side of the experimenter, the observer was required to score trials using the same criteria as the experimenter and using the same recording procedure. To minimise the influence of the experimenter's decision and subsequent reinforcement, the observer was asked to decide on and record the responses as rapidly as possible.

CHAPTER III

RESULTS

SUMMARY OF RESULTS OF INDIVIDUAL SUBJECTS:

Subject 1 -

This subject was in Group 1 and rapidly learned the motor imitation tasks, especially the more gross movements. However he had a great deal of difficulty with those tasks involving fine mouth movements and, due to time limitations, it was decided to move him onto Phase 2 with the last two tasks unlearned. His progress in Phase 2 was steady but slow and in 24 sessions he achieved the performance criteria on only 7 of the 20 tasks. This was attributed to his apparent dislexic ability to consciously control his mouth parts and tongue. His performance on the pre-test/post-test word list did not change, nor did his use of language outside the experimental setting.

Subject 2 -

This subject learned the card touching response of the discrimination task rapidly but continued to respond by card-touching on almost every trial. That is, he did not learn the significance of the discriminative stimuli and continued to act as if he was on a variable ratio schedule of reinforcement. In Phase 2 he learned at a varying rate but attained the performance criteria on 14 tasks in 20 sessions. His performance on the pre-test/post-test word list was improved in the post-test session and he also showed an increase in his use of language and speech sounds in settings other than the experimental one.

Subject 3 -

This subject had the least verbal ability of any of the subjects. Sessions with her were occasionally missed due to her disturbed behaviour and her occasional epileptic seizures. She learned the card touching response within the first few sessions of Phase 1 although her responding to this task was less reliable than that of the other two Group D subjects. She did not appear to learn the correct response to the discriminative stimuli.

In Phase 2 she made no attempt to imitate the verbal stimulus responses, and, after 5 sessions in Phase 2 she was dropped from the experimental group. There was no change in her response to the pre-test and post-test sessions and there was change recorded in her use of sounds or words to communicate outside the experimental setting.

Subject 4 -

Although she rapidly learned the card touching response in the discrimination task, this subject also failed to learn the discrimination task itself and continued to respond on almost all trials. When introduced to the verbal responses in Phase 2 her response rate and accuracy were quite varied from session to session but she learned 10 responses in the eleven Phase 2 sessions she had before data collection had to cease. Her performance on the pre-test/post-test word list increased slightly, and her communication with words and sounds outside the experimental setting underwent a marked increase which was remarked upon by ward staff.

Subject 5 -

In Phase 1 of the imitation task this subject made very slow progress and required almost continual prompting. After 43 sessions she had learned 8 tasks. Because of time limitations Phase 2 was begun at this point. She made no progress at all in Phase 2 and after 5 sessions she was dropped from the experiment. There was no change in her performance on the pre-test/post-test word list and no change in her vocalisations outside the experimental setting.

Subject 6 -

After a delay of 8 sessions this subject began to make slow but steady progress in learning the imitation tasks in Phase 1. In 24 sessions he had reached the performance criteria on 14 of the responses at which stage Phase 2 was begun. Response rate dropped markedly from an average of 40.0 per session in Phase 1 to 14.7 per session in Phase 2, and in the eight Phase 2 sessions available he achieved the performance criteria on only 4 of the vocal responses. There was a slight increase in the number of correct responses on the pre-test/post-test word list following Phase 2 and an increase in frequency, but not an increase in variety, of the words used outside the experimental setting.

RESULTS OF THE DISCRIMINATION TASK:

The Group D subjects all learned the card touching response to the cue "Touch the card, N _____" within the first few sessions and they performed this response reliably.

However none learned to respond appropriately to the discriminative stimuli and continued to respond as if on a fixed ratio of reinforcement.

RESULTS OF THE MOTOR IMITATION TASK:

Performance on the Motor Imitation Task was variable. Figure III shows the accumulated number of responses reaching the performance criteria for the Group I subjects in Phase 1. Subjects 1 and 6 reliably attempted to imitate the responses but subject 5 would only attempt those that she was capable of and required many prompted trials before attempting to imitate freely.

RESULTS OF THE VERBAL IMITATION TASK:

There was a wide variety of performances on the Verbal Imitation task. Two subjects were dropped from the experiment after making no attempt at verbal imitation in 5 sessions. Figure IV shows the accumulated number of responses reaching the performance criteria for the remaining four subjects in Phase II. All the curves, showing rate of acquisition, show an initial rapid rise and a following plateau and some subjects show a later following rise. Subject 2 shows a more steady and gradual progression with a less marked plateau effect.

RELIABILITY:

Percentage reliability was calculated by scoring each trial as either 'agree' or 'disagree' and dividing the total number of agreements by the number of agreements plus disagreements and mulitplying by 100% (Bijou, Peterson & Ault, 1968).

The average percentage reliability over the 18 observed sessions was 89.1%, with a range from 78% to 100% per session.

FIGURE II

PRE-TEST/POST-TEST WORD LIST PERFORMANCE

Sound		Subject 1	2	3	4	5	6	1	2	3	4	5	6
1	Lulling	—	—		—			—	—		—		
2	Ma	—			—	—	—	—	—		—	—	—
3	(i) feet	—	—	—	—			—	—	—	—		
4	(ʔ) door	—			—			—			—		
5	(u) moon	—	—					—	—		—		—
6	(ɑ) hard	—	—		—		—	—			—		—
7	(ɒ) sang	—						—	—		—		
8	bay	—						—			—		—
9	bee								—				
10	out										—		
11	eat							—					
12	look												
13	baby							—					
14	head												
15	hand	—						—	—		—		
16	drink												
17	sleep												
18	dinner												

Figure II showing performance of individual subjects on the pre-test/post-test word list in both the pre-test and the post-test evaluation sessions.

FIGURE III

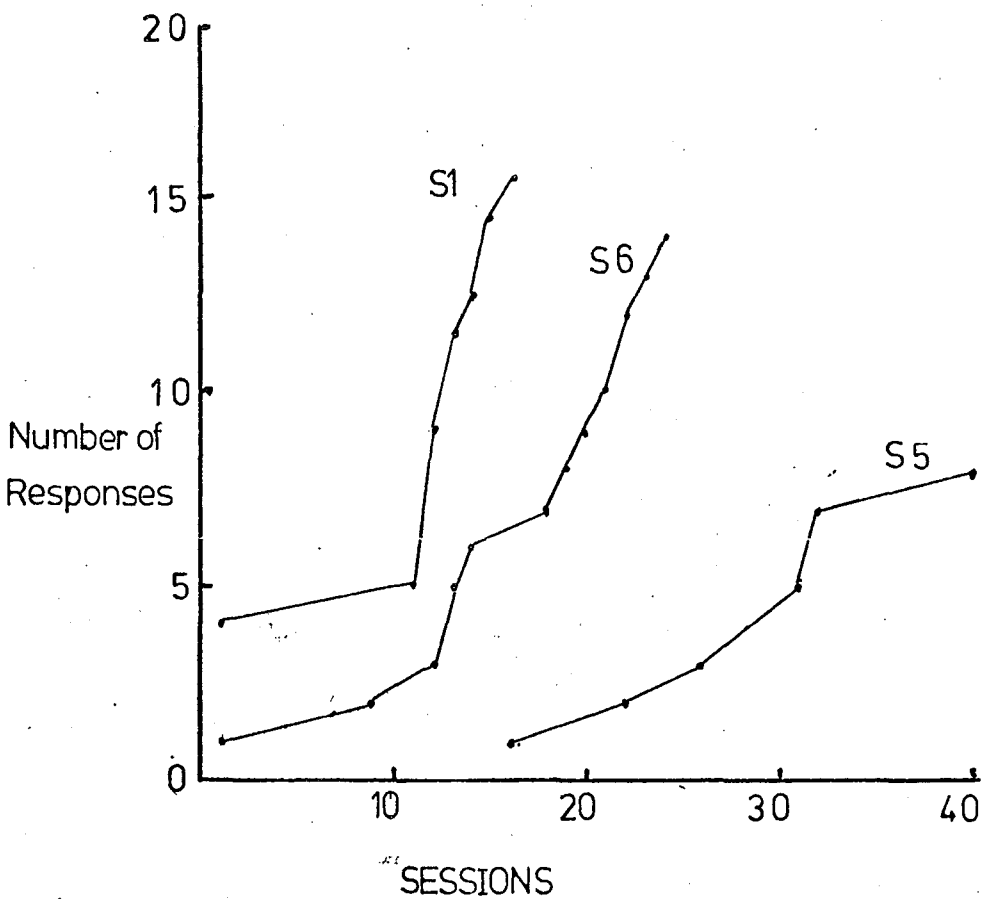
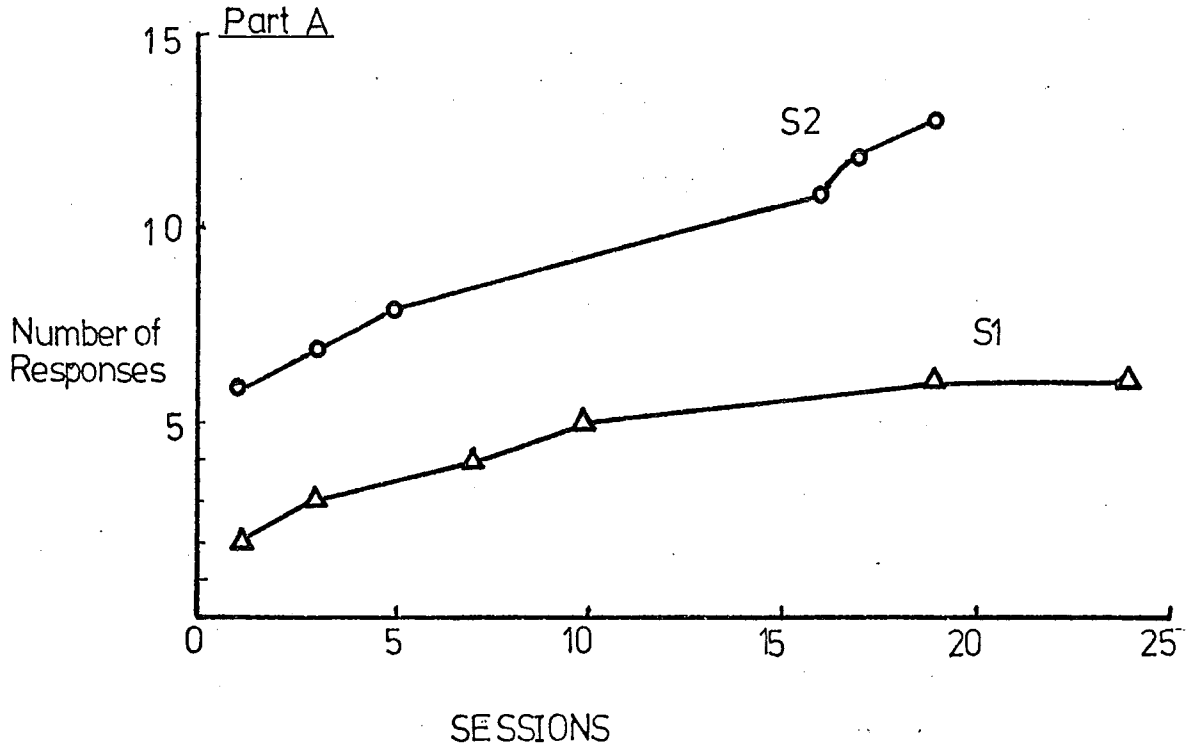


FIGURE III: The accumulated number of responses reaching the performance criteria for the Group I subjects in Phase 1.

FIGURE IV



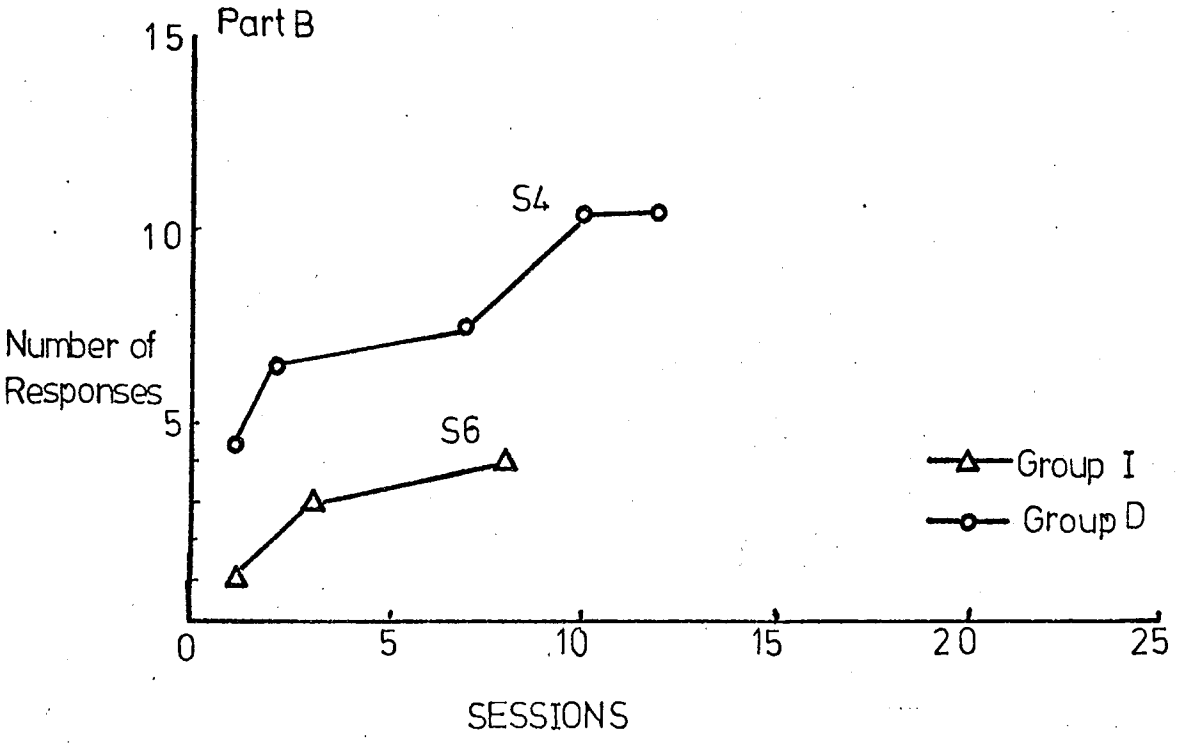


Figure IV: The accumulated number of responses reaching the performance criteria for those subjects who responded in Phase 2. Part A shows Subjects 1 and 2; Part B shows Subjects 4 and 6.

CHAPTER IV

DISCUSSION

The results presented indicate that the conditions that the subjects were exposed to in Phase 1 had no effect on their later rate of acquisition of speech in Phase 2. There appears to be no benefit from learning the response of imitation of motor tasks when compared with a discrimination task involving similar contact with the experimenter and the experimental situation. Both Phase 1 conditions appear to have contributed equally, if at all, to an increased use of language and vocalisations in the wider setting of the ward. That is, some generalisation from the experimental setting occurred and this generalisation was limited to those subjects who were most successful in Phase 2 of the experiment. These same subjects improved in their performance on the pre-test/post-test word list. From this it is possible to conclude that the Phase 2 conditions, reinforced imitation of speech sounds, is an important step in the process of basic speech acquisition. However, in making this conclusion the small size of the subject population and the loss of two subjects during Phase 2, must be kept in mind. The reason for these limiting conditions occurring, and further limitations inherent in the study are outlined below.

Within the limitations mentioned, this study appears to support the evidence of Garcia et. al. (1971) who observed generalisation of imitation occurring within topographical boundaries but not across them. It can be seen in Figure III that the

rates of acquisition of motor imitative behaviour increase over time for the two most successful subjects which indicates generalisation within the topographical area of motor imitation training. The same effect does not appear in Phase 2 (Figure IV) with the possible exception of Subject 2. The rate of acquisition of the other subjects appears to decline near the end of the Phase, possibly indicating a developmental limit to the vocal ability of these subjects or possibly an increase in task difficulty. This finding is supported by the clinical findings of Lovaas (1977) and Sherman et. al. (1965) who warn of the difficulty in making the transition from motor to verbal imitation. Sherman et. al., with one of their subjects, used a system of pairing motor and vocal responses which the subject had to imitate. Over a series of trials the motor component was reduced in significance until only the vocal component was left, thus overcoming the apparent topographical barrier. This is an apparently useful technique which, with further research, may have valuable application in the clinical field.

The finding that some of the subjects showed a generalisation of speech training to the wider setting of the ward could be seen to support Steinman's (1970) claim that generalisation of imitation is under the control of intangible reinforcers not directly involved with topographical similarity and, in this case, not involved with similarity of setting or the people with whom the subject was responding at the time. It indicates that generalisation is either under social and instructional control as Steinman suggests or that Sherman (1965) was correct when he suggested that maintenance of language learning is under the control of some intangible reinforcer, although reinforced imitation is necessary for acquisition.

Other clinical researchers have concluded that training with motor imitation before verbal imitation training does have value as a therapeutic technique. While not able to draw any firm conclusions due to the heterogeneity of the subjects' responses, and the sample size and attrition rate, it would appear that the benefit that other researchers have found from pre-imitation training may be due to the process of imitation itself. This would still allow for the generalisation of imitation effect if Steinman's (1970) explanation is accepted. The prior experience of the experimental situation would allow the subject to become aware of the social demand characteristics of the situation and so the contribution to later language learning would be the same whether there was exposure to imitation or not.

This research lends support to that evidence cited by Prutting and Connolly (1976) in favour of the use of reinforced imitation of verbal behaviour in language therapy especially with the subject population, retarded children, and in the area of basic speech acquisition. It is acknowledged that learning of speech and language, and therapy with speech delayed individuals, is a complicated and intricate process and simple explanations are not sufficient. It will only be through continued research that we will understand more of these processes and it is only through wider therapeutic application of these findings that the time and money spent on research can be justified.

LIMITATIONS OF THIS STUDY:

The primary limitation of this study lies in the basic properties of the process being tested; that is, speech acquisition.

The experimental designs which would normally be used in a behaviourally oriented experiment with few subjects, such as this one, are not appropriate here. Acquisition of basic speech sounds is a non-reversable behaviour so there would be little chance of replicability, a primary requirement for the use of the reversal (ABAB) Design. The multiple baseline technique could not readily be used since the procedure used to evaluate the data involves verbal interaction with the subjects, an immediate effect on the verbal environment which is known to have an effect on their expressive language abilities (Kent 1974).

The conclusions drawn have the obvious qualifications and limitations which arise from the small experimental population size and the high attrition rate in Phase 2. The reason for the high drop out rate is obvious when one looks at the selection processes which must be used. The subjects are selected on the basis of behaviours which they lack; there is no objective way of predicting what their ability will be in the intensive training of the experimental situation. The size of the initial group had to be limited, even with the high expected attrition rate in mind, because of the practical difficulties of extended individual testing in such a clinical setting. For the same reason, large group experimentation is not practical.

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APPENDIX

The appendix includes a copy of the raw data collection sheet which was used in all the phases of the experiment, adapted for each phase as outlined in the method section.

SUBJECT:_____. GROUP:_____.

SESSION NUMBER:_____. DATE:_____.

SHEET:_____.

TRIAL	TASK	ATTEMPTED	REINFORCED	TRIAL	TASK	ATTEMPTED	REINFORCED
1				26			
2				27			
3				28			
4				29			
5				30			
6				31			
7				32			
8				33			
9				34			
10				35			
11				36			
12				37			
13				38			
14				39			
15				40			
16				41			
17				42			
18				43			
19				44			
20				45			
21				46			
22				47			
23				48			
24				49			
25				50			

TRIAL	TASK	ATTEMPTED	REINFORCED	TRIAL	TASK	ATTEMPTED	REINFORCED
51				76			
52				77			
53				78			
54				79			
55				80			
56				81			
57				82			
58				83			
59				84			
60				85			
61				86			
62				87			
63				88			
64				89			
65				90			
66				91			
67				92			
68				93			
69				94			
70				95			
71				96			
72				97			
73				98			
74				99			
75				100			