

THE UNIVERSITY OF MANITOBA

Tacting and Manding: Transfer of Verbal Operants
Across Two Different Response Classes

by

Wanda L. Plante

A Thesis

Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements for the Degree of
Master of Arts

Department of Psychology

Winnipeg, Manitoba

August, 1980

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Abstract

Two single subject experiments examined whether responses trained as one response class, either tacts (names) or mands (requests), would later transfer to the other response class. Acquisition rates for both response classes were also evaluated. In Experiment I, mand condition, the subject was taught to ask for food items using the phrase, "please (name of food item)". A second group of food items were concurrently trained as tacts by requiring the response "it's (name of food item)" when the subject was asked, "What's this?" Transfer was assessed by probing learned items of one response class in sessions of the other condition. Experiment I demonstrated that for most of the tacts learned, transfer to mands occurred and for a few of the mands learned, transfer to tacts occurred. That is, although the subject was originally trained to name an item, he appropriately requested that item when given the opportunity for most of the items tested. Also, on some occasions, the subject correctly named items which he had been previously trained only to ask for. Acquisition rates could not be compared. Experiment II replicated the earlier experiment with additional baselines and procedural refinements. Transfer was again observed across the two response classes; there were repeated instances of transfer from mands to tacts, and few instances of transfer from tacts to mands. Tacts were learned slightly faster than mands. Recommendations for verbal training are discussed.

Acknowledgements

To my advisor and friend, Joseph J. Pear, for devoting much time and interest to the design of this research and for continued support while I conducted the study.

To my other committee members, Garry L. Martin and Glen H. Lowther, for comments on the final draft. To J. Grayson Osborne for his valuable comments during the early stages of the design.

To the staff of Eastgrove, Manitoba School, and the staff of 1-East and Mapleside, St. Amant Centre for their cooperation.

To my fellow graduate students who gave much needed encouragement and support throughout all stages of the research.

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CHAPTER I

Introduction

The literature contains many studies which have dealt with teaching verbal behavior to the retarded (for review see Snyder, Lovitt and Smith, 1975). Many are examples of a functional analysis of verbal behavior as proposed by Skinner (1957). Within this framework several operants are identified of which tacts and mands are two. A tact is a verbal response which is under the control of a prior stimulus and is followed by a generalized reinforcer (Skinner, 1957). A mand is a verbal response which is under the control of a condition of deprivation or aversive stimulation and is reinforced by a characteristic consequence (Skinner, 1957). (For a more detailed account, see Appendix I).

There are two shortcomings in the published research related to tacts and mands. The first involves the "package programs" which several authors have developed to teach functional speech to speech-deficient populations (e.g., Hartung, 1970; Kent, 1974; Lovaas, 1968; Risley & Wolf, 1967; Sloane, Johnston & Harris, 1968). The majority of these programs propose similar strategies involving the following sequence of training: motor imitation, verbal imitation (sounds, then whole words), tacting or naming, imitative phrases, and finally functional speech which includes manding. Further, some programs (e.g., Lovaas, 1968) recommend that a mand should be trained only after its corresponding tact has been learned. These strategies regarding the training of mands can be criticized on two counts. First, that mands should only be trained at the end of a long training program or only

after its corresponding tact has been learned has no empirical support. In fact, the great utility or functionality of mands over other verbal operants suggests otherwise (Buddenhagen, 1971). It may be that mands because of their functionality could be learned more readily and generalize more than tacts. This statement gains some support from the research on training sign language to chimpanzees (Gardner & Gardner, 1969, 1975). The manner in which the signs were trained approximated the natural contingencies under which a child acquires language. Here it was found that the earliest signs that emerged were mands. Thus, the assumption that mands should be introduced late in verbal training and that the earlier acquisition of its corresponding tact is a necessary prerequisite can be questioned.

The second shortcoming is the lack of any systematic investigation of mands. There are apparently no published studies which systematically isolate mands as the verbal operant under investigation. Rather, mands have been studied in conjunction with various other verbal operants (e.g., Jeffrey, 1972) or in a manner such that it is unclear whether the emerging mands are a function of the experimental procedures or of the subject's previous history (e.g., Halle, Marshall & Spradlin, 1979). Further, the minimal attention that mands have received has generally been an unsystematic "train when the opportunity arises" approach as exemplified by Lovaas (1968). More recently, Lovaas (1977) has presented a more structured approach to teaching mands. In this program he has structured formal sessions such that a greater variety of mands can be trained rather than waiting for an opportunity to arise.

Given the above, the two experiments that follow were designed to

systematically study mands and tacts and to determine if current training practice would be substantiated. In Experiment I two groups of food items were trained under two different training conditions, mand condition and tact condition. The purpose was to examine if items trained under one condition would transfer to the other response class. In the mand condition the response "please (name of food item)" was trained; the experimenter would present a food item with the question "What do you want?" and consequate correct responses with a portion of the food item. In the tact condition the response "it's (name of food item)" was trained; the experimenter presented the food item with the question "What's this?" and consequated correct responses with a conditioned reinforcer backed up by a variety of edible reinforcers. Once items were learned in either condition they were probed in the other condition to assess whether the response had transferred. Experiment II was a replication of Experiment I with additional baselines and procedural refinements.

CHAPTER II

Experiment I

Method

Subject

One male resident of the Manitoba School, Portage la Prairie, served as the subject in Experiment I. Jimmy was 22 years old at the start of the study and had been institutionalized 12 years previously. His diagnosis was profound retardation due to mechanical injuries at birth. Jimmy's verbal repertoire was comprised mainly of tacts: picture names and answers to questions such as "What's your name?" and "How old are you?"; and some simple mands (e.g., "fork" when needing an eating utensil).

Experimental Setting and Apparatus

Sessions were conducted in a room approximately 5 m by 7.5m located in the Eastgrove Unit of the Manitoba School. The room contained a table, chairs, food items, various toys at one end of the room which served as an activity area during session breaks, and cleaning facilities. The design of the table was such that while the subject and the experimenter sat across the table facing each other, the food items, data sheets, tape recorder, and session clock were both out of reach and, when necessary, out of sight, from the subject.

A wooden token board, 12.7 cm x 20.3 cm, was affixed to the table directly in front of the subject during the tact condition and 5 cm wooden dowels served as tokens. Smarties, potato chips, cheezies, chocolate covered peanuts and raisins, soft drinks, and various penny candies were the back-up reinforcers in this same condition. Canned,

prepackaged, and fresh foods were used as stimuli in both experimental conditions and as reinforcers in the mand condition. These food items were displayed in 12.7 diameter bowls when serving as stimuli.

Preliminary Procedures

Echoic baselines. Two baselines were taken of the subject's echoic repertoire. An echoic baseline was taken of 60 food items to guide the experimenter in item selection. This baseline was conducted in several 15-minute sessions. The subject was instructed to imitate the word by the experimenter saying, "Say _____." Correct imitations and approximations (e.g., "mik" for "milk") given within 10 seconds of the prompt were consequted by praise and intermittently by candy. Incorrect responses and omissions resulted in the presentation of the next trial after a short pause. Each item on the list was tested in this manner and the list was evaluated three times. An item met the echoic criterion if it was imitated correctly or the correct pronunciation closely approximated on two out of the three times tested.

The second echoic baseline tested responses that were later to be used as tact and mand autoclitics; one to be chosen for each respective experimental condition. The mand autoclitics tested were: "want", "please", "give", and "wish". The tact autoclitics tested were: "it's", "that's", "there's", and "here's". The testing of these phrases was conducted in a similar fashion to the food item imitation baseline with the exception that the subject was not reinforced for correct imitations. All responses were consequted by a short pause and presentation of the next trial. One phrase that the subject imitated most reliably from each group was selected.

Tacting baseline. A tacting baseline of the 60 food items was taken to evaluate if the subject could already name any of the foods. This was realized over several 15-minute sessions. The food items were represented by Peabody Picture cards or magazine photographs with the general rule that the picture card or photograph should depict the food as closely as possible to the manner in which the subject would likely encounter it in his natural environment. For example, to test corn, a picture of kernels of corn on a plate was tested rather than a picture of corn on the cob. To test each item, the experimenter would present the picture and ask "What's this?" Correct responses occurring within 5 seconds were consequted by praise and intermittently by candy. Incorrect responses and omissions resulted in moving to the next trial. Each item was tested three times as done in the echoic baseline. Any item which the subject correctly named or even closely approximated (e.g., "ceem" when shown "ice cream") on any trial was discarded from the possible pool of training items. Thus only items which the subject did not name on all three occasions met the criterion of unknown tacts.

Manding baseline. To evaluate the extent of the subject's manding repertoire two baselines were conducted in the subject's natural environment. Practical limitations did not allow all 60 food items to be tested in this manner. The alternative chosen was to sample two situations in which the experimenter could set up a condition of deprivation where the subject had the opportunity to mand. The two situations were mealtime and morning hygiene. The subject was tested on two consecutive days in each situation.

The mealtime manding baseline was conducted during the subject's

regular dinner. Dinner took place in the dormitory with four tables of usually four boys to a table. The subject was seated at his regular place during the test. The procedure was that the experimenter removed the items listed below one at a time when the subject started to engage in eating that item. Upon removal of the item, which was held in sight of the subject, the experimenter instructed "Eat your lunch" and waited 10 seconds for a response. If no response occurred, the experimenter asked "What do you want?" and again waited 10 seconds. An item was returned at the end of the first interval if the subject manded the item when told "Eat your lunch" or after the second 10-second interval if the experimenter was required to ask, "What do you want?" The items tested were:

1. soup spoon
2. soup
3. plate - containing main course
4. fork
5. dessert
6. dessert spoon
7. milk

Since a variety of foods were present during the two occasions of this testing, a small sample of the 60 food items was tested. If a food item was manded on either occasion, it was discarded from the potential pool of training items.

The hygiene manding baseline was conducted in the morning during the time regularly scheduled for self-care in the washroom of the dormitory. The subject was currently a participant in a hygiene program which

involved a set sequence of behaviors to complete the routine. He could engage in these behaviors without physical guidance and required simple instructions only to complete the entire routine. The testing procedure was that at each step in the routine the experimenter removed an item essential to completion of that step. Upon removal of the item, the experimenter gave an instruction appropriate to the step currently underway and waited 10 seconds. If the subject asked for the item, it was returned at the end of the interval; however, if no response occurred the experimenter asked "What do you want?" After 10 seconds the item was returned. The items tested and the experimenter's instructions were:

Item	Instruction
1. toothbrush	brush your teeth
2. toothpaste	brush your teeth
3. sink plug	wash your face
4. facecloth	wash your face
5. soap	wash your face
6. towel	dry your face
7. hair brush	brush your hair

Item selection. After completion of the above-described baselines, items were chosen for training on the following criteria: (1) that the subject could not tact it; (2) that the subject had not manded it; and (3) that the subject could imitate the word reliably. Items which met all of these criteria were randomly divided into two groups; one group of food items were trained in the mand condition, and the other group in the tact condition.

Token training. Prior to the commencement of the experiment, the

subject was token trained. The tokens and token boards were introduced into the subject's regular picture-naming sessions which had been in progress for approximately eight months prior to this experiment. The terminal behavior required was that upon delivery of the last token in the ratio of a fixed-ratio 4 (FR4) for correct responses, the subject would give all of the tokens to the experimenter when told "You have all your tokens" with the experimenter in turn delivering a back-up reinforcer.

Initially, a schedule of continuous reinforcement (CRF) was in effect. After each correct response the experimenter said "Good boy, Jimmy, you get a token", while placing the token in the token board; after the token was in place, the experimenter said "You have a token, give it to me", and, if necessary, physically guided the subject to remove the token and place it in the experimenter's hand after which the experimenter said "Here you go", and gave the subject one of the back-up reinforcers. When the subject had sampled all of the back-up reinforcers and was reliably returning the token to the experimenter without any assistance, the ratio was increased by one such that two correct responses or the earning of two tokens (FR 2) was necessary before a back-up reinforcer was delivered. This schedule remained in effect until the subject's rate of correct responding was approximately equal to that on the CRF schedule and until the subject was reliably and independently returning both tokens to the experimenter, at which point it was increased to an FR 3. This schedule was thus incremented by one after every few sessions until an FR 4 was reached.

Experimental Procedures

Experimental design. A multi-element design (Sidman, 1960) was

used wherein the two conditions were run concurrently. Two sessions of one experimental condition were conducted in the morning and two sessions of the other experimental condition were conducted in the afternoon. Each session lasted 15 minutes, with a 10-minute break between the two sessions of the same condition. The two conditions alternated between mornings and afternoons each day. Sessions were conducted four days per week.

Training procedure. The training procedure in both experimental conditions was a modified version of the picture-naming described by Stephens, Pear, Wray, and Jackson (1975). This procedure allowed for the training of one unknown item with the interspersal of three known items to facilitate discrimination. The procedure was comprised of 36 steps of prompt trials and question trials (see Figure 1). A prompt trial was a trial on which a model of the correct response was presented for the subject to imitate. This prompt was either presented in two parts, Prompt Type A, or presented as one unit, Prompt Type B. A question trial was a trial where the correct response was not modelled for the subject. Correct responses on any trial advanced steps and incorrect responses or omissions resulted in a systematic recycling to a previous step.

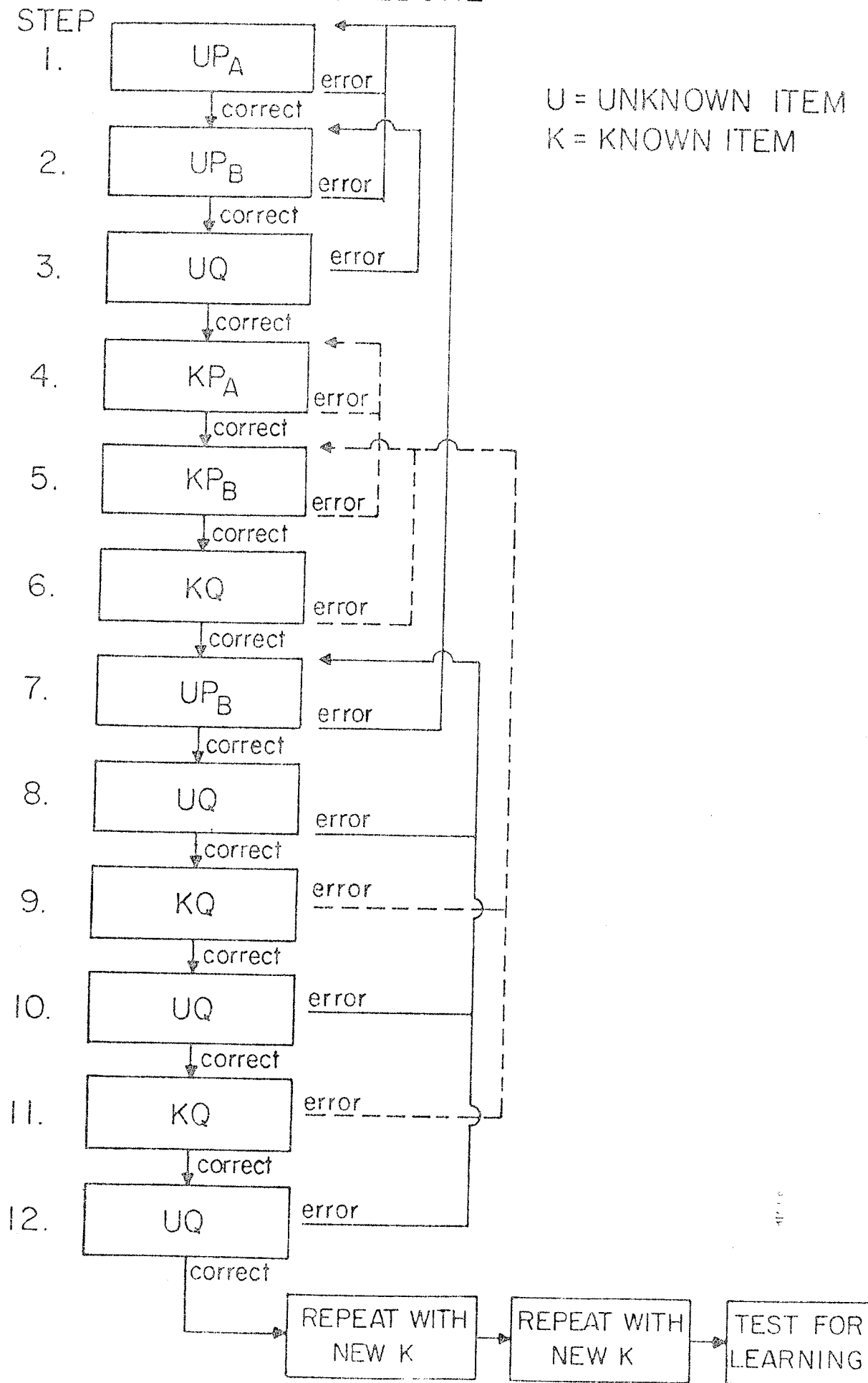
Training commenced with the unknown item as depicted on Step 1 in Figure 1. On all training trials the experimenter would present the food item being trained and ask the question appropriate to the condition in progress. Whether the answer was prompted or not was dependent on which step the subject was on. On Step 1 a Type A prompt (PA) was presented; the experimenter prompted the first part of the phrase, the tact or mand autoclitic, and if the subject imitated it correctly, the experimenter

Figure 1. Diagram of the training
procedure.

TRAINING PROCEDURE

12.

U = UNKNOWN ITEM
K = KNOWN ITEM



prompted the second part of the phrase, the name of the food item. If the subject imitated the second part correctly the response was consequated in the manner appropriate for that condition and the experimenter proceeded to Step 2. If the subject made an error on Step 1, this step was repeated. A response was considered to be correct only if the subject matched or approximated the correct verbalization within 10 seconds after the experimenter had asked the question. An error was considered to have been made if the subject responded incorrectly, wherein the trial was immediately terminated, or if the subject did not vocally respond at all within the approximate 10-second period. After every trial there was an approximate 5-second pause before the next trial was presented.

On Step 2, a Type B prompt (PB) was presented; the experimenter prompted the full phrase, the tact or mand autoclitic, and the name of the item. If the subject imitated the full phrase correctly, the experimenter consequated the response appropriately and proceeded to Step 3. If the subject made an error, the experimenter returned to Step 1.

On Step 3, a question was presented; the experimenter asked the question only. If the subject responded correctly, that is, tacted or manded the item without a prompt, the experimenter reinforced the response and proceeded to Step 4. If the subject responded incorrectly or omitted, the experimenter returned to Step 2.

The above-described three steps were repeated with a known item (see Steps 4, 5, and 6 in Figure 1). If the subject responded correctly, he moved up steps in the same fashion as for the unknown item.

Once the subject correctly tacted or manded the known item without a prompt (Step 6), the unknown item was introduced. On Step 7, the same

prompt was given as on Step 2; that is, the experimenter prompted the complete phrase. If the subject responded incorrectly on Step 7, the experimenter returned to Step 1 and proceeded as described above for Step 1. If the subject responded correctly, the experimenter proceeded to Step 8 which was a question trial for the unknown item. Step 8 and continuing to Step 12 were alternating known and unknown question trials. If on the question trials for the unknown item (Steps 8, 10, and 12) the subject erred, the experimenter recycled to Step 7, a prompt trial for the unknown item. If the subject erred on the known item question trials (Steps 9 and 11), the experimenter recycled to the prompt trial for the known item, Step 5. If the subject successfully completed each step by correctly tacting or manding both the known and unknown items without prompting, the experimenter continued to proceed down to Step 12.

When the subject completed Step 12, the whole procedure (Steps 1 through 12) was repeated with a new known item and then again with a third known item.

An unknown item which successfully progressed through the above-described procedure was said to have reached criterion. If an item did not reach criterion within 10 sessions it was dropped from the experiment. When an item reached criterion it was tested (as an unprompted question trial) at the beginning of the session in the condition in which it had reached criterion. If the subject correctly tacted or manded the item on three successive occasions, the item was said to be learned. If the subject responded incorrectly, that item was then reclassified as an unknown item and retained in the session immediately following. If a

criterion item was tested for learning on six occasions and did not reach the learning criterion it was dropped from the experiment.

Tact condition. In the tact condition the response "It's (name of the food item)" was trained when a food item was presented in conjunction with the question, "What's this?" (The tact autoclitic, "it's" was selected during baseline). The consequence for correct responses during training was a token and praise. The tokens were cashed in on an FR 4 schedule of reinforcement for one of the back-up reinforcers. Incorrect responses and omissions were consequted as discussed in the training procedure above.

Mand condition. In the mand condition the response "please (name of the item)" was trained when a food item was presented and the question "What do you want?" was asked. (The mand autoclitic "want" was chosen during baseline.) Correct responses were consequted with a portion of the food item currently being trained on an FR 4 schedule of reinforcement. Incorrect responses and omissions were consequted in the same manner as in the tact condition.

Probes. When an item met the learning criterion in either the tact or the mand condition it was probed as a nonreinforced question trial in the other condition. On a probe trial the experimenter presented the probe item and asked the question appropriate to the condition in progress. Thus, if a mand had been learned, that item was then probed in the tact condition with the question, "What's this?" Similarly, if a tact had been learned it was probed in the mand session with the question, "What do you want?"

The probe trials were intermixed with the regular training at

approximately equal intervals during a session. The format of the probe trials was identical to the training trials except that a probe item was presented for a fixed 10-second interval and no consequences were given for verbal responses. All verbal responses that occurred within the interval were recorded.

There were six such probe trials per session. The actual item or items to be probed during a given session and the number of times an item was probed per session was dependent on the number of items that had been learned. If just one item had reached the learning criteria it was probed six times in the other experimental condition. When a second item was learned both items were probed three times each. When a third item was learned all three items were probed twice each during a session. As new items were learned the least recently learned items were dropped from probes such that there was a maximum of three items being probed at any given time.

Response definitions of transfer. Responses emitted on probe trials were classified as exemplifying instances of complete transfer or partial transfer. Complete transfer was defined as the occurrence of only the appropriate autoclitic and name of the food item in the correct order. That is, if "please cheese" was the mand learned and "it's cheese" was emitted when probed in the tact condition, complete transfer to a tact was said to have occurred. Similarly, if "it's peas" was the tact learned and "please peas" was emitted when probed in the mand condition, complete transfer to a mand was said to have occurred.

Partial transfer was defined as the occurrence of any element of the appropriate autoclitic and any element of the name of the food item. The

order could be reversed and other responses may have also been emitted. Examples of partial transfer in the case of "please cheese" learned as a mand would be "please it's cheese", "cheese it's", "please cheese it's", "cheese it's cheese", etc.

Interobserver reliability. All experimental sessions were tape recorded and approximately one-sixth of these were randomly selected for reliability assessment. An observer versed on the experimenter's criteria for correct and incorrect responses independently scored the subject's responses. Reliability measures, the number of agreements divided by the number of agreements plus the number of disagreements, were calculated on trials which the experimenter had judged as correct and on trials which the experimenter had judged as incorrect. Trials on which there were omissions recorded were not computed. For correct responses agreements ranged from 93% to 100%; and for incorrect responses agreements ranged from 86% to 100%.

Results

In Experiment I five tacts and 11 mands were learned. The cumulative number of tacts and mands learned and the instances of transfer from one response class to the other are shown in Figures 2 and 3.

In the upper graph of Figure 2 the acquisition rate for the tacts is presented. Tacts were learned at a low, steady rate requiring an average of approximately nine sessions for each item to reach criterion. (The fifth tact learned reached the learning criterion on the last session of the tact condition which was the last session of the experiment. The acquisition of this item is noted in the cumulative number of tacts learned but there are no probe data for this item and it does not appear elsewhere in the figures.)

Figure 2. Cumulative number of tacts learned and instances of complete and partial transfer to mands for the tacts probed. Asterisks (*) indicate sessions that had to be omitted because the subject was not available.

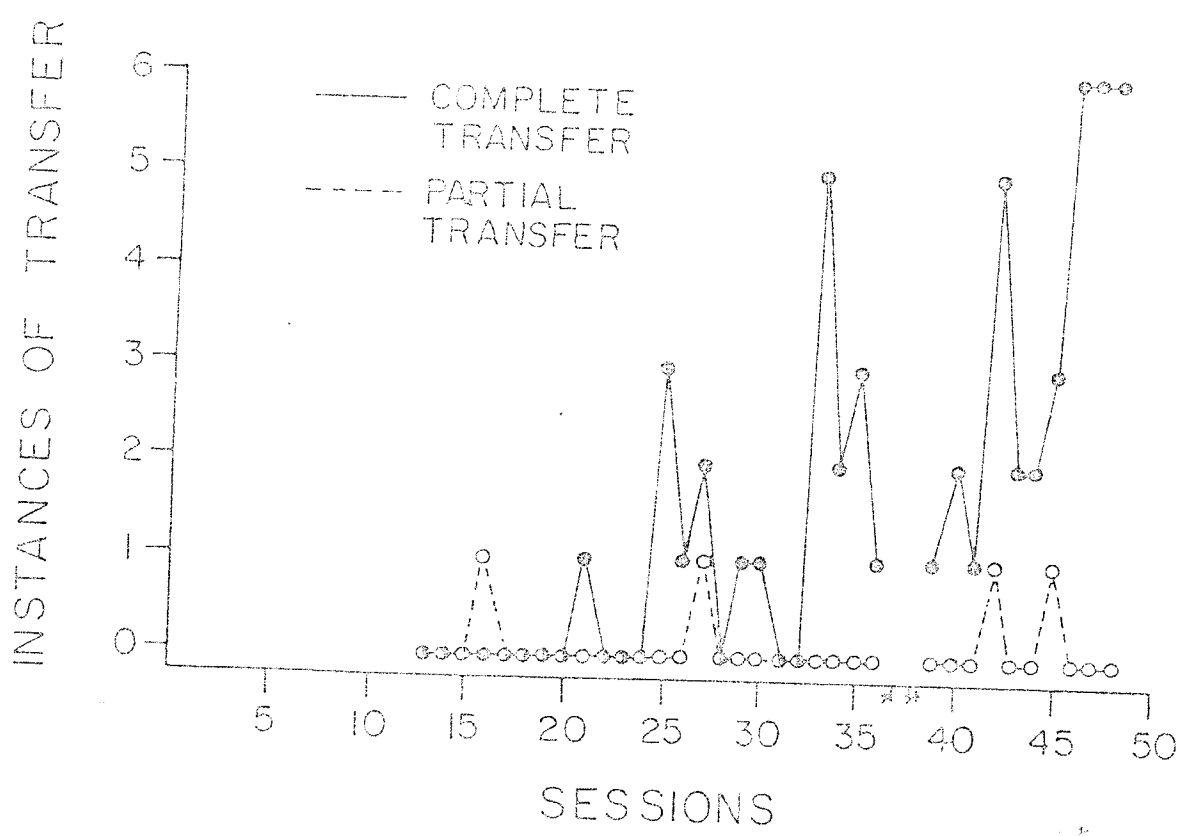
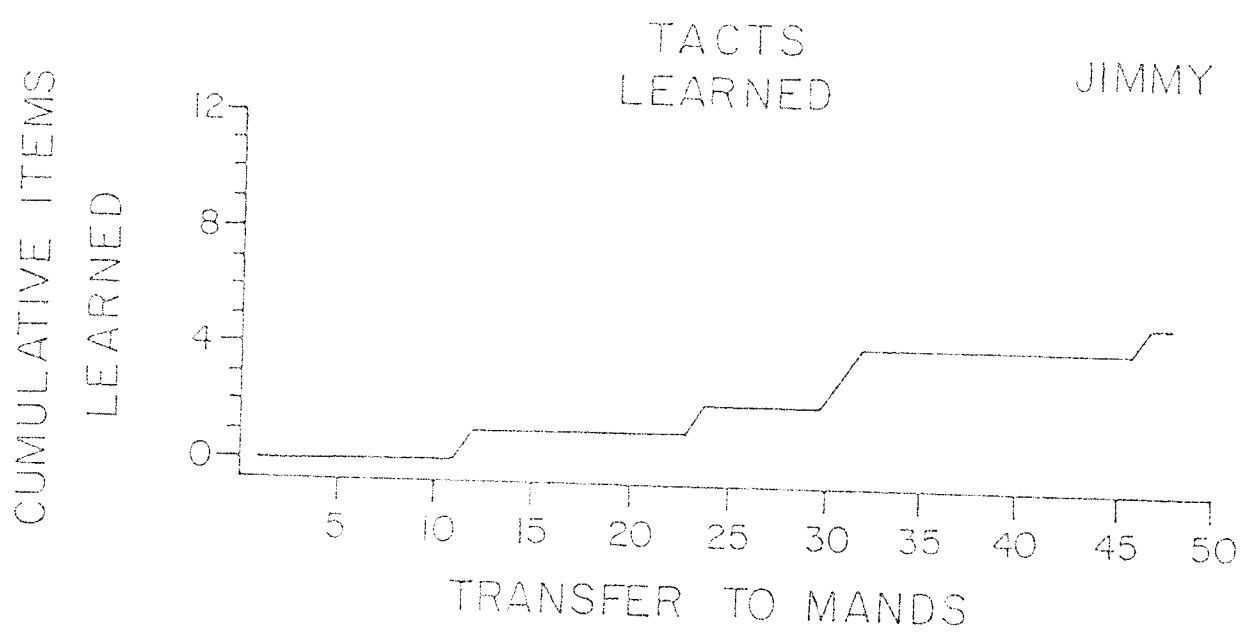
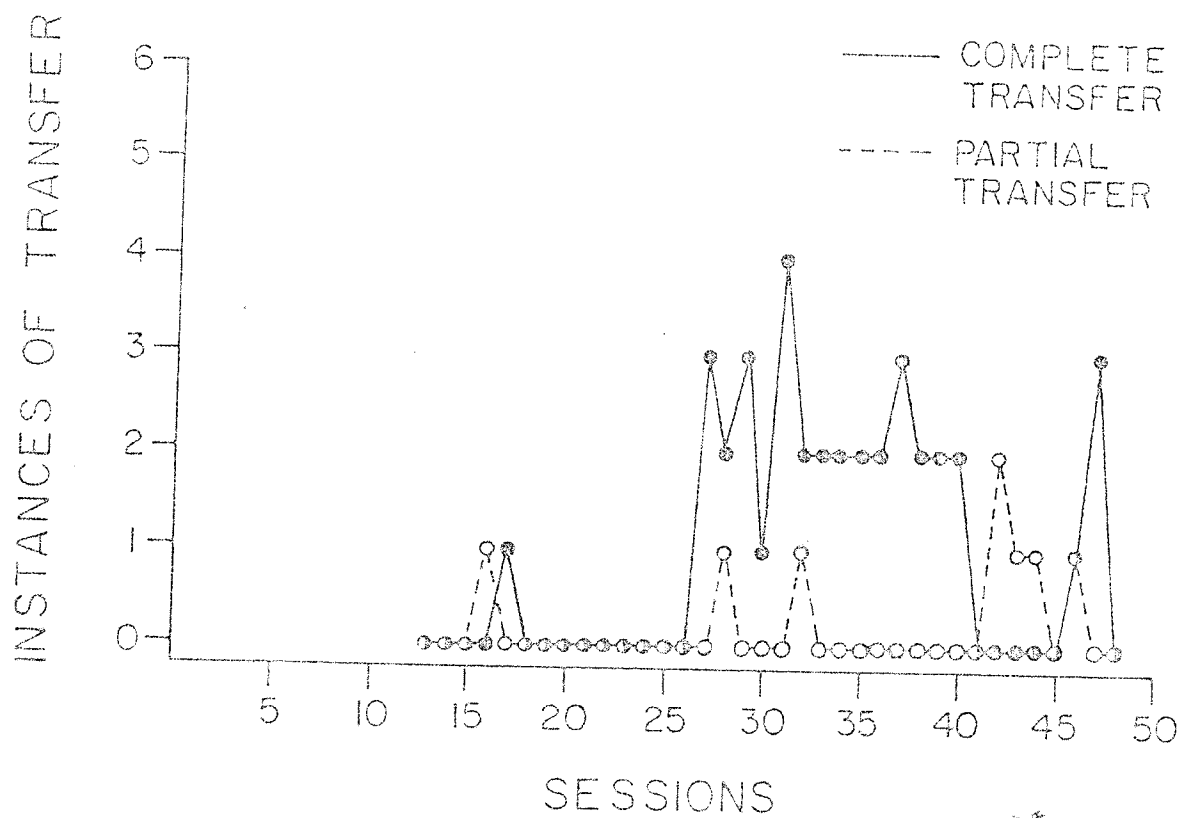
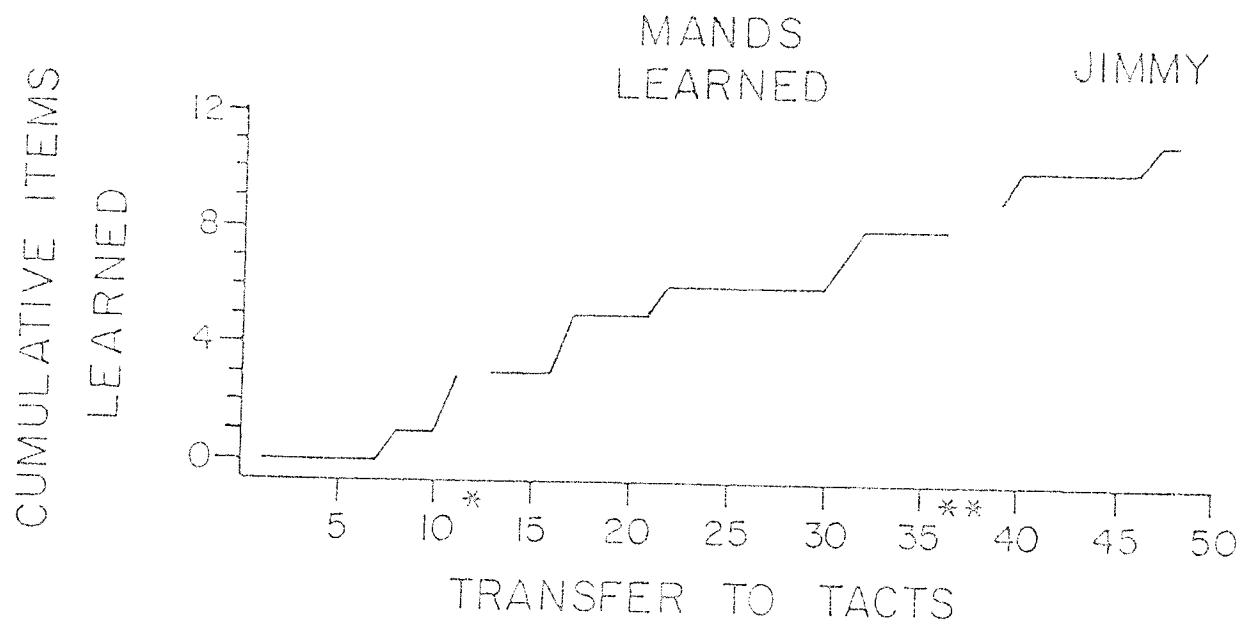


Figure 3. Cumulative number of mands learned and instances of complete and partial transfer to tacts for the mands probed. Asterisks (*) indicate sessions that had to be omitted because the subject was not available.



The lower graph of Figure 2 shows the instances of complete and partial transfer to mands for the tacts learned. The maximum number of possibilities per session for transfer to be observed were six. When probing began for the first tact learned, no instances of complete transfer were observed for the first eight sessions. Following this one instance of complete transfer occurred. When subsequent tacts were learned and probed, complete transfer was observed more frequently. For the last three sessions complete transfer was observed on every occasion a tact was probed. Overall, the frequency of complete transfer steadily increased from the initial tact probed until the end of the experiment. Partial transfer was observed very infrequently.

The upper graph of Figure 3 shows the cumulative number of mands learned. Mands were learned at a high steady rate requiring an average of less than five sessions for each item to be learned. The lower graph of Figure 3 shows complete and partial transfer from mands to tacts. Complete transfer was observed only once during the first fourteen sessions that probing was conducted for the first six mands learned; following this transfer was occurring at approximately the same frequency each session until near the end of the experiment after which occurrences of transfer fluctuated. As was the case with the tacts, the instances of partial transfer were few.

Figures 4 and 5 trace the instances of transfer for each individual item as a function of the sessions during which the item was probed. The tacts are presented in Figure 4. There was only one instance of complete transfer observed for "peas" for the entire time that item was probed;

Figure 4. Individual instances of complete and partial transfer from tacts to mands for the tacts learned as a function of the sessions during which the item was probed.

TACTS

JIMMY

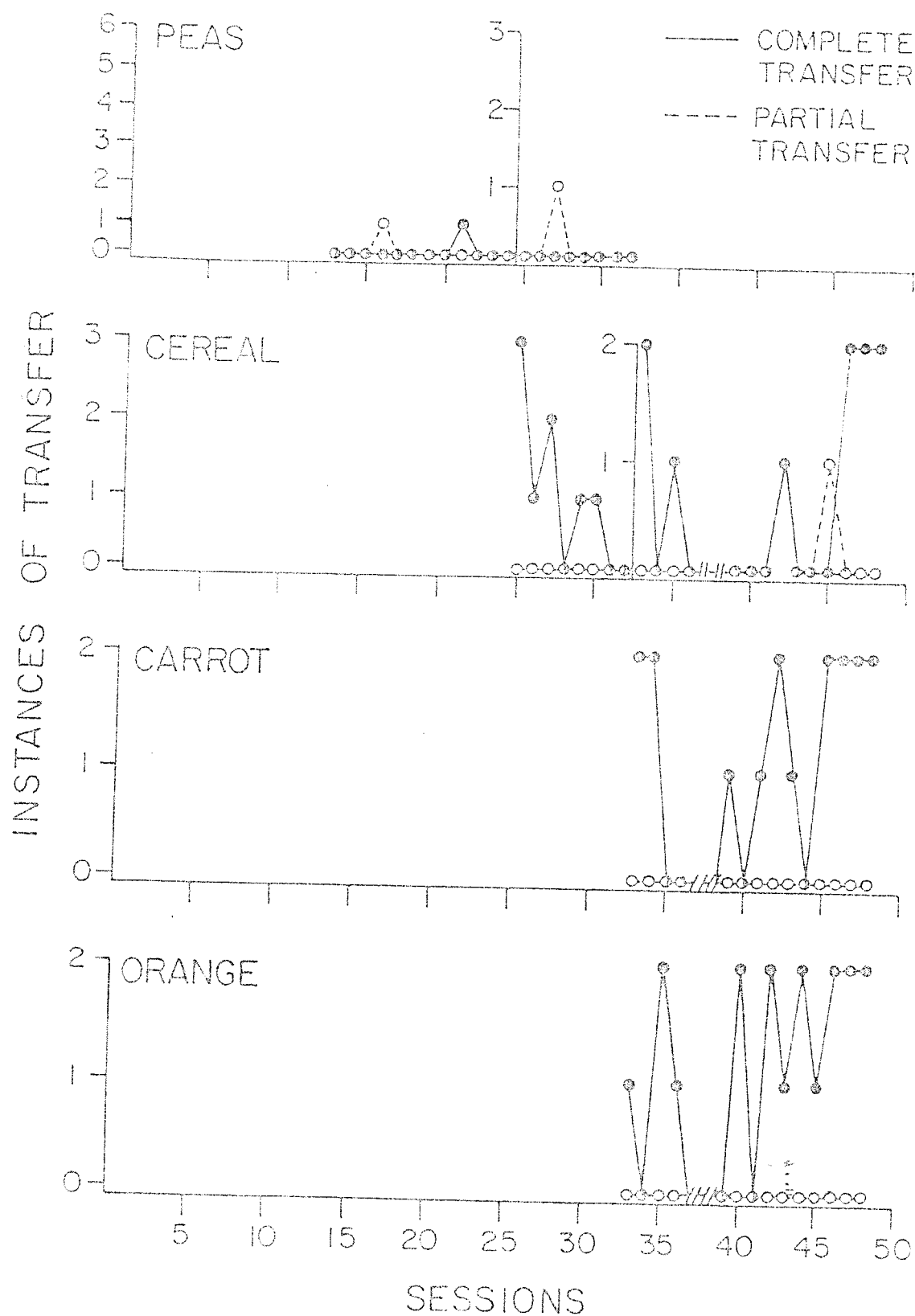
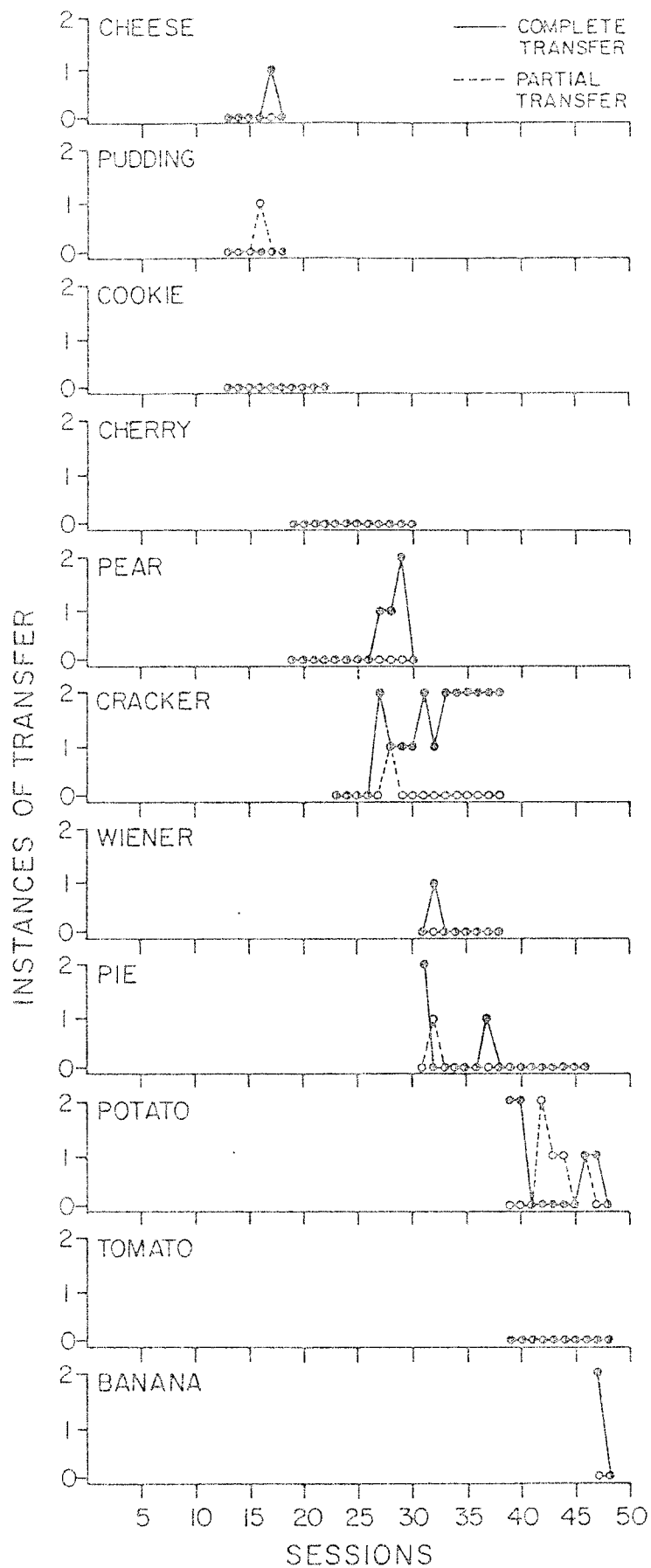


Figure 5. Individual instances of complete and partial transfer from mands to tacts for the mands learned as a function of the sessions during which the item was probed.



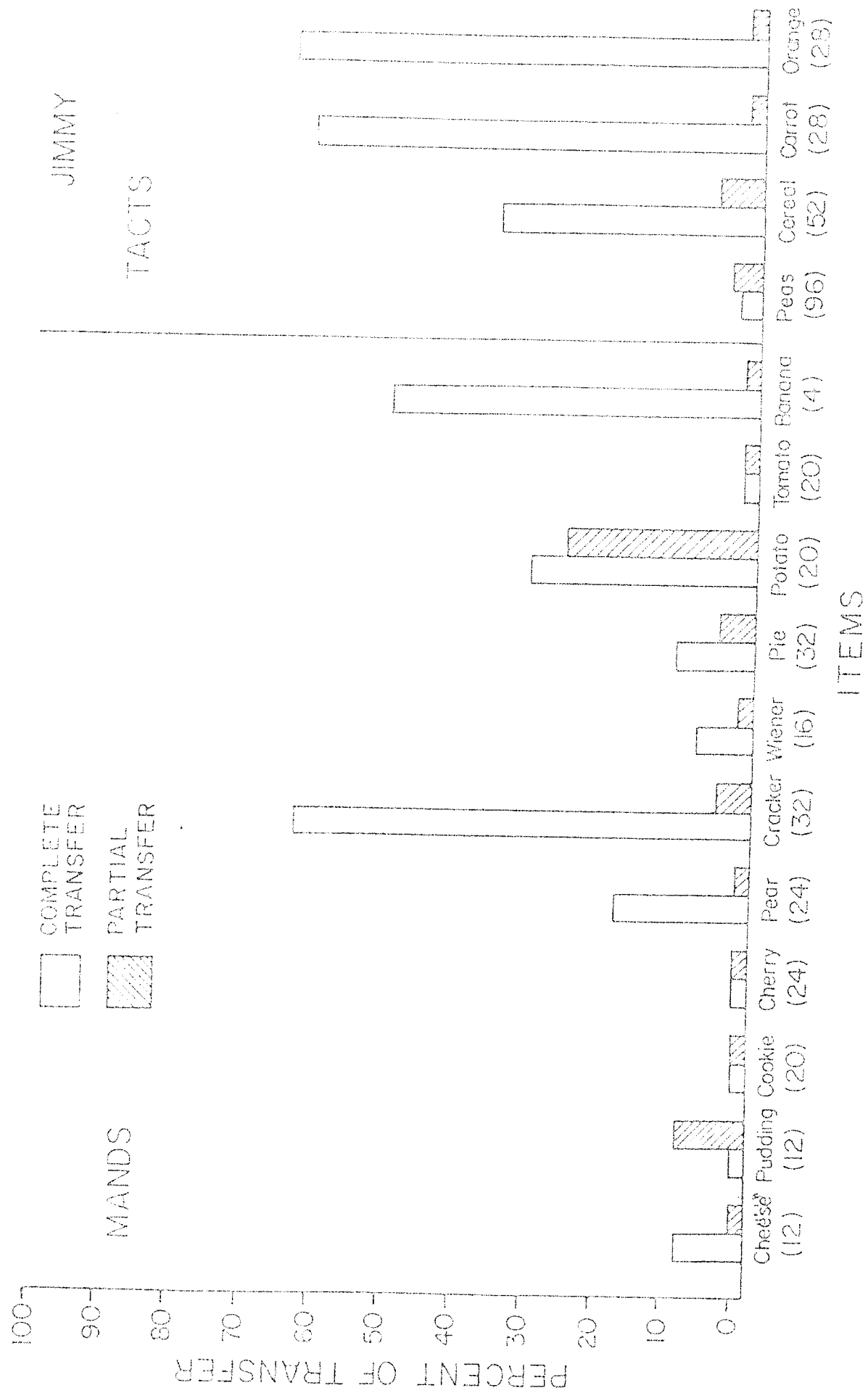
whereas for the other three tacts probed, "cereal", "carrot", and "orange", complete transfer was observed repeatedly from when probing was first initiated until it terminated. The mands are presented in Figure 5. For the mands, the instances of complete transfer varied greatly from item to item. There were no occurrences of complete transfer for four of the mands, "pudding", "cookie", "cherry", and "tomato"; only one instance was observed for two mands, "cheese", and "weiner"; and for the remaining items several instances of complete transfer occurred. Overall, the tacts displayed consistently higher frequencies of complete transfer than did the mands. When an item was probed in relation to the other items did not appear to affect transfer for either the tacts or the mands.

In Figure 6 the percentage of transfer, complete and partial, for tacts learned and mands learned is presented. For most of the mands the percentage of transfer is low; the exceptions are "cracker", "potato", and "banana". The percentage of complete transfer is high for all but one of the tacts.

Discussion

The results demonstrate that for most of the items initially learned as tacts the response will easily transfer to a mand when later tested. That is, if a child learns to name an item (e.g., it's cereal") when asked what it is, he will later appropriately request the item (e.g., "want cereal") when asked what he wants. Transfer in the other direction, from mands to tacts, was demonstrated for few of the mands learned. That is, if an item is learned as a mand (e.g., "want cheese") only in a very few cases will it transfer to a tact if the child is asked to name it (e.g., "it's cheese").

Figure 6. Percentage of transfers, complete and partial, for tacts and mands learned.



For this subject it appears that tacts transfer to mands more reliably than mands transfer to tacts. This was demonstrated both in general for tacts and for individual tact items. Finally, the experiment also demonstrated that for this subject, mands were learned at a much faster rate than tacts.

Some suggestions regarding verbal training practice could be given based on the above results; however, there are some reservations: (1) the higher learning rate for mands as compared to tacts may be a function of the number of training trials per condition (this was much higher in the mand condition) or the reinforcers in the mand condition may be stronger (more reinforcing) than those in the tact condition or learning may be occurring in other environments; (2) transfer may in part be a function of the verbal repertoire the subject had prior to this experiment; (3) transfer or non-transfer, especially from tacts to mands, may be related to the reinforcing strength of a particular item; that is, the preference the subject has for that item; and (4) the "pureness" of the tacts may be questioned because the back-up reinforcers, although unrelated to the item being trained, were always food items.

Given the above reservations, a second experiment was designed to address this. The refinements made in Experiment II were: (1) the number of training trials was equalized across conditions and untrained items were periodically tested to evaluate if learning was taking place outside of the sessions; (2) a subject who had only a minimal verbal repertoire was used; (3) all items to be trained as mands or tacts and items to be used as tact back-up reinforcers were

pre-tested and demonstrated to have approximate equal reinforcing strength; and (4) non-food items were added to the tact back-up reinforcers. In addition some small procedural changes were made to further refine Experiment II.

CHAPTER III

Experiment II

Method

Subject

One male resident of the St. Amant Centre, Winnipeg, served as the subject in Experiment II. Ryan was 8 years old and had been institutionalized one year prior to the start of the study. His diagnosis was given as mental retardation of unknown etiology. Ryan had not previously participated as a subject in the Research Unit and was naive with respect to the experimental procedures. His verbal repertoire was comprised largely of incoherent babblings. He could tact a few items; however, the pronunciation was poor, e.g., "ba" for "ball". His manding repertoire consisted of "ma" for "mama" and "he" for "help" which were emitted when he required adult assistance; e.g., to open a door or to reach a toy. Due to Ryan's poor articulation and lack of an extensive vocal imitative repertoire, American Sign Language was selected to train. Ryan had not had any previous history with sign language nor was he exposed to any sign language training apart from the experimental sessions.

Experimental Setting and Apparatus

All sessions were conducted in one of the experimental rooms in the Psychology Research Department, St. Amant Centre. The room contained a child-sized table and two chairs placed in a manner such that the experimenter and subject faced each other from across the table. All apparatus was placed on a counter to the experimenter's right. During preliminary training, relay equipment, a cumulative recorder, and a micro-switch were operative in order to test the stimuli for reinforcing

strength. In the experimental conditions, an experimenter-pacer which timed the duration of the training trials, a counter which recorded the number of training trials, and an audio-tape recorder to record any spontaneous verbalizations were present. During the experimental sessions the table was covered with one of two tablecloths; a different color and pattern was used for each condition. Periodically, video-tape recording equipment was present in the room so that sessions could be taped for reliability assessments.

Licorice, caramels, chocolate bar, a blue rattle, a soft yellow squeak toy, potato chips, orange juice, ice cream, and coke were the reinforcers used in the tact condition. Various other food items were used as the training stimuli in the tact condition, or as both the training stimuli and the reinforcers in the mand condition. The food items were displayed in 8 cm diameter bowls.

Preliminary Procedures

Sign imitation baseline. A baseline of the signs for 50 different food items was taken to see if the child could imitate the signs. This baseline was conducted in a similar manner to that described for the echoic baseline in Experiment I. The only procedural difference was that in this case, the experimenter said "do this" and manually presented the sign for the particular item while in Experiment I the experimenter had said "Say (name of item)".

When this baseline was conducted it became evident that the subject could not imitate most of the signs being tested. Since correct imitation of signs (parallel to correct word imitation) is the first step in training items, this drastically reduced the potential pool of training items.

To overcome this deficit, a few sessions of fine motor coordination were introduced. In the fine motor imitation sessions, approximately 10 to 15 hand configurations of right versus left hand and open hand versus closed fist discriminations were trained. After this, the sign imitation baseline was repeated. As in Experiment I, the subject had to correctly imitate the sign on two out of three presentations in order for an item to be considered further.

Tact and mand autoclitics were not chosen as had been done in Experiment I. Instead, a simplified "want" sign was used as the mand autoclitic, and a pointing response was used as the tact autoclitic "it's". An effort was made to equate these two signs for ease of signing for the subject.

Tacting baseline. The tacting baseline was conducted as described in Experiment I. If the subject emitted a response, manually or vocally, demonstrating that the tact was already in his repertoire, that item was discarded from the potential pool of training items.

Manding baseline. The manding baseline was similar to that described in Experiment I, excepting that only the mealtime was tested. The testing was done during the subject's regular dinner on two successive days. The subject sat at a table with seven other children. The procedure of removing items singularly, waiting for a response, and if none, prompting a response has already been described. The items tested were: water, fork, dinner plate, dessert, dessert spoon, and milk.

Test of reinforcer strength. Items for which the subject could imitate the sign but which he did not tact or mand in the respective baseline were then evaluated for their reinforcing strength. In this

test the subject was required to press a button (microswitch) ten times (FR10) in order to receive a small portion of the item. A five-minute segment was allotted for each item. Eight items were tested in this manner each day with a particular item being tested twice on two different days. A cumulative recorder recorded the response rate for each item. After all items had been tested in this manner they were categorized as producing high, medium, or low rates relative to all of the test items. From this, items which had produced high rates on both occasions or a high and a medium rate on the two occasions were selected. Thus only items which were demonstrated to be strong reinforcers were selected to train and to be used as back-up reinforcers.

Item selection. From the above-described baselines, items were selected on the following criteria: (1) that the subject could reliably imitate the sign; (2) that the subject did not tact the item when presented with the picture card; (3) that the subject had not manded the item if present in the mealtime baseline; and (4) that the item had been demonstrated to be a strong reinforcer. Nine items (two of which were non-food items) were chosen as back-up reinforcers for the tact condition. The remaining items were randomly divided into two parts; one group to be trained as tacts and one group to be trained as mands.

Experimental Procedures

Experimental design. As in Experiment I, a multi-element design was employed with the two conditions being run concurrently. Two sessions, one of each condition, were conducted daily with a 10-minute break scheduled between the sessions. The order of the sessions was alternated daily. A session was terminated after 50 training trials had been

completed which took approximately 15 minutes. Sessions were conducted five days per week.

Training procedure. Signs were trained in Experiment II in essentially the same way as vocal responses had been trained in Experiment I. That is, the experimenter presented prompt and question trials in a systematic sequence providing signs to be imitated on prompt trials while no signs were given on question trials. In addition, the experimenter also provided vocal prompts on prompt trials but these responses were not explicitly trained.

There were two differences between Experiments I and II regarding the type of prompts and the learning criterion. In Experiment I on Type A prompts the experimenter prompted each part of the phrase individually and proceeded only if the subject imitated each part correctly. On Type B prompts the phrase was prompted as one unit and the subject was required to imitate the entire phrase. On Type B prompts in Experiment II, the experimenter prompted only the first part of the phrase - the tact or mand autoclitic. The subject was required to imitate this and then emit the sign for the food item without any prompting. If he responded incorrectly or omitted, the experimenter recycled to a Type A prompt. The other difference was that if an error occurred on a criterion item in Experiment II, the item was not immediately retrained. Rather, the correct response was prompted until the subject responded correctly without a prompt and the item was then retested at the beginning of the next session. If the subject responded incorrectly on three successive occasions, only then was the item retrained. All other criteria remained the same.

The schedule of reinforcement in both experimental conditions was a differential schedule for primary reinforcement (Olenick & Pear, in press). On this schedule, correct responses on question trials were reinforced on a continuous schedule of reinforcement, while correct responses on prompt trials were reinforced on a low fixed-ratio schedule. The schedule on the prompt trials varied from an FR2 to an FR5 schedule during the course of the experiment, but was always the same across the two conditions.

As in Experiment I, the experimenter presented training trials after a fixed time interval had elapsed since the previous training trial, regardless of the subject's behavior. In Experiment II, the pacing of these intervals was aided by an electronic pacer. In Experiment II the experimenter placed the subject's hands palm-down on the table at the start of each trial. This was necessary for reliability purposes and was not done in Experiment I.

Tact Condition. In this condition the response "it's (name of food item)" was trained when a food item was presented in conjunction with the question "What's this?" The consequences for correct responses was delivery of one of the nine back-up reinforcers according to the prevailing schedule of reinforcement. The selection of any one of the back-up reinforcers was on a haphazard basis. Praise followed every correct response. Incorrect responses and omissions were treated as described above.

Mand Condition. In the mand condition, the food item was presented with the question "What would you like?" and the response trained was "want (name of food item)". Correct responses were consequted according to the prevailing schedule with a portion of the food item being trained. Praise followed every correct response. Incorrect responses and omissions

were treated similarly to the tact condition.

Probes. When either a tact or a mand met the learning criteria it was probed as a non-reinforced trial on the other condition. The manner in which this was done has been detailed in Experiment I. In Experiment II there were five probe trials per session. If only one item of a given condition had been learned it was probed four times; if a second item reached the learning criteria each item was probed twice; when a third item was learned, probes for the first item were discontinued and the second and third learned items were each probed twice. Thus, as items were learned the probes changed with the two most recently learned items being probed. In Experiment II a maximum of two items were probed with a total of four probe trials per session; in Experiment I a maximum of three items had been probed with a total of six probe trials per session. The reduced number of items probed per session as compared to Experiment I was necessitated by the reduced overall number of training trials per session. A fifth probe trial tested an untrained item which remained the same throughout the Experiment and acted as a control item.

Response definitions of transfer. The definitions of transfer were exactly as described in Experiment I except that the responses classified were signs, not vocal words.

Interobserver Reliability. Approximately one-tenth of all experimental sessions were videotaped for reliability checks. An observer familiar in sign language training scored the subject's responses independent of the experimenter's decisions. A correct response was determined by the subject's responses on the sign imitation baseline. Any hand movement off the table not directed toward the sign being

trained constituted incorrect responses. Reliability measures, number of agreements divided by the number of agreements plus disagreements, were computed on trials which the experimenter judged as correct, trials the experimenter judged as incorrect, and on probe trials. Trials on which the experimenter had recorded omissions were omitted from all calculations. For correct responses agreements ranged from 90% to 100%; for incorrect responses agreement was 100%; and for probes agreement was 100%.

Results

In Experiment II five tacts and two mands were learned. Figures 7 and 8 present the cumulative number of tacts and mands learned and the instances of transfer from one response class to the other.

In the upper graph of Figure 7, the tacts learned are presented cumulatively. No tacts were learned for the first 30 sessions; after this four tacts were learned at a fairly high rate; a long pause followed before the final tact was learned. Each tact required approximately 13 sessions to reach learning criterion. The lower graph of Figure 7 shows complete and partial transfer for the tacts learned. There were four opportunities per session for transfer to occur. Complete transfer was observed immediately when the first learned tacts were probed. Complete transfer continued to occur sporadically with a long interval of no instances from sessions 48 to 62. Partial transfer occurred early during probing and continued to occur on approximately 50% of the sessions for the remainder of the experiment. Generally, the frequency of partial transfer was somewhat higher than that of complete transfer from tacts to mands.

Figure 7. Cumulative number of tacts learned
and instances of complete and partial
transfer to mands for the tacts probed.

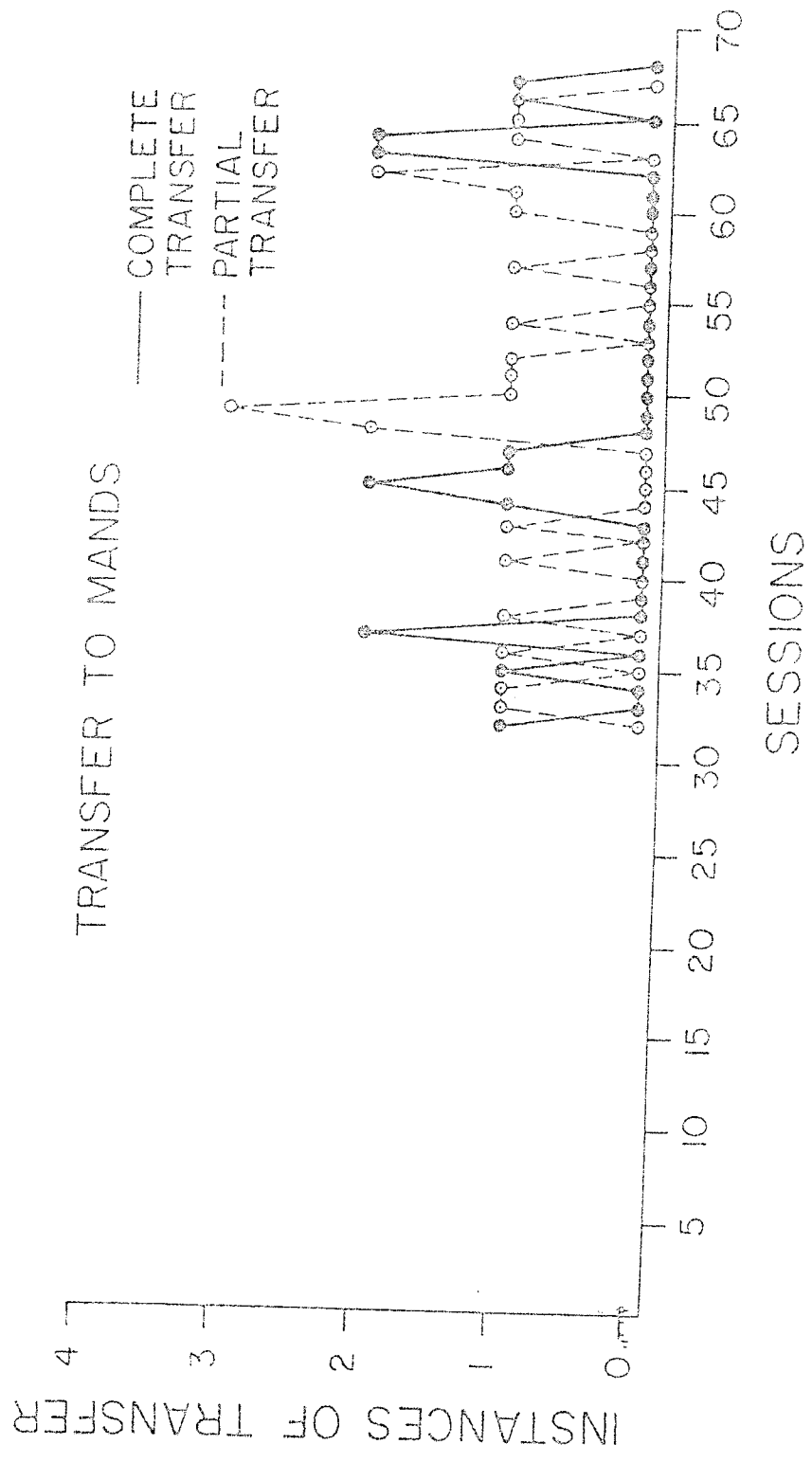
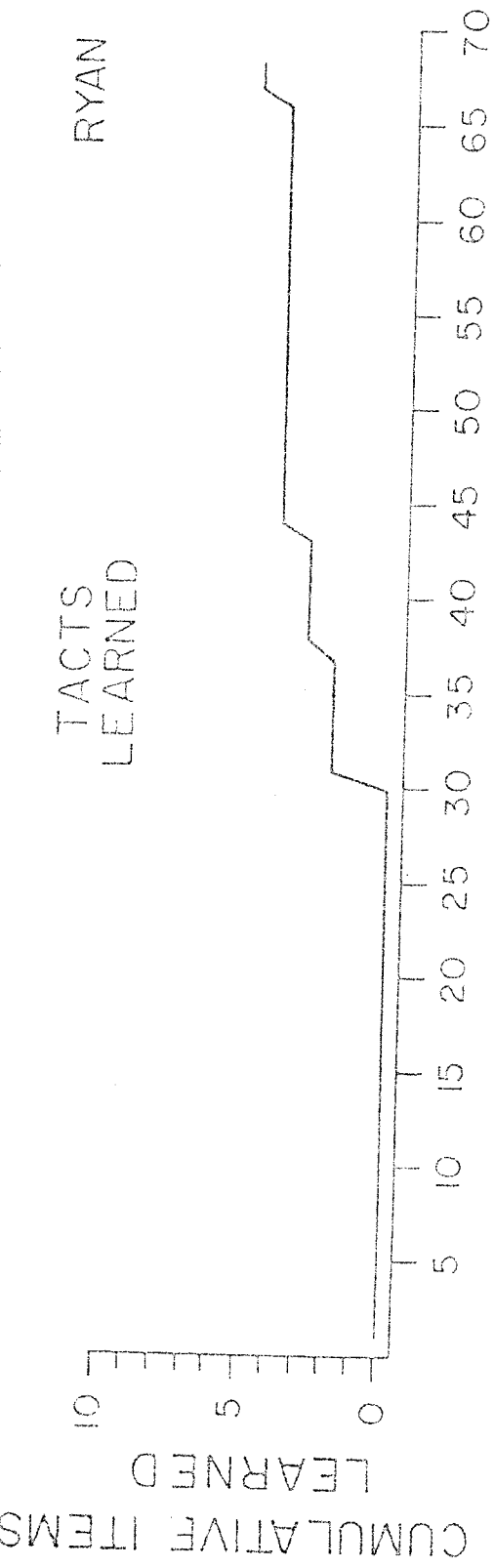
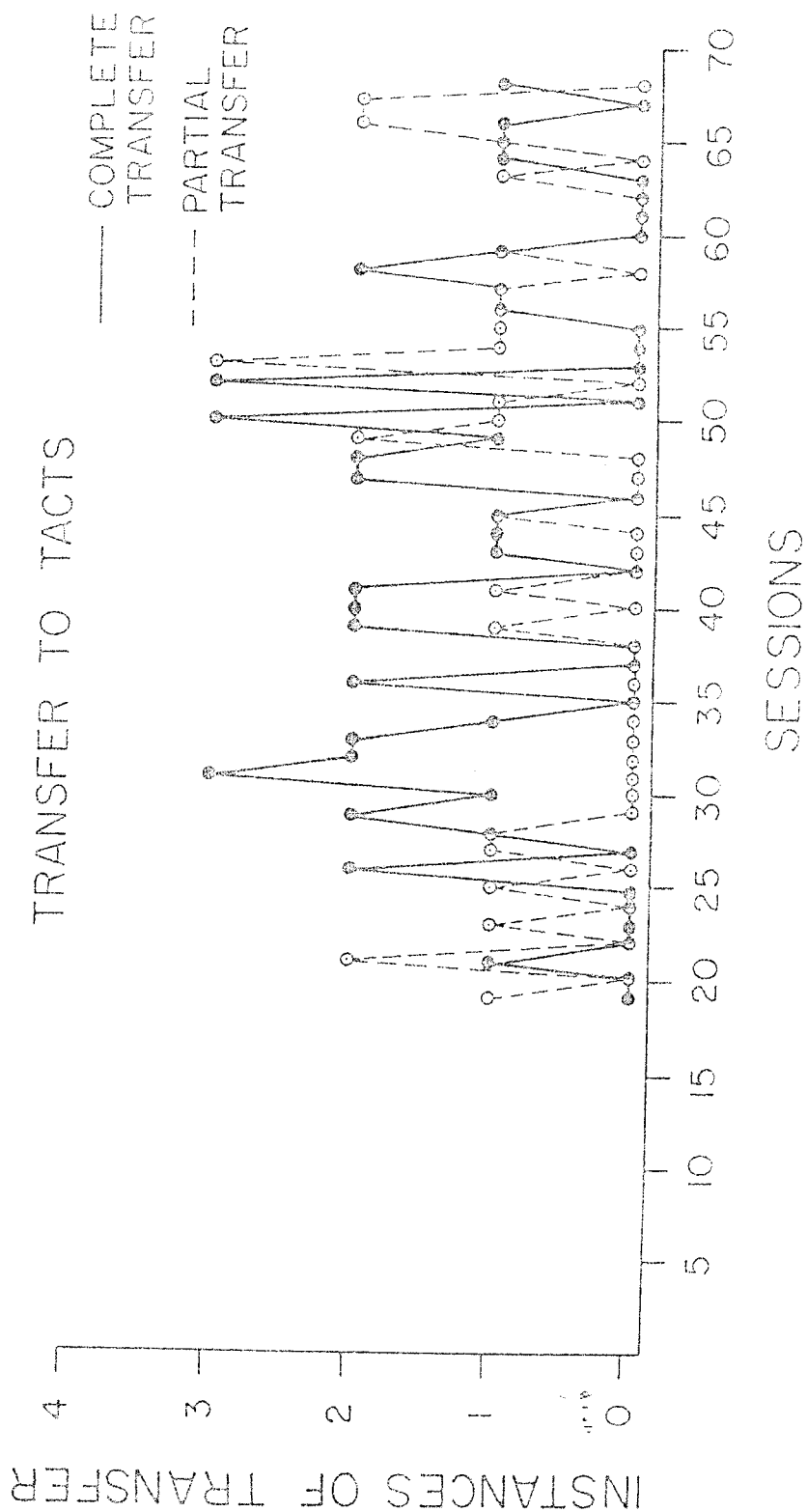
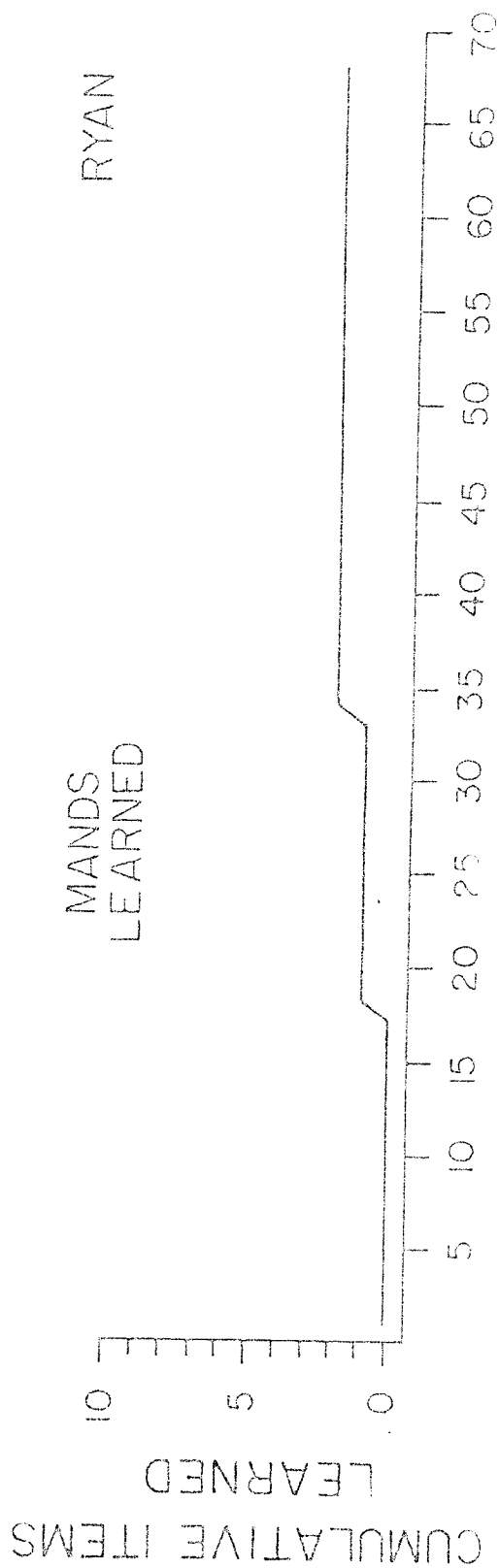


Figure 8. Cumulative number of mands learned
and instances of complete and partial
transfer to tacts for the mands probed.

4.00



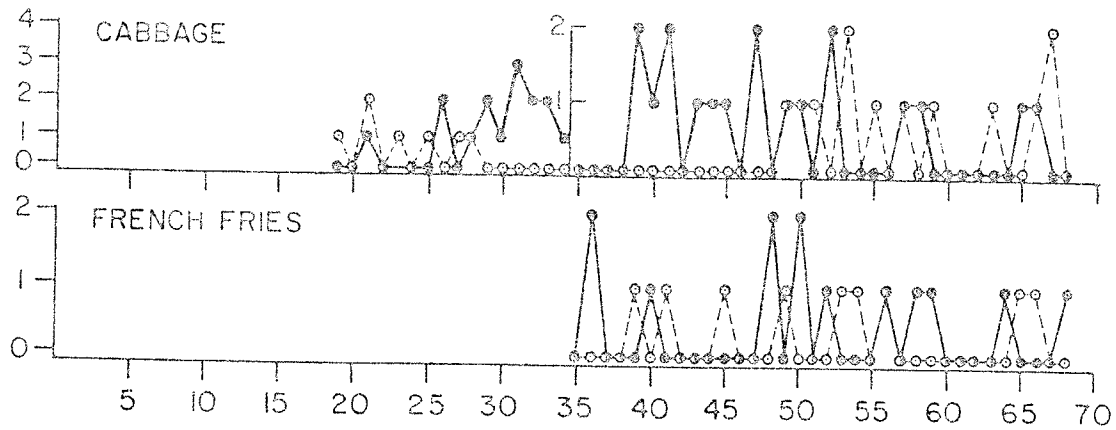
Mands learned are presented in the upper graph of Figure 8. Mands were learned at a very low rate requiring an average of 34 sessions for each item to be learned. The cover graph of Figure 8 shows complete and partial transfer. Shortly after the first mand was probed, complete transfer occurred and continued to occur with regular frequency when the second mand was learned and also probed. Partial transfer was observed early in the probing and with the exception of one brief period, it was repeatedly observed. Overall, there were more instances of complete transfer than of partial transfer from mands to tacts.

Figure 9 traces the instances of transfer for each individual item as a function of the sessions during which the item was probed. It also illustrates when a particular item was probed in relation to the other items. For the two mands probed, the instances of transfer were approximately equal. Frequency of transfer for the first mand, "cabbage", did not change dramatically when probing for the second mand, "french fries", was initiated. For the tacts the pattern of complete transfer was different for the different items probed. Complete transfer was observed only at the end of the probing for both "tomato" and "nut", whereas the opposite was true for "hamburger" and "chicken" - most of the instances of complete transfer occurred early in the probing. For all of the above four tacts, partial transfer occurred more consistently and at a higher rate than complete transfer. "Turkey" was only probed in one mand session and no transfer occurred.

Figure 9. Individual instances of complete and partial transfer from mands to tacts for the mands learned and from tacts to mands for the tacts learned as a function of the sessions during which the item was probed.

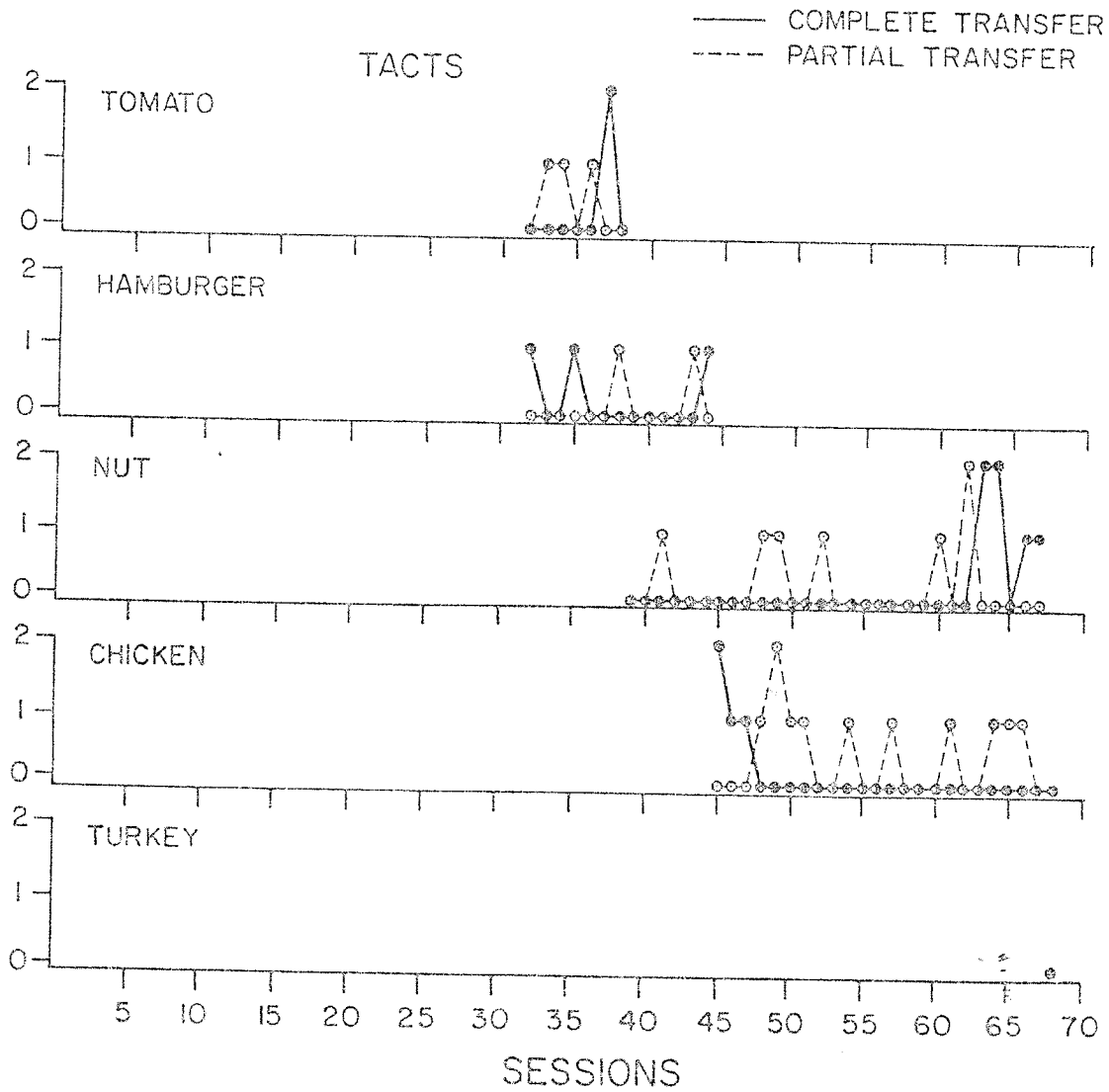
MANDS

RYAN



INSTANCES OF TRANSFER

TACTS



SESSIONS

The percentage of transfer, complete and partial, for the mands learned is compared to the percentage of transfer for tacts learned in Figure 10. Overall, the percentage of transfer from mands to tacts and from tacts to mands is approximately the same, with the exception of "turkey". Tacts and mands differ in that (1) there was a higher percentage of complete transfer for the mands compared to that for tacts and (2) for each mand the percentage of complete transfer was higher than the percentage of partial transfer while for only one of the tacts was this the case.

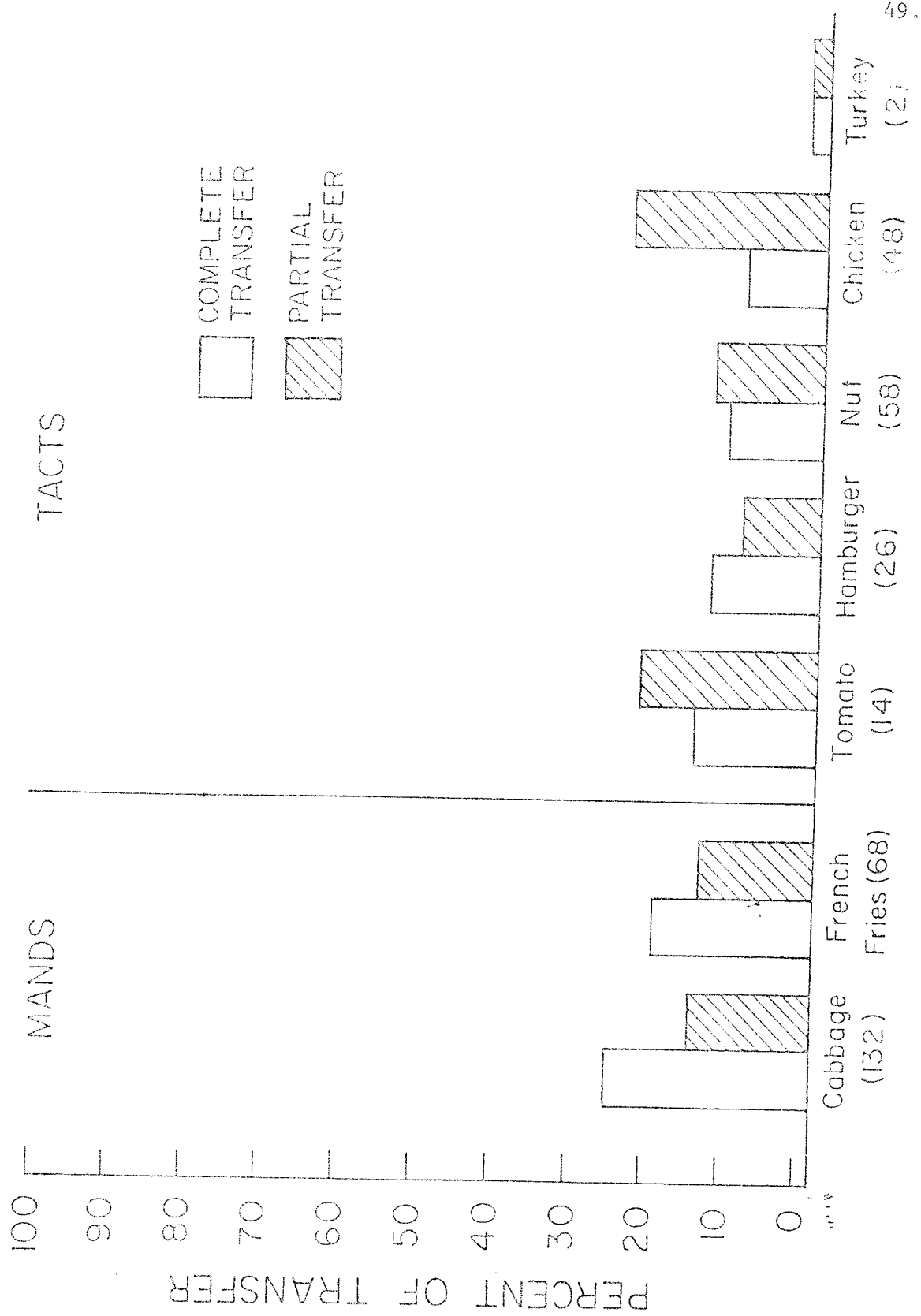
The control item, a fifth probe item, in each condition remained the same for the duration of the experiment. On no occasion was either of the control items correctly tacted or manded when probed.

Discussion

The results from Experiment II demonstrate that when tested the subject will often tact an item that has been trained only as a mand and will sometimes mand for an item that has been trained as a tact. This was demonstrated for more than one tact and mand.

Although the first mand learned was acquired much earlier in training than the first tact learned, in general tacts were learned more readily than mands. In Experiment I the number of mands learned greatly exceeded the number of tacts learned; however, the number of training trials per condition was not controlled. In correcting for this variable in Experiment II, it appears that tacts may be learned more rapidly than mands.

Figure 10. Percentage of transfer, complete and partial, for tacts and mands learned.



There were many instances of partial transfer in Experiment II compared to almost none in Experiment I. The high frequency of partial transfer in this experiment may be a function of the verbal form trained, sign language. Anecdotal data showed many blends of signs which were later classified as partial transfer. The level of the subject's verbal repertoire, quite different from the subject of Experiment I, may also have contributed to the many instances of partial transfer.

In Experiment I the instances of tacts transferring to mands were much more frequent than mands to tacts. However, the direction of greatest transfer was in the other direction in Experiment II: mands transferred more often to tacts than tacts to mands. The pattern of transfer for each item taken individually is reversed also. In Experiment I complete transfer was observed regularly for nearly every tact whereas the frequency of transfer for the mands varied greatly. The opposite was the case in Experiment II. There is difficulty in trying to assess which response class transfers more readily with such diverse results, and based on the limited data. However, in both cases the greatest amount of transfer was observed for the response class that had the lower learning rate. Thus, number of items learned may be a critical variable in the observation of transfer.

CHAPTER IV

Summary and Conclusions

Experiments I and II demonstrated that verbal responses learned as a particular response class will frequently transfer to another response class when tested. The data from Experiment I, although pilot-like, nevertheless do support the occurrence of transfer.

That the phenomena of transfer across tacts and mands, although transitory in nature, has been demonstrated is an important experimental finding. Sidman (1960) has stated that initially experiments must be performed to establish the existence of a behavioral phenomenon and once established a systematic investigation of the controlling variables can be carried out. As a follow-up, experiments designed (1) to determine why some items transfer so readily while others do not, (2) to evaluate whether the number of tacts or mands learned has an effect on the transfer in either direction, and (3) to compare the extent of generalization of tacts and mands to other environments could be conducted.

With regards to the future practice in verbal training, a strategy which primarily trains tacts while at the same time providing the child with even a minimal manding history would probably be the most efficient method of developing verbal behavior. The tacts seem to be acquired quite quickly and practically tacts are easier to train. It appears that tacts will often transfer to mands when the situation occurs provided the child also has some mands. Although the instances of transfer from mands to tacts is much greater than in the other direction, the limited number of mands learned restricts any recommendations made to train mands only.

REFERENCES

- Buddenhagen, R. Establishing vocalizations in mute mongoloid children. Champaign, Illinois: Research Press, 1971.
- Gardner, R.A., & Gardner, B.T. Teaching sign language to a chimpanzee. Science, 1969, 165, 664-672.
- Gardner, R.A., & Gardner, B.T. Early signs of language in child and chimpanzee. Science, 1975, 187, 752-753.
- Garcia, E., Guess, D., & Byrnes, J. Development of syntax in a retarded girl using procedures of imitation, reinforcement, and modelling. Journal of Applied Behavior Analysis, 1973, 6, 299-310.
- Guess, D., Sailor, W., Rutherford, G., & Baer, D.M. An experimental analysis of linguistic development: The productive use of the plural morpheme. Journal of Applied Behavior Analysis, 1968, 1, 297-306.
- Halle, J.W., Marshall, A.M., & Spradlin, J.E. Time delay: A technique to increase language use and facilitate generalization in retarded children. Journal of Applied Behavior Analysis, 1979, 12, 431-439.
- Hartung, J.R. A review of procedures to increase verbal imitation skills and increase functional speech in autistic children. Journal of Speech and Hearing Disorders, 1970, 35, 203-217.
- Jeffrey, N.B. Increase and maintenance of verbal behavior of a mentally retarded child. Mental Retardation, 1972, 10, 35-39.
- Kent, L.R. Language acquisition program for the retarded or multiply impaired. Champaign, Illinois: Research Press, 1974.
- Lovaas, O.I. A program for the establishment of speech in psychotic children. In H.N. Sloane and B.O. MacAulay (Eds.), Operant procedures in remedial speech and language training. Boston: Houghton, Mifflin Co., 1968, pp. 125-156.
- Lovaas, O.I. The autistic child: Language development through behavior modification. New York: Irvington Publishers Inc., 1977.
- Lovaas, O.I., Berberich, J.D., Perloff, B.F., & Schaeffer, B. Acquisition of imitative speech by schizophrenic children. Science, 1966, 151, 705-707.
- Olenick, D.L., & Pear, J.J. Differential reinforcement of correct responses to probes and prompts in picture-naming training with retarded children. Journal of Applied Behavior Analysis, in press.

- Risley, T.R., & Wolf, M. Establishing functional speech in echolalic children. Behavior Research and Therapy, 1967, 5, 73-88.
- Sidman, M. Tactics of scientific reserach. New York: Basic Books Inc., 1960.
- Skinner, B.F. Verbal behavior. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1957.
- Sloane, H.N., Johnston, M.K., & Harris, F.R. Remedial procedures for teaching verbal behavir to speech deficient or defective young children. In H.N. Sloane and B.D. MacAulay (Eds.), Operant procedures in remedial speech and language training. Boston: Houghton, Mifflin Co., 1968, pp. 77-101.
- Snyder, L.K., Lovitt, T.C., & Smith, J.D. Language training for the severely retarded: Five years of behavior analysis research. Exceptional Children, 1975, 42, 7-15.
- Stephens, C.E., Pear, J.J., Wray, L.D., & Jackson, G.C. Some effects of reinforcement schedules on teaching picture names to retarded children. Journal of Applied Behavior Analysis, 1975, 8, 435-447.

APPENDIX A

A Summary of Skinner's Definitions of Verbal Operants

Skinner (1957) presented a comprehensive account of verbal behavior within the framework of the experimental analysis of behavior. Essentially, he defined verbal behavior as behavior which is reinforced through the mediation of another person. This is opposed to other behavior which directly operates on the environment through mechanical actions. Although verbal behavior acts on the environment indirectly, an analysis of the functional relations can be done in a manner similar to a functional analysis of other human behavior. The necessary steps are to describe the topography of the behavior and then to identify the variables of which it is a function. With respect to topography, Skinner stated that a rough description at this point will suffice. Thus, rather than using traditional definitions employed by linguistics, Skinner focuses on the effects the response has on the environment and the resultant controlling conditions. On the basis of this, a verbal operant is defined as a response class whose occurrence has an identifiable form, has a characteristic effect on the environment, and comes under control of one or more independent variables. Skinner identified five verbal operants - echoic, intraverbal, autoclitic, tact, and mand.

An echoic response is under the control of a preceeding verbal stimulus. The response emitted has a similar sound pattern, that is, matches the stimulus it follows. Reinforcement of echoic behavior may be in the form of educational reinforcement such as parental approval or it may be clarifying what was previously said; specifically, reinforcement is of a generalized nature and does not depend on a specific state of deprivation. Many researchers have taught echoic behavior

to nonverbal children; an illustrative study would be Lovaas, Berberich, Perloff and Schaeffer (1968).

An intraverbal response is similar to an echoic in that it is also controlled by an antecedent verbal stimulus; however, intraverbal behavior does not match or have the point-to-point sound correspondence to the stimulus it follows. For example, the response "blue" to the verbal stimulus "red, white, and" would be an intraverbal response. Reinforcement is also generalized reinforcement.

An autoclitic is a response to other verbal behavior which serves to modify the listener's reaction by specifying a property of the speaker's verbal response or the circumstances responsible for that response. For example, in the statement "I think it's raining", "I think" is an autoclitic because it conveys to the listener that the speaker is not definite about the weather conditions. Autoclitic processes have been demonstrated experimentally; for example, Guess, Sailor, Rutherford and Baer (1968) trained the grammatical rule of pluralization, and more recently, Garcia, Guess and Byrnes (1973) demonstrated the development of syntax.

A tact is a verbal response which is under the control of a prior stimulus which could be a particular object or event or a property of either. Thus a tact is emitted upon presentation of some physical stimulus and is followed by a generalized reinforcer. An example of a tact is when a child emits the response "doll" in the presence of a doll. The reinforcement of this response may be approval by the parent - "that's right". The majority of the data reported on tacting has been as part of a 'package' program to teach functional speech to different populations - speech-deficient children (Sloane, Johnston & Harris,

1968), psychotic children (Lovaas, 1968), and echolalic children (Risley & Wolf, 1967). Other researchers have used the tacting response as a mode for studying other variables. For example, Stephens, Pear, Wray and Jackson (1975) studied schedules of reinforcement with the tacting response as the dependent variable.

The mand is a verbal operant which is under the control of a condition of deprivation or aversive stimulation and is reinforced by a characteristic consequence. The mand specifies its reinforcement. Because the state of deprivation or aversive stimulation is the necessary condition preceeding a mand, there is no specific relation to any prior stimulus. For example, if a person is in a state of water deprivation and the statement "give me water" is emitted, this would be a mand reinforced by the listener providing some water. The literature on manding parallels that on tacting in that mands have usually been studied only as part of a program on language training (Johnston & Harris, 1968; Lovaas, 1968; Risley & Wolf, 1967).