A BASIC AND APPLIED INVESTIGATION INTO THE EFFECT OF THE RATE OF REINFORCER DELIVERY

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by

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This sub-thesis describes original research carried out by the author in the Division of Psychology of the Australian National University.

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ABSTRACT

There is some evidence from basic research with animals that increasing the rate of delivering a reinforcer serves to increase response rates. There have been very few applied studies which have investigated rate of delivering a reinforcer independent of other variables, especially with non-discrete or durational target behaviours. Reinforcement remains a central feature of training or intervention programmes with severely developmentally delayed clients. Yet the parameters of a reinforcer and the parameters of the reinforcement process have not been fully investigated.

The purpose of the current research was to investigate the effects of delivering a functionally positive reinforcer at a high and very high rate on discrete and durational target behaviours with two severely developmentally delayed adults.

The present research consisted of two single subject ABACAC within subject reversal design experiments. Trainers presented the onset of the different reinforcer delivery rate conditions in a multiple baseline across two tasks.

Results in the first three conditions of Experiment 1 demonstrated that when initially delivered at an increased rate, verbal praise rate was a functionally positive reinforcer of accurate production rate and time spent in production. When the rate of delivering praise was further increased, this increase was initially associated with a further increase, but a later decrease in target behaviours. All target (production) behaviours became more variable with Client employee 1 and the function of the positive reinforcer did not remain stable when delivered at its highest rate. A correlational analysis of some of the data in the very frequent praise conditions did not support a positive proportional relationship between delivery rate of the reinforcer and either of the target behaviours.

Results during the first three conditions of Experiment 2 also demonstrated that an increased rate of verbal praise was a functionally positive reinforcer of accurate production rate and time in production. When the rate of verbal praise was further increased, this increased rate was associated with maintaining, but not further increasing accurate production rates. Further increasing the rate of verbal praise was

associated with decreases in time spent in production. Only one of the target behaviours became more variable with Client employee 2 when praise was delivered at a very frequent rate. A correlational analysis of some of the data in the very frequent praise conditions offered partial support for a positive proportional relationship between rate of delivering the reinforcer and the target behaviours.

Although reinforcer delivery rate was associated with different specific effects across the two Client employees, the reinforcing function of verbal praise did not remain stable when delivered at different rates across both individuals. It was concluded that it cannot reliably be predicted that a reinforcer delivered at one rate will continue to reinforce at a higher rate across all behaviours. This result is discussed in light of previous related research and the parameters of the reinforcement process.

The specific effects obtained across the two Client employees are discussed with reference to contributing experimental factors and possible functional accounts of the effects. Suggestions for future research are made.

INTRODUCTION

Positive reinforcement is one of the most widely used techniques employed by therapists and educators for effecting behaviour change in a variety of settings (Cooper, Heron & Heward, 1987; Vollmer & Iwata, 1991). Because of its reliability, positive reinforcement is considered a very powerful procedure when used alone or in conjunction with other behavioral techniques. However, possibly because of its apparent simplicity, positive reinforcement is often applied incorrectly, incompletely, or without a full understanding of the implications and limits of the technique. Despite much replicated research and textbooks devoted to descriptions of general rules or 'principles of reinforcement' (see Honig, 1966; Cooper, Heron & Heward, 1987, for examples of complete descriptions), the limits and parameters that influence reinforcement (consequence frequency, magnitude, schedule and immediacy) are not yet thoroughly delineated in either the experimental or applied fields (Kelleher & Gollub, 1962; Zeiler, 1978; Balsam & Bondy, 1983).

Operant reinforcement is functionally defined as occurring when a behaviour is followed by a consequence, and as a result similar behaviours occur more often in the future (Cooper, Heron & Heward, 1987). This describes the *process* of reinforcement. Reinforcement can also be defined as an *operation* that refers to the occurrence of a consequence subsequent to a behaviour which increases the probability of that behaviour (Cooper, Heron & Heward, 1987). Operant reinforcement strengthens a response class of behaviours, not a single behaviour (Skinner, 1953). These definitions of reinforcement can result in confusion when used interchangeably or, when used to mean positive reinforcement. As a solution Catania (1984) proposes that the term reinforcement is descriptive rather than explanatory and views the necessary conditions as follows.

> First, a response must have some consequence. Second, the response must increase in probability (i.e. the response must be more probable than when it does not have this consequence). Third, the increase in probability must occur *because* the response has this consequence and not for

> some other reason. For example, if we only knew that a response had become more probable, it would not be appropriate to say that the response must have been reinforced; the response might have been elicited by a stimulus. It would not even be sufficient that the response was now producing some stimulus it had not been producing before. We would still have to know whether responding increased *because* the stimulus was its consequence (p.64).

Thus, positive reinforcement is concluded only if a behaviour is followed by a consequence which serves to increase the future occurrence of similar behaviours, and whose removal serves to decrease the behaviours.

A reinforcer is defined solely by its function. The defining characteristics of reinforcers are how they change behaviour; there is no concept that predicts reliably when events will be or will not be reinforcers (Morse and Kelleher, 1970) . An environmental event or stimulus is identified as a positive reinforcer when; 1) it follows a particular response and there is a subsequent increase in similar responses, and; 2) there is not a subsequent increase in similar responses without the presence of the reinforcer (Catania, 1984). A negative reinforcer is a stimulus or event following a response, whose removal serves to increase the occurrence of similar responses (Catania, 1984). The process or operation of reinforcement cannot be ascertained as having occurred without firstly identifying the functional reinforcer (Arco, 1987). Thus, it is imperative that both reinforcer characteristics of increasing the behaviour it consequently follows and decreasing that behaviour when removed, are tested before concluding a stimulus or event to be a positive reinforcer (Herson & Barlow, 1976; Catania, 1984; Arco, 1987).

Early research into positive reinforcement with non-human subjects focused on testing the generality of the principle that increasing reinforcement serves to increase the response frequency or accuracy (Meyer, 1951; Meyer & Harlow, 1952; Schrier, 1956, 1958; Schrier & Harlow, 1956). Results from these studies generally showed that rats and monkeys responded with increased accuracy, speed, or reduced response latency on discrimination tasks when the reinforcer (usually food) magnitude was increased (see Schrier, 1958 for a review of early animal studies).

In a comprehensive review of the basic literature on positive conditioned

reinforcement by Kelleher & Gollub in 1962, no studies are cited which test the principle that increased reinforcement leads to increased responding. A similar lack of research on this relationship was noted by Honig (1969) who pointed out the need for additional studies on the parameters of conditioned reinforcers. In addition, a review of the more recent experimental literature with animals failed to obtain any studies that investigated the limits of the relationship between reinforcement and responding, independent of other variables.

There are early studies with non-human subjects that have reported results which are related to the limits and parameters of reinforcement and reinforcers. For example, Wike and Casey (1954, cited in Williams, 1973) found that satiated rats ran faster if they were rewarded for entering a goal box containing food, which they did not eat, than for entering an empty goal box. Satiation refers to "the condition that exists when an overabundance of a reinforcer has been provided with a corresponding decrease in the future occurrence of the behaviour. In short, the reinforcer has lost its reinforcing properties" (Cooper, Heron & Heward, 1987, pp.263). Satiation is generally considered as an aversive procedure (Ayllon, 1963), and is suggested as a necessary and sufficient condition for punishment (Holburn & Dougher, 1986). Whether considered as an aversive procedure or not, satiation is said to be the upper limit on the relationship between reinforcer amount and responding (Skinner, 1953; Cooper, Heron & Heward, 1987). However, decreases in response rates have been evidenced without reference to satiation. For example, Skinner and Morse (1958) found that making a known reinforcer (food) contingent upon wheel turning by a rat, decreased rather than increased the rate of running under conditions in which a high rate of running normally occurred. Results from studies such as these are viewed as exceptions to the rule. Morse (1966) suggests that these exceptions are limited to certain classes of responses and asserts that "reinforcement may be assumed to have a characteristic and reproducible effect on a particular behaviour, and usually it will enhance and intensify that behaviour" (pp.55). It would seem however, that satiation may not be the only phenomena which can limit increases in responding.

Other studies with non-human subjects have reported results which are also

related to the limits and parameters of reinforcement and reinforcers. One such effect reported by some researchers of reinforcement schedules and preferences of alternative responses (Harzem, Lowe & Davey, 1975; Harzem, Lowe & Priddle-Higson, 1978; Zeiler, 1978), concerns interfering behaviour or behaviour that competes with the emission of the target response. Some studies found that for a time after its presentation, the reinforcer may occasion behaviour that competes or interferes with the reinforced response, and that the duration of the resulting response-suppression is related to the magnitude of the reinforcer (Harzem, Lowe & Davey, 1975; Harzem, Lowe & Priddle-Higson, 1978). Other researchers (Zeiler, 1978) in summarising the results from this area of research found that both responses were maintained, and the frequency of each response was related to the consequences arranged by each schedule. Despite these different results, no direct laboratory analysis of interfering responses and their relationship to delivery rate of the reinforcer independent of other variables were found when reviewing the relevant recent literature.

By comparison, there has been considerably more research concerned with varying the frequency of a reinforcer under various reinforcement schedules (a prescription for initiating and terminating stimuli, either discriminative or reinforcing, in time and in relation to some behaviour) in order to analyse the process of reinforcement with both animals (e.g. Morse, 1966; Lowe, Davey & Harzem, 1975; Harzem, Lowe, & Priddle-Higson, 1978; Gentry, & Eskew, 1984) and humans (Schmitt, 1974; Heth, & Warren, 1978; Buskist, Oliveira-Castro, & Bennet, 1988).

Results from reinforcement schedule studies showed that increases or decreases in response rates were controlled by the schedule and the current rate of responding (Morse, 1966 ; Schmitt, 1974; Harzem, Lowe, & Priddle-Higson, 1978; Heth, & Warren, 1978; Gentry, & Eskew, 1984; Buskist, Oliveira-Castro, & Bennet, 1988). Reinforcer delivery rate effects were not independently assessed because these researchers were more interested in analysing and replicating the control over responding achieved by the schedule (for a more detailed discussion, see Morse, 1966; Harzem, Lowe & Priddle-Higson, 1978). Reinforcement schedule studies however, are primarily restricted to well controlled settings that permit the

identification of discrete, unitary responses, and are not commonly applied to non-discrete target behaviours (Morse, 1966). More importantly, the schedule studies reviewed do not directly test the limits of the relationship between reinforcement increases and response improvements or investigate which properties of a reinforcer may be more or less critical to the relationship.

In the applied literature, despite the wide spread application of positive reinforcement for facilitating the acquisition of a broad range of behaviours, very few studies are concerned with directly testing the generality of the principle that increasing a parameter of a reinforcer increases responding (see for example, Balsam & Bondy, 1983; Lennox, Miltenberger, Spengler & Erfanian, 1988 for reviews). It appears that research utilising positive reinforcement procedures assumes the generality of this principle and seeks to improve, rather than establish the maximum performance of subjects. For example, in Balsam & Bondy's (1983) review of the negative aspects of positive reinforcement, the "rule" of increasing responding by increasing the reinforcer amount is clearly stated, but little is devoted to delineating the limits of the relationship .

Several studies in the applied literature that have varied reinforcer magnitude in conjunction with other variables (e.g. Gerwirtz & Baer, 1958a, 1958b; Landau & Gewirtz, 1967; Gerwirtz, 1969; Perry & Garrow, 1975; Barton & Ascione, 1978; Miller & Kirschenbaum, 1979). Much of this research has varied the number (but not the rate) of contingent reinforcers delivered in an attempt to test the response deprivation-satiation hypothesis. This hypothesis suggests that a contingent response serves as a reinforcer or a punisher depending upon the amount of the contingent response delivered relative to its free-operant level and the free-operant level of the target response and, that a contingency can be calculated *a priori* using a simple formula (Gerwitz, 1969; Allison & Timberlake, 1974; Barton & Ascione, 1978; Miller & Kirschenbaum, 1979; Holburn & Dougher, 1986; Vollmer & Iwata, 1991). Results from this line of research were varied and inconclusive, both in terms of the response deprivation-satiation hypothesis and in reliably increasing target behaviours. Furthermore, many of these studies did not establish the functional relationship between increases in the amount of the reinforcer and increases in

responding.

Comparatively fewer studies in the applied literature have been concerned with the effect on target behaviours of increasing the rate or magnitude of reinforcers independent of other factors. A possible reason for this may be that studies which fail to increase (or decrease) the target behaviour by increasing (or decreasing) reinforcer magnitude might commonly be viewed as treatment failures and thus, may not be reported. Exceptions are experiments that seek to decrease target behaviours by increasing reinforcer magnitude via a satiation procedure. For example, Ayllon (1963) showed that increasing reinforcer magnitude served to decrease an undesirable target behaviour. Ayllon (1963) increased the number of towels given to a psychotic patient who hoarded towels. After a baseline was established, towels given to the patient were rapidly increased over six weeks. Towel hoarding by the patient increased during this period until the patient began to rid herself of a few (she had accumulated 625 towels). Thereafter, no more towels were given to the patient who continued to remove almost all of the towels she had accumulated. This result was maintained over each of the subsequent twelve months following the cessation of the experiment. Ayllon (1963) concluded stimulus satiation had occurred and suggested that the reinforcer functioned as an aversive stimulus at a high magnitude. It is not clear from this study how the satiation procedure operated or could be extended since a functional analysis of the procedure was not undertaken. Would the target behaviour have continued to decrease if increasing the delivery of towels was continued? As stated earlier, the more recent studies utilising a satiation procedure seek to test the satiation-deprivation hypothesis rather than test the limits of increasing reinforcer magnitude.

One study that does assess the effects on responding of increasing reinforcer magnitude independent of other variables is a study conducted by Waters (1979). Waters (1979) investigated the effect of one versus two occasions per day of giving an approving comment as a reinforcer on baseline time samples of the working behaviour of 18 mildly developmentally delayed female workers in a rehabilitation centre. Results indicated that one occasion of an approving comment per day increased working behaviour and that two such occasions of approval per day further

increased working behaviour. However, this study did not establish an occasion of approval as a functional reinforcer. In addition, the variations in the amount of the reinforcer were very small as the researcher was not attempting to test the upper limit of the relationship between reinforcer increases and response increases.

It is difficult to draw conclusions about the limits of the relationship between magnitude of reinforcer and response rate based on the applied research. This is due to methodological shortcomings and the obviously small number of studies that have assessed reinforcer magnitude variations independently of other factors. Very few of the studies functionally identified the reinforcer used. Thus, conclusions about the reinforcer being responsible, as opposed to any other stimuli or combination of events, for increasing or decreasing the target behaviour are tentative (Herson & Barlow, 1976; Catania & Brigham, 1978; Arco, 1987). Furthermore, none of the studies reviewed were directly concerned with assessing the limits of the general principle that increasing reinforcer amount serves to increase response rates.

In summary, research concerned with the effects of varying the magnitude and /or frequency of a positive reinforcer demonstrated both increases and decreases in responding on target behaviours. Early animal studies generally support a positive relationship between a functional reinforcer and response rates, although there are exceptions. Satiation is considered to be an upper boundary on the relationship between reinforcer amounts and response rates. Other related effects concerning the parameters of reinforcement, such as interfering or competing behaviours, have not been directly tested. Overall, the properties of reinforcers which may or may not be critical to the process of reinforcement, have not yet been thoroughly investigated in the experimental animal literature.

Results from applied studies have shown both decreases and increases in the target behaviour when the magnitude or frequency of a positive reinforcer was increased. Most studies in the applied field appear to assume the principle that increasing reinforcer magnitude or frequency leads to increasing response rates, and do not assess the limits of the principle directly. In addition, a paucity of directly related applied research makes it difficult to draw conclusions about the critical parameters of a reinforcer.

The parameters of reinforcers most commonly used are frequency, magnitude, and schedule. With the exception of Waters (1979), none of the studies reviewed here utilised rate per quantity of time to deliver a reinforcer. Furthermore, very few studies clearly report how much or how often a reinforcer is delivered, making replication and a clear understanding of the reinforcer effects difficult. Those studies that do clearly report the magnitude or frequency of reinforcement are often referring to the occurrence of the entire process of reinforcement, rather than to a specific parameter of the reinforcer.

With two exceptions, all studies reviewed here were confined to examining effects of varying reinforcer magnitude or frequency on discrete behaviours. Non-discrete, chained or durational behaviours are not commonly studied when investigating the relationship between response rates and reinforcer parameters. These behaviours remain open to investigation. Taken together, the results from both the basic and applied research reviewed here do not adequately test the generality of the principle that increasing the magnitude, frequency or rate of a positive reinforcer serves to reliably increase responding. Nor do these results clarify those properties of reinforcers which may be or may not be critical to the process of reinforcement.

Applied behaviour analysis texts and "how to" books, (Catinia & Brigham, 1978; Logan, 1981; Cooper, Heron & Heward, 1987) however, caution the reader about delivering too much reinforcement and instructing them to control for satiation. "General rules" and recipes offered to control for satiation from these authors include; alternating or varying the response and/or reinforcer to ensure novelty (Logan, 1981; Cooper, Heron & Heward, 1987), arranging the magnitude of reinforcer proportionally to the effort involved in making the response, and ensuring a state of deprivation exists and access to the reinforcer in other environments is restricted (Cooper, Heron & Heward, 1987).

A functional definition of satiation or other possible effects of increasing the reinforcer is not given. These authors say little regarding the specific empirical evidence on which these cautions are based. Their description of the possible effects or limits of increasing reinforcer delivery is insufficient to answer the question; How much of a reinforcer is too much? Neither the research into positive reinforcement or

these "how to" books clearly identify or distinguish between the possible or reported effects of increasing reinforcer delivery. It may be difficult, for example to distinguish functionally (if there is a distinction) between a satiation effect and a punishment effect as both serve to decrease response rates when associated with the presentation of a reinforcer. It is not clear that decreased response rates are the definitive feature of a satiation effect, since it has been shown that rats who are food satiated will still eat and respond to food as a reinforcer in a goal box, and humans will still eat when not hungry. It is also not clear if there is a maximum beyond which responding does not increase further, possibly due to the physical limitations of the target behaviour or subject, despite further increases in the reinforcer. It is clear however, that the general rules and parameters of reinforcement are vaguely defined and that we need to continue to assess whether increasing a reinforcer will always, and with consistent limits, continue to increase responding.

There is an assumption that reinforcement principles and research results obtained with animals and normal populations will apply in the same manner to the developmentally delayed population. Although there is promising evidence to support this assumption, the assumption itself is still in the process of being thoroughly tested, especially in a variety of applied settings with severely developmentally delayed clients (e.g. Huddle, 1967; Catania & Brigham, 1978; Waters, 1979; Lennox, Miltenberger, Spengler & Erfanian, 1988). Much of the research concerned with the acquisition of work skills with the developmentally delayed population has focused on those with mild to moderate delays (Huddle, 1967).

Severely developmentally delayed clients in supported employment or training programmes need to be seen as economically viable if integration into the community is to be fully achieved. A common measure of economic viability is so called 'normal' production measures (Waters, 1979). The argument for normalised production as a measure is that if the production output of the severely developmentally delayed can approach the production output of the normal population, competition in the open employment market may be more accessible to those with severe delays.

Positive reinforcement is a central feature of most training or education programmes with the developmentally delayed and has been used to increase and maintain of a wide range of work, social and living skills (Kelleher & Gollub, 1962; Huddle, 1967; Lennox, Miltenberger, Spengler & Erfanian, 1988; Vollmer & Iwata, 1991). Given the lack of clear evidence or guidance available for maximising the production output of the severely developmentally delayed, it is important to explore those properties that are most favourable to normalised production with this group.

In particular, it would be very useful to know if the rate of delivery of a consequence changes the response and if there are differences between high and very high reinforcer delivery rates in terms of production output. This may serve to improve the cost-effectiveness of reinforcement procedures, particularly with respect to the developmentally delayed population as a major recipient of these procedures. If the rate of delivery of a reinforcer is a significant parameter of the reinforcement procedure, then we might be able to maximize production output by changing reinforcer delivery rate. Manipulating the rate at which a reinforcer is delivered may be a relatively simple and inexpensive method of assisting the integration process for the severely developmentally delayed population. We simply cannot predict, based on what little evidence exists, if such a method would be successful. Rather, the question remains open.

The purpose of the present research was to investigate the stability of the effect of a positive reinforcer at increasing rates of delivery, with two severely developmentally delayed adults in a supported employment programme. The study consists of two single subject experiments and was designed; i) to identify a functionally positive reinforcer, ii) to investigate its effect on discrete and durational target behaviours (production rate and duration of time spent in production) when delivered at a frequent and very frequent rate, iii) to investigate for transfer of training from experimental to non-experimental tasks and, iv) to determine if the results were similar in a second experiment with another subject.

GENERAL EXPERIMENTAL METHOD

(i) ***Setting***

The experiments described in this sub-thesis were conducted at the Training, Evaluation and Demonstration Centre (TrED) at the University of Canberra's Faculty of Education, Australian Capital Territory. The TrED Centre was chosen as the applied research setting because it satisfied this experimenter's criteria of a systematic behavioral approach to individualised skills training with sufficient consistency of skill across trainers. The Training, Evaluation and Demonstration Centre (TrED) was established in 1982 to develop, apply, evaluate and disseminate "a variety of formal structured training techniques suitable for the habilitation services for adults with severe intellectual disability" (TrED, 1988). The TrED Centre achieves its purpose in two ways. The Centre provides training to personnel who service intellectually disabled persons and it provides vocational and life skills training to a group of severely intellectually disabled adult client employees. The TrED Centre utilises a "structured training" method based on the principles of applied behavioral analysis and behavioral management for teaching vocational and life skills (after Bellamy, Horner & Inman, 1979 and Podilchack & Cibiri, 1980).

Client employees at the TrED Centre carry out a variety of electronics work ranging from simple wire tip cutting to the assembly of circuit boards and computer keyboards. Some of this work is contracted from local companies and the client employees receive extra salary for this work. Client employees are assisted by two to three trainers who, as a team, are responsible for the design, implementation, training and ongoing evaluation of individualised Client employee skill acquisition programmes. All trainers have a minimum of tertiary academic qualifications in either Psychology or Special Education, have been trained extensively to teach the Centre's methods, and have at least one year's experience in training intellectually disabled persons. TrED Centre client employees work approximately three hours per day and work sessions are usually fifteen minutes long with short breaks or lunch between sessions. Client employees receive a small regular weekly salary for their work and are allowed ten 'sick' days per year, which approximates normalized working

conditions.

The experimenter wrote a letter to the Director and Trainers of the TrED Centre providing information concerning the purpose and content of the experiment and requesting permission to carry out the study. A copy of these letters is in Appendix 2.12a and 2.12b. In addition to these letters, a discussion was held with the Director concerning the possible results of the study.

The TrED Centre seeks permission for a client's inclusion in research and training from clients and/or their guardians and the Faculty of Education at the University of Canberra when a client joins the Centre. The Director of TrED agreed to the present research being carried out because the study assured confidentiality and would be no more intrusive than previous research projects conducted at the Centre.

ii) ***Subjects***

The Director of TrED chose two client employees on the basis of their predicted availability for the duration of the study, willingness to participate, the need to improve their work performance, and the likelihood that the experimental training programme would benefit them.

Client employee 1 was a twenty-seven year old male diagnosed as severely developmentally delayed. TrED staff viewed this person as easily distracted from his work. Client employee 2 was a twenty-seven year old female also diagnosed as severely developmentally delayed with psychotic features to her behaviour. TrED staff viewed this person as underachieving in her production rates. More detailed information concerning the client employees and their reinforcement history is contained in the description of each experiment.

The Director of TrED chose two trainers as subjects based on their willingness to participate and the Client employee whom they usually assisted. Trainer 1 was a male in his mid twenties. During all experimental sessions Trainer 1 exclusively trained Client employee 1. Trainer 2a was a twenty-eight year old female who exclusively trained Client employee 2 for all experimental sessions in the first three conditions of the experiment. Because this trainer left the TrED Centre prior to the completion of the experiment, a third trainer was selected by the Director of TrED to replace her.

Trainer 2b was a twenty-six year old female who trained Client employee 2 for all experimental sessions in the final four conditions of the experiment. More detailed information concerning the trainers is contained in the description of each experiment.

(iii) ***Experimental Tasks***

The two experimental tasks utilised in this study are wire tip cutting and wire tip stripping. The tasks were chosen from existing TrED jobs as experimental tasks because; 1) they were topographically similar tasks and, 2) TrED identified that each subject had achieved mastery at these tasks according to their criteria. Mastery is defined by TrED as the Client employee correctly carrying out all steps in the task analysis on five consecutive production trials under the lowest level of supervision (a more detailed definition is presented on page 28 & 29, under "Description of TrED's Supervision Levels and Their Relationship to The Experimental Conditions"). These tasks require similar levels of gross and fine motor skills, eye-hand coordination skills and, discrimination skills.

Wire stripping essentially consists of removing the end centimetre of casing from an approximately twenty centimetre cased wire in order to expose the bare wires, using a wire stripping tool. Those wires judged by the Client employee to be correctly cut are placed into a small plastic tray (see TrED's task analysis, Appendix 2.1).

Wire cutting is the task of cutting the end centimetre of exposed wire flush with the casing, using needle nose pliers and similarly placing correctly cut wires into a small tray (see TrED's task analysis, Appendix 2.2).

Fifty wires are commonly cut or stripped per work session, and the duration of a session is between seven and fifteen minutes. The number of correctly produced wires is judged by trainers against a standard correct product and recorded at the completion of each session. These production procedures were unaltered during experimental sessions.

(iv) ***Response Definitions***

There were nine trainer and four Client employee responses which represent

the thirteen response variables under investigation. These responses and the operational definitions used in the current study are listed below. Responses were coded as a single digit number for recording purposes and these codes are detailed in the "Observations and Data Collection" section.

RESPONSE DEFINITIONS

Responses	Operational Definitions
Client Employee:	
1. Attending to task	When the Client employee is waiting for a trainer response or carrying out any aspect of the task.
2. Not attending to task	When the Client employee engages in physical, verbal or signing behaviour that interferes with the performance of the task.
3. In production	When the Client employee is carrying out the production task.
4. Not in production	When the Client employee ceases to carry out the production task.
Trainer:	
5. In proximity	When the trainer is less than half the distance between work stations from the Client employee (about 30 cm), regardless of what the trainer is doing.
6. Not in proximity	When the trainer is greater than half the distance between work stations from the Client employee
7. Giving physical instructions	When the trainer is in bodily contact with the Client employee.
8. Not in physical instruction	When the trainer is not in bodily contact with the Client employee.
9. Verbal instruction	When the trainer engages in any verbal or signed (but not physical) interaction with the Client employee which is not a reprimand or praise, as defined below.

10. Verbal reprimand	When the trainer verbalises or signs "no", "not like that", or other similar statement.
11. Specific verbal praise	When the trainer is verbalising or signing any positive descriptive praise that is delivered to the employee within ten seconds of the behaviour being praised occurrs.
12. General verbal praise	When the trainer is verbalising or signing any positive descriptive praise which is delivered to the employee more than ten seconds after the behaviour being praised occurrs.
13. Other	When the trainer engages in any of the above behaviours with another trainer or employee not under study.

(v) ***Apparatus***

The apparatus used to collect data was a Sharp Pocket Computer 1600 (PC-1600) with a model CE-1600 RAM module which contains a 32 Kbyte memory capacity. The PC-1600 has a three line screen, a full alphabet and numeric keypad, and a serial port connection for transferring data to other microcomputers. The Sharp Pocket Computer 1600 is capable of recording the time and date of a keyed instruction, letter or number to within the nearest second.

Video equipment was used for reliability purposes. This consisted of a Sony 3/4" U-matic video recorder with playback facilities, a standard tripod, extension microphone and VHS 180 minute videotapes.

(vi) ***Observations and Data Collection***

Preliminary observations were conducted by the experimenter over approximately twenty-five hours of all TrED Centre client employees and trainers to investigate experimental tasks, subjects, variables and recording methods. Manually performed frequency counts and interval recordings of variables were conducted and

assessed as inadequate data collection methods for the purpose of investigating a variety of possible reinforcement variables operating simultaneously in an applied setting. These observations were also used to assist client employees and trainers to become accustomed to the experimenter's presence in the TrED Centre workshop.

Experimental data was collected at the TrED Centre by the experimenter three mornings per week (10:00 a.m. to 12:30 p.m.) over approximately twenty-three weeks between July 1989 and February 1990.

A log book was used to record the experimental condition, the experimental session number per task per Client employee and trainer, the corresponding data collection programme run number, TrED's supervision level assigned to the experimental session (detailed in the next section), the number of correctly and incorrectly produced wires, and any adjunctive behaviours displayed by the client employees.

In addition, cumulative productivity data for both client employees for all tasks were obtained from the TrED Centre. This data was used to investigate transfer of training from the two experimental tasks to two non-experimental tasks, and also to provide a measure of reinforcement history and level of mastery achieved over time (see page 29 for definition). This data includes the following information on each task: the total number of work sessions; the total number of minutes spent working; the number of units attempted and number correctly completed; the percentage correct; the rate of production per fifty minute hour; the average time spent producing a unit and the average supervision level.

Data was recorded using the Sharp PC-1600 and a data collection programme written in BASIC (see Appendix 2.3 for a copy of the programme). In the data collection programme each of the thirteen trainer and Client employee responses detailed earlier in the Response Definition section were coded as a numerical value between 0 and 9.

The experimenter initiated the data collection programme and then entered the numerical codes into the PC-1600 as the responses were being observed. The data collection programme recorded all data in a given experimental session in three separate files. One of these files recorded the experimental session number and the

codes to identify the Client employee and trainer participating in the experimental session. A second file recorded the response codes in the order in which they were entered into the programme. The third file recorded the times at which the response codes were entered. The PC-1600 recorded these times in the format MMddhh.mmss, where MM represents the month; dd the day; hh the hour; mm the minutes; ss the seconds.

The PC-1600 data collection programme was able to record this time data for all responses to within one second's accuracy. Therefore, times for all thirteen subject responses could be recorded simultaneously for the duration of an experimental session. A summary of the data collection programme codes and corresponding method for recording each Client employee and trainer response is listed below.

DATA COLLECTION RECORDING METHOD

Data Collection Programme Code	Recording Method For Each Response
6	When depressed records STUDENT ATTENDING TO TASK starting at this time and continuing until '6' is depressed again to record STUDENT NOT ATTENDING TO TASK.
3	When depressed records STUDENT BEGINNING PRODUCTION at this time and continuing until '3' is depressed again to record STUDENT STOPS PRODUCTION.
0	When depressed records TRAINER COMING INTO PROXIMITY at this time and continuing until '0' is depressed again to record TRAINER LEAVING PROXIMITY.
I	When depressed records TRAINER GIVING PHYSICAL INSTRUCTION at this time and continuing until '1' is depressed again to record TRAINER STOPS PHYSICAL INSTRUCTION.
7	When depressed records TRAINER GIVING VERBAL INSTRUCTION to Client employee at this time.
4	When depressed records TRAINER GIVING REPRIMAND (verbal or physical) to Client employee at this time.
5	When depressed records TRAINER GIVING SPECIFIC VERBAL PRAISE to Client employee at this time.
8	When depressed records TRAINER GIVING GENERAL VERBAL PRAISE to Client employee at this time.
9	When depressed records TRAINER GIVING OTHER at this time to another Client employee or trainer.

The command language used to run the data collection programme and manipulate data files is detailed in the Sharp Pocket Computer Operation Manual-PC-1600 (Sharp Corporation, 1986). All data files were stored in the PC-1600's RAM CE-1600 32 kbyte module. This memory capacity allowed storage of data files for at least three experimental sessions. The data files were then transferred through a Macintosh Plus computer to the University's VAX 8700 computer for data analysis (see Appendix 2.4 for details of the transferring method).

(vii) ***Experimental Data Analysis Method***

The raw data was analyzed on the VAX 8700 by running a number of programmes written in FORTRAN. Programmes used to analyze the independent and dependent variables are described below.

(a) Time Conversion Programme.

This programme converted the data in the time files from the MMddhh.mmss format to a seconds format. The zero of time in the seconds format was set to the time at which the first response code key was depressed. A copy of the time conversion programme is included in Appendix 2.5.

(b) Data Plots Programme.

This programme plotted a marker for each response as it occurred across a time interval of a given experimental session. The horizontal axis shows the time in seconds and the vertical axis separates each of the responses. This provided a graphical representation of the occurrence of responses in an experimental session and a simple check on whether or not the PC-1600 data collection programme was functioning accurately. For example, a trainer cannot give physical instruction if s/he is not in proximity to the Client employee. If these incompatible responses had been recorded as occurring simultaneously then the graph would display a marker for each response at different locations on the vertical response axis but the same location on the horizontal time axis. The interval of time shown on the horizontal axis could be varied to give increased resolution for the occurrence of responses. A copy of the data plot programme and an example of a plot is included in Appendix 2.6.

(c) Discrete and Durational Data Analysis Programme.

This programme was used to carry out the fundamental calculations on the response variables. These were frequency calculations, i.e. the number of times a response occurred within a given time interval, and duration calculations, i.e. the length of time over which certain responses persisted. In particular, the programme calculated the total time in seconds of each experimental session and carried out one set of calculations for the discrete experimental responses and, another set of calculations for the durational experimental responses detailed earlier in the Data Collection Recording Method table.

The total number of times each discrete response was recorded in an experimental session was calculated. The rate for each discrete response recorded in a session was calculated by dividing the total number of occurrences of a discrete response by the total amount of time of an experimental session.

The total amount of time spent in each durational response recorded in an experimental session was calculated. The percentage of time spent in a durational response was calculated by dividing the total amount of time spent in a durational response divided by the total time of an experimental session multiplied by 100.

A copy of the Discrete and Durational Data Analysis Programme is contained in Appendix 2.7. Means from this programme are included in the table of mean values for all variables in each experimental condition and are presented in the Results section.

(d) Trainer Response per Employee Response Rate Analysis Programme

This programme carried out data calculations for the purpose of making decisions about possible functional reinforcers and to ensure that the independent variables were not currently at ceiling levels. In particular the programme calculated, for each trainer response, the percentage of those times that the Client employee was in production when the trainer delivered a certain response and the percentage of those times that the Client employee was not in production when the trainer delivered the response. The formula for calculating these percentages is the total number of times a trainer gave a particular response while the Client employee was in production (or not in production) in a session divided by the total number of times that the trainer gave that response, multiplied by one hundred.

This data was available in histogram form for each of the trainer responses. The horizontal axis labels the session number and the vertical axis labels the percentage of those times that the Client employee was in (or not in) production when the trainer gave a particular response. A copy of the programme is included in Appendix 2.8.

(e) Interval Data Analysis Programme

The calculations from this programme were used to investigate possible functional reinforcers by measuring changes in the employee's behaviour in the five and/or ten second interval immediately prior to and following a trainer behaviour. Explicitly, the programme calculated the percentage of time that the Client employee is recorded as attending to task or in production in a five or ten second interval preceding and following each trainer response. The formula to calculate this percentage is the amount of time that the Client employee is attending to task (or in production) in the five (or ten) second interval divided by five (or ten) seconds and multiplied by one hundred. The programme also calculated the mean percentage of time the Client employee spent attending to task and in production in the time interval preceding and following each trainer response in each experimental session. A copy of this programme is contained in Appendix 2.9.

(f) Correlations

Pearson product moment coefficient correlations (Mendenhall, 1979) were carried out on three target behaviours in the very frequent reinforcement conditions (Conditions C1 and C2). This provided a measure of the proportional relationship between the trainer's rate of delivering verbal praise (specific and general) and a) the percent of time the Client employee spent in inappropriate behaviour and, b) the rate of accurate production per minute. Two sets of graphs were constructed showing a plot of the rate at which the trainer delivered verbal praise on the horizontal axis versus; a) the percent of time the Client employee spent in inappropriate behaviour on the vertical axis and, also b) the rate of accurate production per minute on the vertical axis. A dashed line is used to show the best proportional fit between the two variables. A table of these correlations is presented in the Results section and the plots are in Appendix 2.10 and 2.11.

(g) Accurate Production Rates

A few basic calculations were carried out by hand held calculator to measure changes in the employee's production under the different experimental conditions. As a measure of the employee's production accuracy the percent of correctly produced wires was calculated by dividing the number of wires correctly produced by the number of wires attempted and multiplied by one hundred. The employee's rate of production per minute was calculated by dividing the number of attempted wires by the total time of an experimental session. The employee's rate of accurate production per minute was calculated by dividing the number of correctly produced wires by the total time of an experimental session. The mean values for each condition are presented in the Results section in a table containing these means for all variables.

(viii) ***Reliability***

Clearly the data collection method described here is subject to many sources of error. For example, the physical proximity of the keys on the numeric keypad makes it possible to hit two keys simultaneously, or responses may occur at too high a frequency for the experimenter to record accurately. Whilst it is not possible to totally eliminate these and other potential sources of error, a reliabiltiy test was carried out to measure the experimenter's skill at reliably coding subject responses. A detailed description of the test and the reliability results are presented in the "Results" section of each experiment.

(ix) ***Analysis of TrED Centre's Cumulative Data***

Production data for each Client employee is collected by TrED trainers during each work session. TrED's data programme averages a client's production data over a week for each task. This data was obtained from TrED's data base to investigate transfer of training from the two experimental tasks to two non-experimental tasks and to provide a measure of an employee's reinforcement history and level of mastery achieved (see page 29 for a definition of mastery). Weekly mean production data was obtained for each Client employee in the study for each of the four weeks preceding, the eight weeks following the experimental intervention, and the thirty-two weeks

during which the experimental data was collected.

TrED's data programme calculates an employee's rate of accurate production by dividing the number of correctly produced units by the total time spent on the task multiplied by fifty to obtain a rate of accurate production per fifty minute hour. The cumulative data tables obtained from TrED listed a weekly mean rate of accurate production for each task the Client employee carried out per fifty minutes. The experimenter divided TrED's production rate by fifty to yield a mean weekly rate of accurate production per minute for a given task. Pre and post experimental means were calculated by averaging over the number of weeks in the corresponding condition. These means are presented in the "Results" section of each experiment.

The cumulative supervision level data was utilized as a measure of a client employee's reinforcement history and mastery level achieved. These supervision levels are described in detail under "Description of TrED's Supervision Levels and Their Relationship to The Experimental Conditions" on page 28. Each client's weekly mean supervision levels were obtained from TrED's cumulative data tables for the two experimental tasks and also for two non-experimental tasks. These means did not require calculations by the experimenter and are also presented in the "Results" section of each experiment.

These weekly means were used to plot bar graphs of each client employee's accurate production rate and supervision levels on the four tasks. The vertical axis of the plot shows the weekly mean supervision level or weekly mean rate of accurate production per minute, and the horizontal axis shows the individual weeks (pre, during, and post experimental) when the data was collected. These graphs are presented in the"Results"section of each experiment.

(x) *General Experimental Design and Procedure*

Design

The experimental conditions for each experiment were presented by each trainer in an **ABACAC** within subject reversal design. The onset of conditions was also presented in a multiple baseline across the two tasks-wire tip cutting and wire tip stripping.

The sequencing of experimental conditions (Baseline, Twice as Much Verbal Praise, Withdrawal, Very Frequent Verbal Praise, Withdrawal, Very Frequent Verbal Praise) was designed to test verbal praise as a functional reinforcer and to investigate the stability of function when delivered at high and very high rates.

The trainer's responses were varied in each condition as follows:

Condition **A1:** Baseline: No Changes in Trainer Response to Employee

During this baseline condition the trainer was instructed to continue to assist the subject Client employee in the same manner as was usual for the Client employee. Thus, no experimental variations were made to TrED's structured training method.

Condition **B:** Twice as Much Verbal Praise

In this condition the trainer was instructed to double the amount of verbal praise they would normally deliver for all production and attending behaviours, while keeping all other interactions at baseline level. (This would, by definition, presumbly double the amount of time spent in proximity to the Client employee.) Each trainer worked exclusively with their designated Client employee during Condition B.

Condition **A2 &A3**: Withdrawal of Verbal Praise

During this condition the trainer was instructed to return to baseline conditions, i.e. to return to assisting the Client employee in the same manner as was usual for the Client employee.

Condition **C1 & C2**: Very Frequent Verbal Praise

During this condition the trainer was instructed to deliver as much verbal praise for production and attending behaviours as possible , while keeping all other interactions at baseline level. Trainers worked exclusively with their designated Client employee and remained in close physical proximity to the Client employee for most of the experimental session. Because trainers had some difficulty delivering verbal praise at a very frequent rate, at the beginning of each of these sessions they were reminded; i) not to increase the rate of instructions, reprimands or any other interactions and, ii) not to correct the employee's errors or interfere in their behaviour in any way during the session other than by delivering very frequent verbal praise.

A second trainer counted the number of verbal praises delivered by the subject trainer on a handheld counter during these sessions to provide feedback to the subject

trainer and as a reliability check on the experimenter's recording.

Description of TrED's Supervision Level and Their Relationship to The Experimental Conditions.

As part of their structured training method the TrED trainers supervise the client employees at one of four levels, depending on the employee's mastery of the task. These supervision levels are whole numbers ranging from 0 to 3 and, represent a percentage of time spent supervising the Client employee in a given work session. According to TrED's structured training method supervision includes the trainer behaviours listed in the section Response Definitions (in/not in proximity, in/not in physical instruction, verbal instruction, reprimand, verbal praise, other).

The supervision level is intended to succinctly identify the level of independence (mastery) at which the Client employee is performing (TrED, 1988). For example, when an Client employee is learning a new production task, they are supervised for most of the work session and thus would receive between 76-100% supervision or level 3.

In an attempt to provide feedback directly relevant to TrED's training methods the rate of delivery of verbal praise in each experimental condition was designed to correspond to TrED's supervision levels. Thus, the Baseline Condition corresponds to TrED's supervision levels 0, when the trainer was supervising the Client employee for 0% of the total work session, and 1, when the trainer was supervising the Client employee for between 1% and 25% of the total session. The Twice as Much Verbal Praise Condition corresponds to supervision level 1 (as above), or 2, when the trainer was supervising the Client employee for between 26% and 75% of the total work session. The Very Frequent Verbal Praise Condition corresponds to supervision level 3, when the trainer was supervising the Client employee for between 76% and 100% of the total work session.

Movement to a lower supervision level is accomplished when the Client employee can correctly carry out all steps in the task analysis (see Appendix 2.1.for an example) on five consecutive production trials under the given level of supervision. TrED's criteria for mastery is that the Client employee correctly carry

out all steps in the task analysis on five consecutive production trials under level 0 supervision.

TrED does not directly train for maintenance. The Director reported that staff review monthly their cumulative data of the employee's production rates (per fifty minutes) for all tasks and if the rate drops significantly in their judgment, they increase the amount of supervision to the Client employee on that task. If this method was found to be unsuccessful at increasing the employee's production rate on a task(s), the Client employee was retrained to carry out all steps of the task.

General Procedure

The general procedures were similar in both experiments with each subject. On data collection mornings, the client employee's work was scheduled by the trainers to carry out alternating sessions of the two experimental tasks; wire stripping and wire tip cutting. The experimenter gave the trainers their instructions prior to the Client employee beginning work according to the condition under investigation. When recording data the experimenter sat in the same spot in the workroom, approximately three feet from the employee's work bench.

When the Client employee was instructed by the trainer to begin work, the experimenter initiated data recording of all thirteen trainer and Client employee responses. After calling the Client employee into the workroom the trainer commenced delivery of verbal praise for production and attending to task behaviours according to the experimental condition being investigated. Delivery of verbal praise as well as data collection ceased when the Client employee put the last of his/her fifty wires into the basket on their workbench.

Typically the Client employee would enter the workroom and be instructed by the trainer to "get their job". They would then obtain a picture card of the tool used for the task from the blackboard where each employee's daily schedule was set out pictorially. The Client employee would then usually gather the tool and a basket of wires, take them to their work bench and begin either stripping or cutting the 50 wires.

As part of common TrED procedure, the Client employee was sometimes

given a few minutes break outside of the work area between sessions. There was a very brief pause between each successive work session while the trainer checked and recorded the production data. This allowed the experimenter time to re-initate the Sharp PC-1600 data collection programme. TrED production data was recorded by the experimenter in a log book after all daily experimental sessions were completed.

The sequence and duration of conditions for Experiment 1 and Experiment 2 are listed below.

EXPERIMENT 1

ONSET AND TERMINATION OF CONDITIONS

Condition	Experimental Session Numbers	
	Task 1	Task 2
A1: Baseline	1-7	1-7
B: Twice as much verbal praise	8-12	8-12
A2: Withdrawal	13-15	13-15
C1: Very frequent verbal praise	16-19	16-21
A3: Withdrawal	20-24	22-26
C2: Very frequent verbal praise	25-30	27-31

EXPERIMENT 2

ONSET AND TERMINATION OF CONDITIONS

Condition	Experimental Session Numbers	
	Task 1	Task 2
A1: Baseline	1-9	1-10
B: Twice as much verbal praise	10-12	11-13
A2: Withdrawal	13-18	14-19
C1: Very frequent verbal praise	19-25	20-23
A3: Withdrawal	26-29	24-27
C2: Very frequent verbal praise	30-36	28-34

EXPERIMENT 1

(i) ***Subjects***

Client employee 1 was a twenty-seven year old male diagnosed as severely developmentally delayed. He is described by TrED staff as a non-verbal communicator with seemingly good receptive skills, who is easily distracted. This Client employee had been living in government run supervised accommodation for the past thirteen years and had been an employee at the TrED Centre for fifteen months.

With the trainer as respondent Client employee 1 was assessed during the experiment using the Scales of Independent Behaviour (Bruininks, Woodcock, Weatherman, & Hill, 1985). His overall broad independence age score was 3 years 2 months and, scores for the four areas of independent functioning were as follows;

Motor Skills Cluster Score: 2 years 11 months

Social and Communication Skills Cluster Score: 1 year 11 months

Personal Living Skills Cluster Score: 3 years 9 months

Community Living Skills Cluster Score: 4 years 1 month

The mean supervision level for Client employee 1 for the five weeks prior to the experiment was .86 on Task 1 and 1.1 on Task 2, and for both tasks was .98. As an indicator of reinforcement history this informs that this Client employee was being supervised between 0% and 25% of the total time of a work session and was performing at TrED's criteria for mastery (see page 25 for definition) on the experimental tasks.

Client employee 1 had been performing the experimental tasks for fifteen months. The Client employee performed the tasks more frequently when they were first introduced to him and mastery training was in progress. As mastery on the experimental and other tasks is achieved, TrED introduces additional tasks to provide variety of work for clients. The experimental tasks remained a standard work task for this Client employee throughout his fifteen months at TrED. He performed the

experimental tasks a minimum of twice a day over that time.

According to Trainer 1, Client employee 1 had been supervised by Trainer 1 approximately 50 per cent of the time he had been at the TrED Centre prior to the experiment. Client employee 1 was supervised by one of the other two Trainers for the remaining 50 per cent of the time. During all experimental sessions Trainer 1 worked exclusively with Client employee 1.

Trainer 1 reports being at the Centre for thirty-one months. This Trainer is a 27 year old male with tertiary academic qualifications in Psychology and three years experience working with intellectually disabled clients. After completing his own training in the Centre's structured training methods, Trainer 1 had been training the Centre's client employees to carry out the work tasks for the past 30 months.

(ii) ***Alterations to General Design and Procedure***

During the first condition of very frequent verbal praise this Client employee displayed some adjunctive behaviour, such as verbalising and touching the trainer. When this occurred the trainer sometimes became distracted from delivering verbal praise and was reminded by the experimenter, between experimental sessions, to "ignore the employee's behaviour and carry on delivering very frequent verbal praise". This occurred in two sessions of condition C1.

(iii) ***Results***

Reliability:

The reliability test was carried out by the Experimenter as follows. The Experimenter coded a number of the experimental sessions twice. Once while the actual session was in progress and secondly, at a later time from a videotaped recording of the same session. The discrete and durational data analysis (described in section (vi) (c) of the Experimental Data Analysis Method) was carried out on both the real time recorded data and the data recorded from the videotaped session. This yielded two sets of data, each set comprised of rates of occurrences for the discrete responses and duration times for the continuous responses. The percentage agreement between corresponding variables in the two sets of data was then calculated using a

handheld calculator. The formula used for this calculation was

$$100 - \frac{|X_1 - X_2|}{X_1} \times 100$$

where X_1 is the variable from the real time data and X_2 is the corresponding variable from the videotaped data. The reliability test was carried out in different conditions of the experiment (Baseline (A1) and Twice as much verbal praise (B)) and the results are listed below. Additional reliability tests of the data were not possible because the video equipment was no longer available to the experimenter. Results reported are the percentage agreement between rates of occurrence or duration times.

The overall mean percentage agreement when comparing the Experimenter's reliability in recording the two sets of data for Experiment 1 was 84.25 percent.

Experimenter Recorded Reliability Data

Condition/ Session/Task	Variable	Real Time Data	Videotaped Data	Percentage Agreement
A1/S6/T1	On task	41.1	48.3	82.9
	In production	80.7	70	86.7
	In proximity	5.2	3.3	63.9
	In phys. instr.	0	0	100
	Combined praise	0.36	0.32	98.8
	Verbal Instr.	0.6	0.8	66.7
	Reprimand	0.19	0.16	86.1
	Other	0	0	100
	Mean Percentage Agreement in Condition A1, Session 6, T1=85.6			
B/S10/T2	On task	86.95	84.4	97.02
	In production	69.2	76.2	89.9
	In proximity	12.6	10.1	79.8
	In phys. instr.	0	0	100
	Combined praise	3.6	3	83.3
	Verbal Instruction	1.1	0.65	58.0
	Reprimand	0.13	0.07	54.8
	Other	0	0	100
	Mean Percentage Agreement in Condition B, Session 10, T2=82.9			

Mean Percentage Agreement for Task 1 & 2 in Condition A1 & B =**84.25**

Experimental Data Results:

Table 1 shows the means for all variables per task for all six conditions in Experiment 1. These means were obtained by averaging results from each experimental session over the number of sessions pertaining to each condition.

As can be seen from the means in Table 1, when instructed to increase or decrease the rate of delivering specific verbal praise, Trainer 1 followed the experimental instructions. However, Trainer 1 delivered specific praise at a higher rate in the final very frequent verbal praise condition (C2) than in the first very frequent verbal praise condition (C1).

Trainer 1 did not follow experimental instructions across all conditions for the rate of delivering general praise. In the first two conditions in which experimental instructions were given (B & A2), the trainer appropriately increased and decreased the rate of delivery. In Conditions C1 and C2, the Trainer did not deliver general praise at a very frequent rate. Rather, the rate of delivering general praise in Condition C1 (very frequent verbal praise) was only slightly higher than that delivered in Condition B (twice as much verbal praise). In the final very frequent verbal praise condition (C2) the rate of delivery of general praise diminished to below the baseline rate. This result is not surprising because the operational definitions of specific verbal praise (delivered within 10 seconds of the behaviour being praised occurring) and general verbal praise (delivered after more than 10 seconds of the behaviour) obviously limit the occurrences of praise that could be defined as "general" under the very frequent verbal praise conditions.

When specific and general verbal praise rate is combined Trainer 1 followed the reinforcer delivery rate schedule as instructed, although the highest rate of praise was delivered in the final condition. The relationship between the Trainer's rate of delivering (combined) verbal praise and the Client employee's rate of accurate production will be investigated in detail later in this section on page 33.

The rate at which the Trainer delivered reprimands to the Client employee and the rate at which the Trainer engaged in interactions with others (in addition to the Client employee) were both very infrequent and relatively stable across all experimental conditions, as indicated by the means in Table 1 for these two variables.

TABLE 1

EXPERIMENT 1: MEANS OF DISCRETE AND CONTINUOUS VARIABLES

Condition	Task No.	Rate per Minute of;							% of Time Spent in;			
		Accurate Production	General Verbal Praise	Specific Verbal Praise	Combined Verbal Praise	Verbal Instruction	Reprimand	Other	On Task	Production	Trainer in Proximity	Trainer in Phys. Instr.
Baseline A1	1	2.6	.7	.042	.742	1.15	.077	1.13	57.53	51.55	27.7	.03
	2	2.1	.351	.377	.728	.994	.489	.18	61.54	44.29	27.87	0
Twice as Much Verbal Praise B	1	3.7	2.52	2.064	4.584	2.4	.84	.036	64.64	45.6	60	.2
	2	3.1	2.76	2.4	5.16	2.28	1.08	.18	68.58	45.98	72.36	1.19
Withdrawal A2	1	2.6	.02	.1	.12	1.08	.12	.14	41.13	29.66	10.46	0
	2	2.6	0	.02	.02	1.4	.16	.18	37.97	22.9	10.26	0
Very Frequent Verbal Praise C1	1	5.2	3.3	29.75	33.05	.78	0	0	96.8	29.63	99.2	0
	2	3.6	2.13	29.6	31.73	1.07	0	0	98.07	44.48	96.05	0
Withdrawal A3	1	4.5	.098	.424	.522	1.18	.092	.3	59.34	42.18	15.92	0
	2	3.6	.048	1.64	1.688	1.17	.034	.16	61.74	35.1	13.96	0
Very Frequent Verbal Praise C2	1	4.38	.3	55.72	56.02	2.54	0	.033	98.62	24.6	97.58	0
	2	3.1	0	35.66	35.66	3.6	.034	0	98.64	24.5	99.32	0

Note:
Task No. 1=Cutting Wire Tips
Task No. 2=Stripping Wire Tips

These results were expected since Trainer 1 was working exclusively with Client employee 1 during the experiment and was interacting with others only very minimally. In addition, reprimands and interactions with others occurred very infrequently during baseline and Trainers were instructed to hold these interactions stable during all experimental conditions.

From Table 1 it can be seen that the Trainer generally spent a very small percentage of time giving physical instruction to the Client employee. The amount of physical instruction given to the Client employee increased slightly during the Twice as Much Verbal Praise Condition. Beginning in the first Withdrawal Condition (A2), the Trainer did not physically instruct the Client employee and this remained constant for the duration of the experiment. It was expected that only a very small percentage of the Trainer's time would be spent in physical instruction (which includes by definition, all bodily contact between Trainer and Client employee) as the Client employee was assessed by TrED as having achieved mastery on the experimental tasks.

The percentage of time the Trainer spent in proximity to the Client employee follows the reinforcer delivery rate schedule as expected. As reinforcer delivery rate was increased or decreased the Trainer correspondingly spent more or less time in proximity to the Client employee in order to deliver the amount of praise appropriate to the experimental condition. Thus, the Trainer was able to carry out the experimenter's instructions for time spent in proximity across all experimental conditions.

The Trainer did not hold constant the rate of delivering verbal instructions to the Client employee as per experimental instructions. The means for the rate of delivery of verbal instructions in Table 1 indicate that when instructed to deliver twice as much verbal praise (Condition B) the Trainer also increased the rate of verbal instructions, instead of holding verbal instruction rate constant. The Trainer again increased verbal instruction rate during the final condition when instructed to reintroduce delivery of very frequent verbal praise (Condition C2). In all other conditions the delivery rate of verbal instructions remained relatively stable. This result will be investigated in more detail later in this section by plotting the individual session data to look for trends in

the data (see page 35).

Of the three Client employee behaviours, only the percentage of time spent in on task behaviour follows the reinforcer delivery rate schedule across all experimental conditions as expected. As reinforcer delivery rate was increased or decreased, it was associated with the Client employee spending more or less time engaged in on task behaviour in accord with the experimental condition.

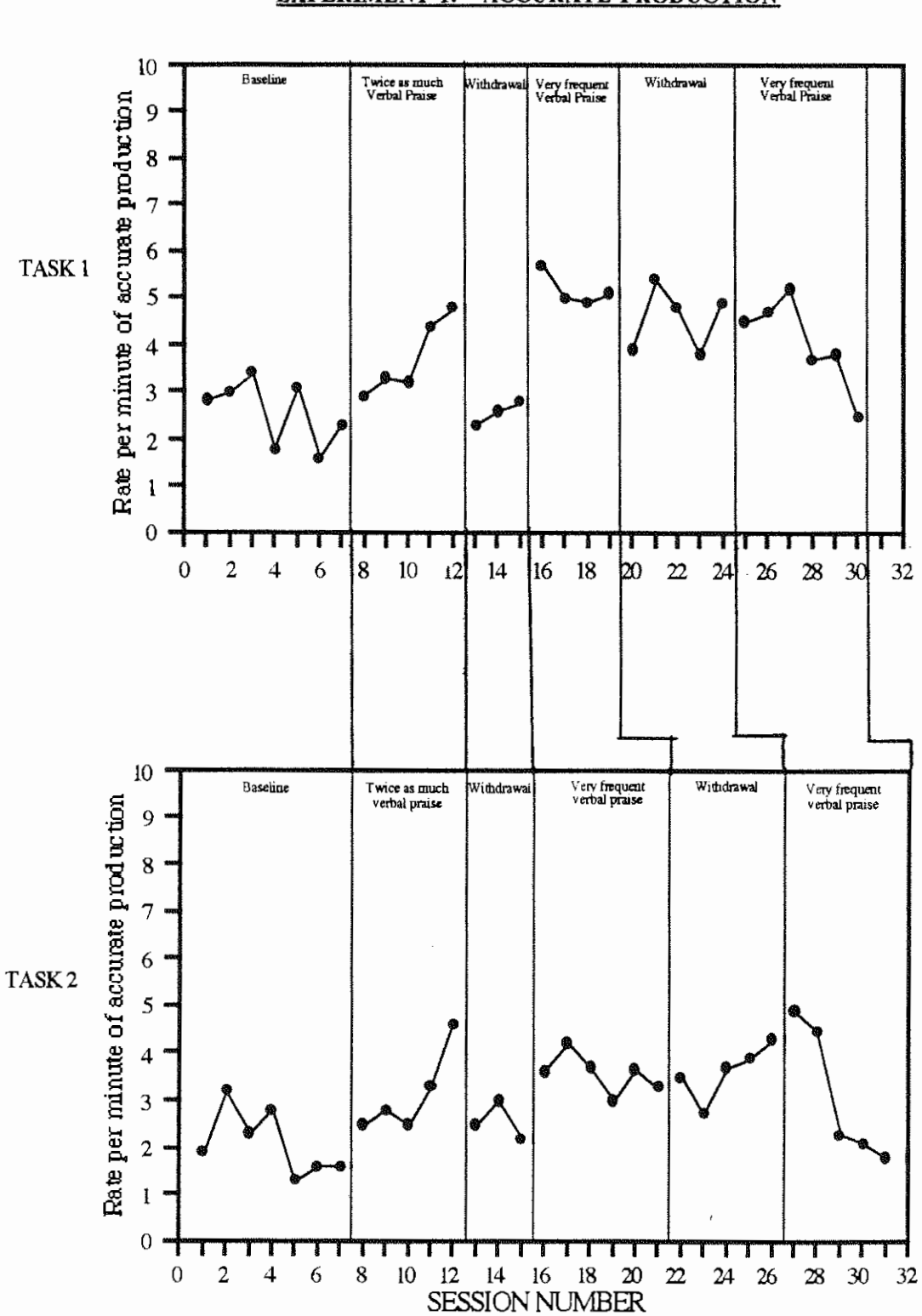
From the means in Table 1, the percentage of time the Client employee spent in production appears to decrease as rate of praise is increased. This result is contrary to that expected and thus, will be further investigated (see page 37). The Client employee's rate of accurate production follows the reinforcer delivery rate schedule across the initial, but not across all of the experimental conditions. This result will now be investigated.

To more closely examine the relationship between the independent variable (rate of delivery of verbal praise) and one of the dependent variables (accurate production rate) Figure 1 is presented below. Figure 1 graphically displays the employee's rate per minute of accurate production for each experimental session within the ABACAC reversal design across both experimental tasks (as described in Chapter 2).

As can be seen from Figure 1, when the trainer was instructed to deliver twice as much verbal praise (Condition B) there was a sharp increase in the employee's rate per minute of accurate production. During the third condition (A2), when the delivery of twice as much verbal praise was withdrawn, the employee's rate per minute of accurate production returned to that which was observed during the baseline condition (A1). This result clearly demonstrates verbal praise as a functionally positive reinforcer of the employee's rate of accurate production when praise was delivered at this rate.

In the fourth condition (C1), when the trainer was asked to deliver verbal praise at a very frequent rate, the employee's rate per minute of accurate production on Task 1 increased dramatically and was higher than that observed in the twice as much verbal praise condition (B). During Task 2, the increase in rate of accurate production was less dramatic but also above that observed in the twice as much verbal praise condition. This result demonstrates that the reinforcer was associated with

FIGURE 1


EXPERIMENT 1: ACCURATE PRODUCTION
TASK 1
TASK 2
Rate per minute of accurate production
Baseline
Twice as much Verbal Praise
Withdrawal
Very frequent Verbal Praise
Withdrawal
Very frequent Verbal Praise
Baseline
Twice as much verbal praise
Withdrawal
Very frequent verbal praise
Withdrawal
Very frequent verbal praise
SESSION NUMBER

a further increase in the target behaviour when delivered at a very frequent rate.

When the delivery of very frequent verbal praise was withdrawn in the fifth condition (A3), the employee's rate per minute of accurate production decreased but remained above the baseline (A1) condition. Furthermore, during this withdrawal condition (A3) the employee's rate per minute of accurate production displays an upward trend on Task 2. This result may suggest a possible carry over of the reinforcement effect from Condition C1 or, a possible loss of the contingent effect of the positive reinforcer. Further investigation of the data may clarify why the reversal was incomplete in this condition.

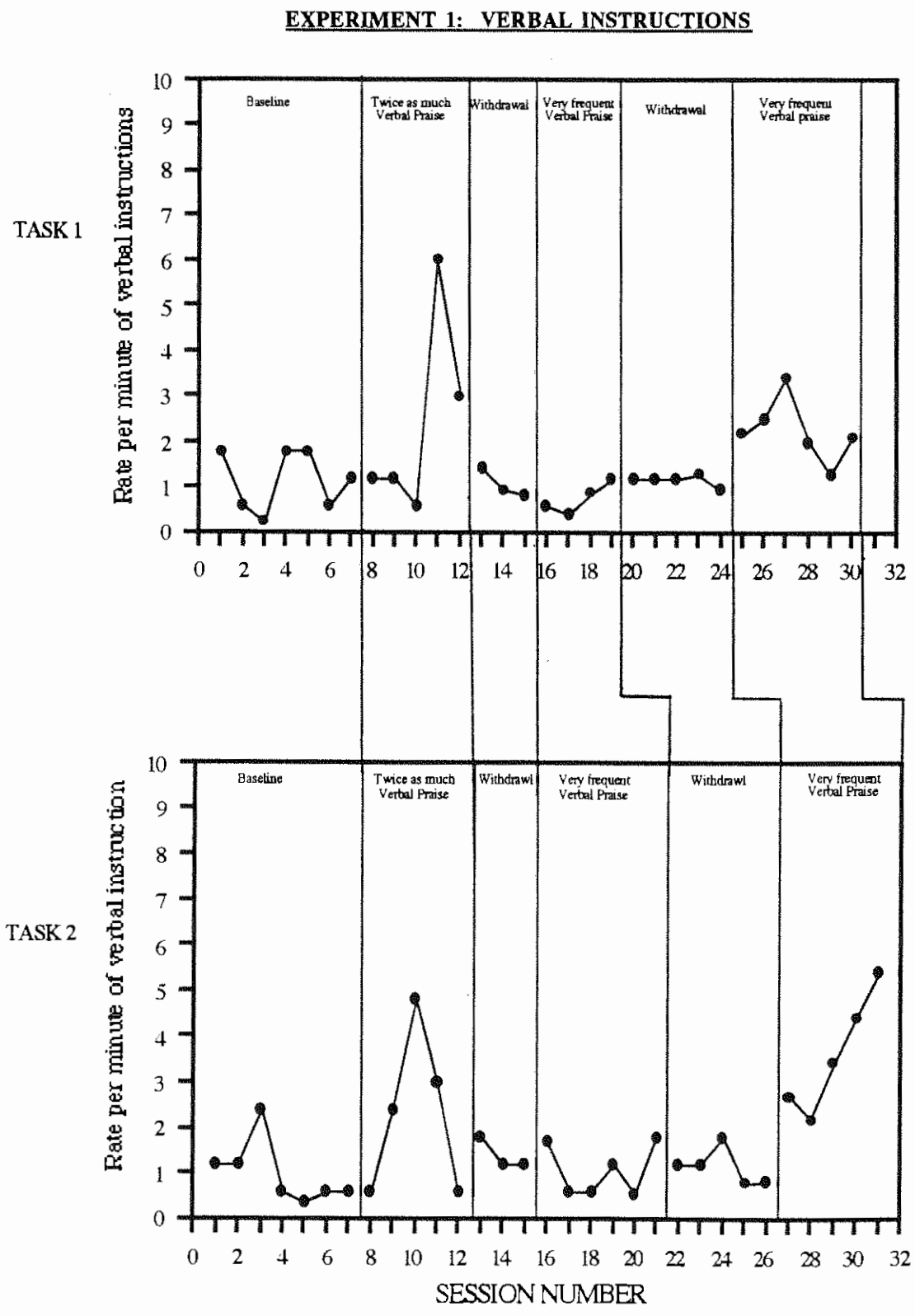
In the final condition (C2) when the trainer was asked to reintroduce the delivery of verbal praise at a very frequent rate, the employee's rate per minute of accurate production decreased on both tasks to below that observed during the preceding withdrawal condition (A3) and the first very frequent verbal praise condition (C1). On Task 1 the rate of accurate production in Condition C2 remained above that observed in Condition B, when twice as much verbal praise was delivered, whereas on Task 2 the data is equivalent.

In summary, results from Experiment 1 demonstrate that verbal praise increased accurate production rate when its delivery rate was initially increased. When the rate of verbal praise was further increased, it was associated with an initial further increase, but a later decrease in the employee's accurate production rate. Verbal praise was a reinforcer when delivered at a rate of twice as much (as baseline) but it is not clear that verbal praise remained reinforcing when delivered at a very frequent rate. This result was demonstrated across both tasks for this Client employee with regards to both the mean rate of accurate production and the trends in the data.

In an effort to clarify the results obtained for accurate production rate in Experiment 1, those variables which did not follow the reinforcer delivery rate schedule as expected (verbal instructions and in production) will now be further investigated.

The relationship between the Trainer's rate of delivering verbal instructions and rate of delivering verbal praise is displayed graphically in Figure 2. As can be seen from Figure 2 the Trainer also delivered verbal instructions at a higher rate on both

FIGURE 2


EXPERIMENT 1: VERBAL INSTRUCTIONS
TASK 1
Rate per minute of verbal instructions
Baseline
Twice as much Verbal Praise
Withdrawal
Very frequent Verbal Praise
Withdrawal
Very frequent Verbal praise
TASK 2
Rate per minute of verbal instruction
Baseline
Twice as much Verbal Praise
Withdrawl
Very frequent Verbal Praise
Withdrawl
Very frequent Verbal Praise
SESSION NUMBER

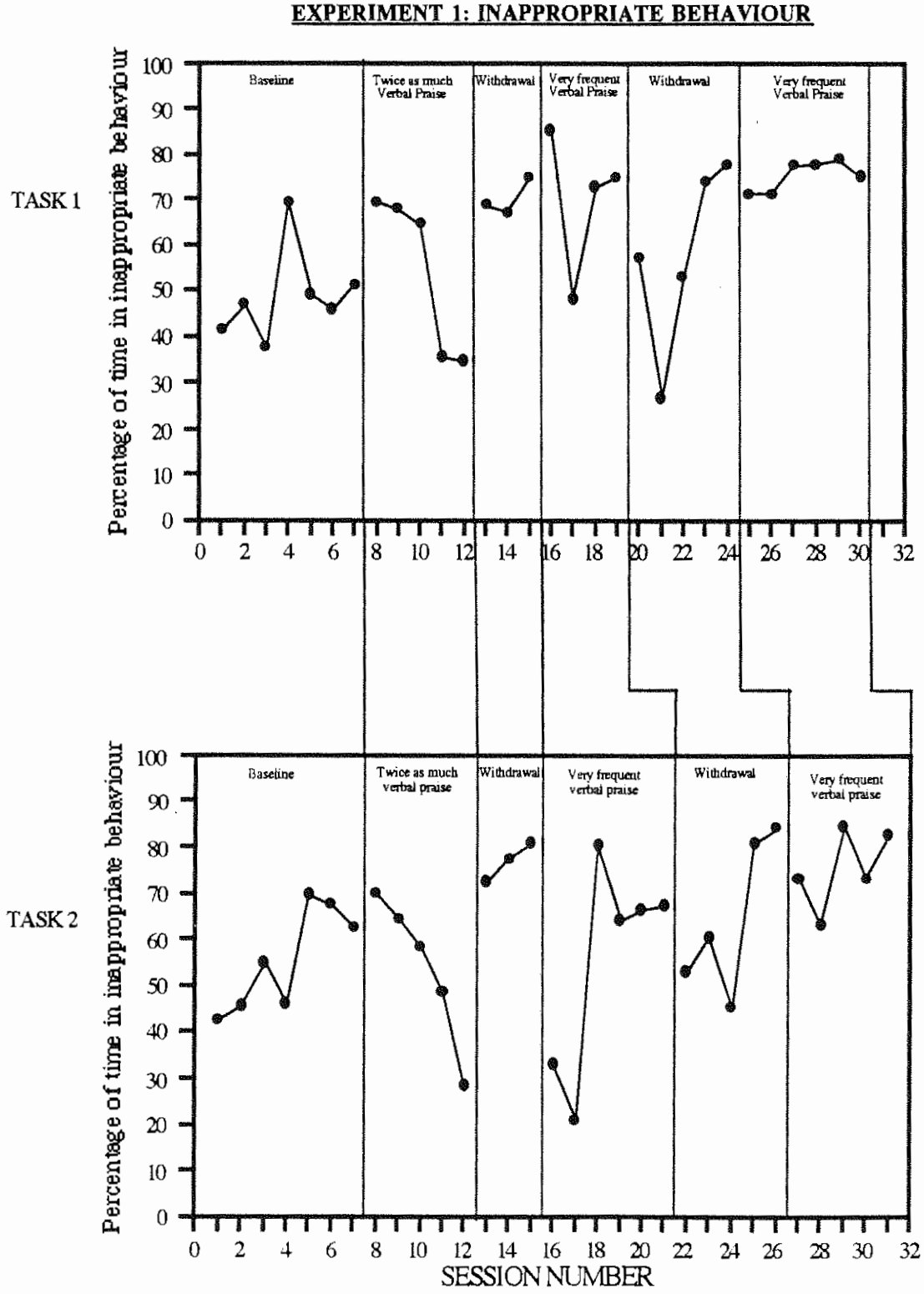
tasks when instructed to deliver twice as much verbal praise. Thus, in Condition B both praise and verbal instructions were delivered at a higher rate by the Trainer. The Trainer again increased the delivery rate of verbal instruction in the final very frequent verbal praise condition (C2).

These results indicate that the delivery of verbal instructions may have contributed to the increase in the Client employee's accurate production rate in the twice as much verbal praise condition (B), and also may have contributed to the decrease in accurate production rate in the final very frequent verbal praise condition. However, the data clearly demonstrates that the rate of delivery of verbal instructions remained relatively stable in all other conditions (A1, A2, C1 & A3) and thus,was not associated with changes in accurate production rates over all experimental conditions. Therefore, verbal instruction delivery rate is not responsible for the results obtained for accurate production rate in Experiment 1, but may have contributed to the effects observed in Condition B and C2.

To further investigate the possible reasons that another of the Client employee's responses did not follow the reinforcer delivery rate schedule, Figure 3 graphically displays the relationship between the Trainer's delivery rate of praise and the percentage of time the Client employee spent in inappropriate production behaviour. The percentage of time the employee spent in inappropriate production behaviour (hereafter referred to as inappropriate behaviour) was calculated by subtracting from 100 the percentage of time the employee spent in production for each experimental session (from Table 1). As can be seen from Figure 3, inappropriate behaviour decreased sharply across both Tasks when twice as much verbal praise was delivered in Condition B and increased again during the subsequent withdrawal condition (A2). These results demonstrate that during the first three experimental conditions, rate of verbal praise functioned as a punisher for this employee's inappropriate behaviour.

Beginning in the first very frequent verbal praise condition (C1), the employee's inappropriate behaviour shows a general upward trend in the data on both tasks. A similar upward trend in the Client employee's inappropriate behaviour is also seen in the subsequent withdrawal condition (A3). And, there was a further increase in the Client employee's inappropriate behaviour on both tasks in the final very frequent

FIGURE 3


EXPERIMENT 1: INAPPROPRIATE BEHAVIOUR
TASK 1
TASK 2
Percentage of time in inappropriate behaviour
Baseline
Twice as much Verbal Praise
Withdrawal
Very frequent Verbal Praise
Withdrawal
Very frequent Verbal Praise
Baseline
Twice as much verbal praise
Withdrawal
Very frequent verbal praise
Withdrawal
Very frequent verbal praise
SESSION NUMBER

verbal praise condition (C2) when the rate of delivery of verbal praise was highest (see Table 1). Thus, beginning in Condition C1, rate of praise was associated with increases in inappropriate behaviour across the final three conditions.

The above results demonstrate that during the first three conditions of Experiment 1, verbal praise rate also served as a positive reinforcer for time spent in production (the opposite of inappropriate behaviour). When the rate of verbal praise was further increased in Condition C1, the rate was associated with decreases in time spent in production across the final three conditions. This decrease which occurred in C1, indicates that the relationship between rate of praise and time spent in production became unstable when delivered at a very frequent rate. This instability may have begun in Condition A3. In that Condition, the reversal of the reinforcement effect was incomplete.

Both the means (Table 1) and the session data (Figures 1 & 3) suggest that the Client employee's inappropriate behaviour may have increased and accurate production rates may have decreased as the delivery rate of praise was increased across the two very frequent verbal praise conditions. To investigate this further, a correlational analysis was performed on the data in the very frequent reinforcement conditions to examine the relationship between the trainer's rate of delivering verbal praise and; i) the percent of time the employee spent in inappropriate behaviour during Conditions C1 and C2 and, ii) the employee's rate of accurate production per minute in Condition C1 and C2. The correlations are presented in Table 2 and plots for each of the correlations listed are in Appendix 2.10.

As can be seen from Table 2, under conditions of very frequent verbal praise the rate of accurate production did not decrease in direct proportion to the rate of praise across both tasks and, the percentage of time spent in inappropriate behaviour did not increase in direct proportion to the rate of praise across both tasks. Although some general trends can be seen for Task 1 in the suspected direction, the correlations are not consistently strong overall. Thus, the results do not support a direct linear relationship as suggested earlier by the means and session data. However, this does not rule out the possibility of a non-linear relationship between these variables.

TABLE 2

EXPERIMENT 1

Pearson-Product Moment Correlations in Very Frequent Reinforcement Conditions

	Task 1 %Time in Inappropriate Behaviour	Task 2 %Time in Inappropriate Behaviour	Task 1 Rate of Accurate Production	Task 2 Rate of Accurate Production
Specific Praise	+.063203	+.50252	-.67907	-.057623
Specific Praise above 30 per minute	+.88913	-.56322	-.59213	+.078364
Specific Priaise below 30 per minute	*	*	*	*
General Praise	+.3917	-.39224	+.47252	+.21805
General Praise above 30 per minute	*	*	*	*
General Praise below 30 per minute	+.3917	-.39224	+.47252	+.21805
Specific and General Praise combined	+.39859	+.49731	-.60669	-.017
Combined Praise above 30 per minute	+.90037	-.56332	-.60669	+.087735
Combined Praise below 30 per minute	*	*	*	*

Notes

- indicates a negative correlation
+ indicates a positive correlation
* indicates a meaningless correlation due to insufficient data points

TrED Data:

In an effort to investigate for transfer of training from experimental to non-experimental tasks Table 3 shows the pre and post experiment means for accurate production rate per minute and supervision levels calculated from TrED's cumulative data.

TABLE 3

TrED's Data for Experiment 1: Mean Accurate Production Rates and Supervision Levels

		Mean Production Rate per Minute				Mean Supervision Level per Task			
Tasks		1	2	3	4	1	2	3	4
Subject 1	Pre-Experiment	3.3	2.5	.53	.16	.86	1.1	.75	1.2
	Post-Experiment	4.4	4	.5	.14	.51	1.3	1.1	1.8

Note: Tasks 1&2 are Experimental Tasks
Tasks 3&4 are Non-experimental Tasks

As can be seen from Table 3 the employee's production rate on the experimental tasks (1&2) remained higher in the eight weeks following the experiment than during the four weeks preceding the experiment. These results suggest maintenance, at eight weeks, of production gains obtained during the experimental conditions in which praise was a functional reinforcer. However, there is no change in the mean production rate on non-experimental tasks (3&4) and thus, no evidence suggested for transfer of training of production increases to non-experimental tasks.

Figure 4 graphically displays TrED's cumulative data of the weekly mean production rates for the experimental and non-experimental tasks in the four weeks preceding, the thirty-two weeks during and the eight weeks following the experiment. In this figure, post experiment maintenance of the reinforcement effect can be seen clearly for the experimental, but not for the non-experimental tasks.

Supervision levels are rated by TrED as whole numbers ranging from 0 to 3. As can be seen from Table 3 there is no change in the mean supervision level on either experimental or non-experimental tasks from pre to post experiment weeks and thus, no evidence suggested for transfer of training of supervision behaviours. This result is confirmed when the weekly mean supervision level of experimental and non-experimental tasks are displayed graphically as in Figure 5.

In summary, there is evidence which shows post-experiment maintenance of the reinforcement effect obtained for accurate production rate on both tasks. There is no evidence for transfer of training for accurate production rate or supervision level to non-experimental tasks.

It should be noted that these results indicate that the employee had not achieved mastery according to TrED's criteria (correct execution of all steps in the task analysis on five consecutive production trials at 0 supervision) on the experimental tasks. Since the employees showed definite improvement in the performance of tasks from pre to post experiment weeks TrED's supervision levels are not a complete measure of employee's performance. In particular employee mastery or increases in production could not be ascertained on the basis of TrED supervision levels alone.

FIGURE 4

CLIENT EMPLOYEE 1: TRED DATA FOR ACCURATE PRODUCTION RATES

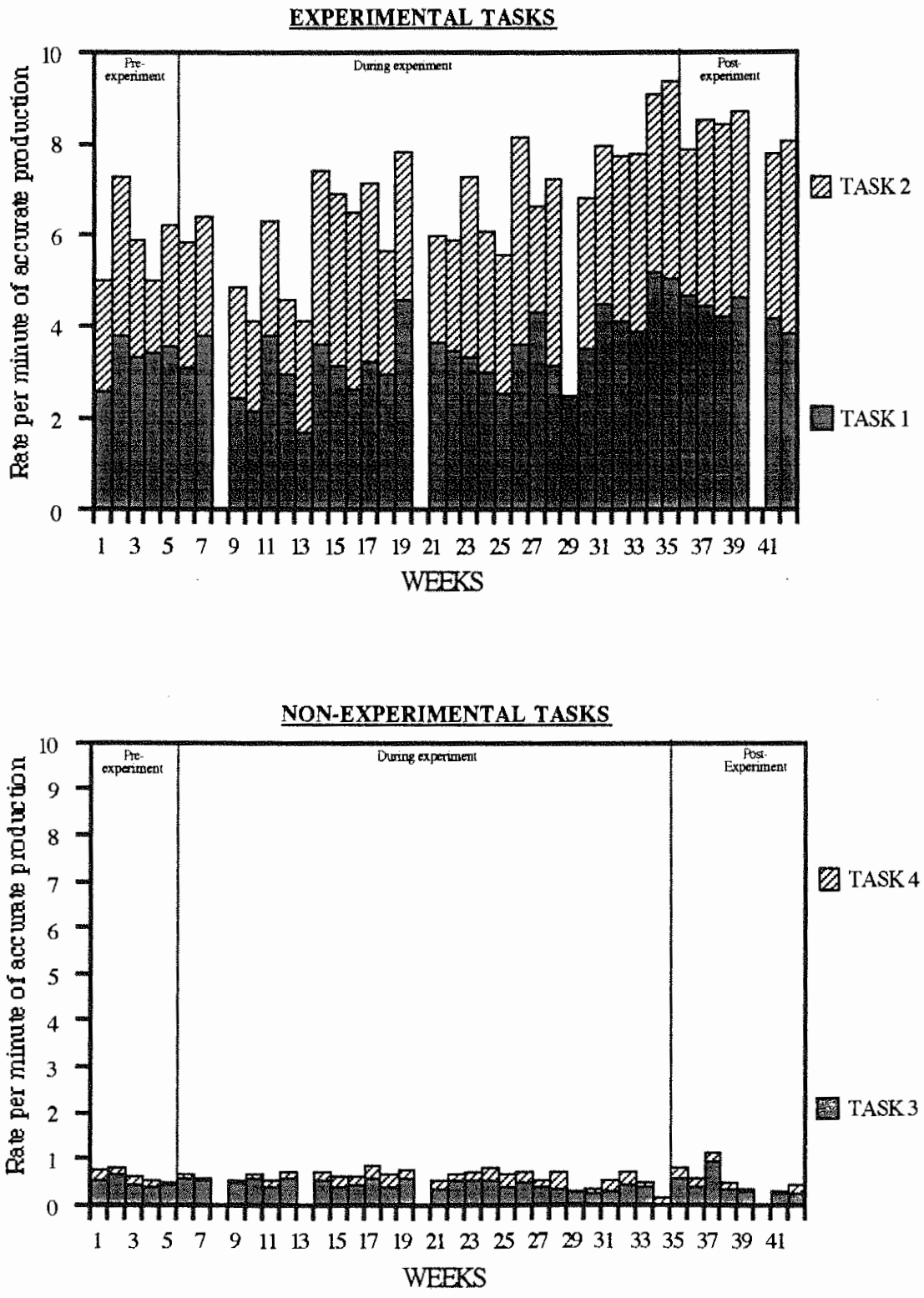
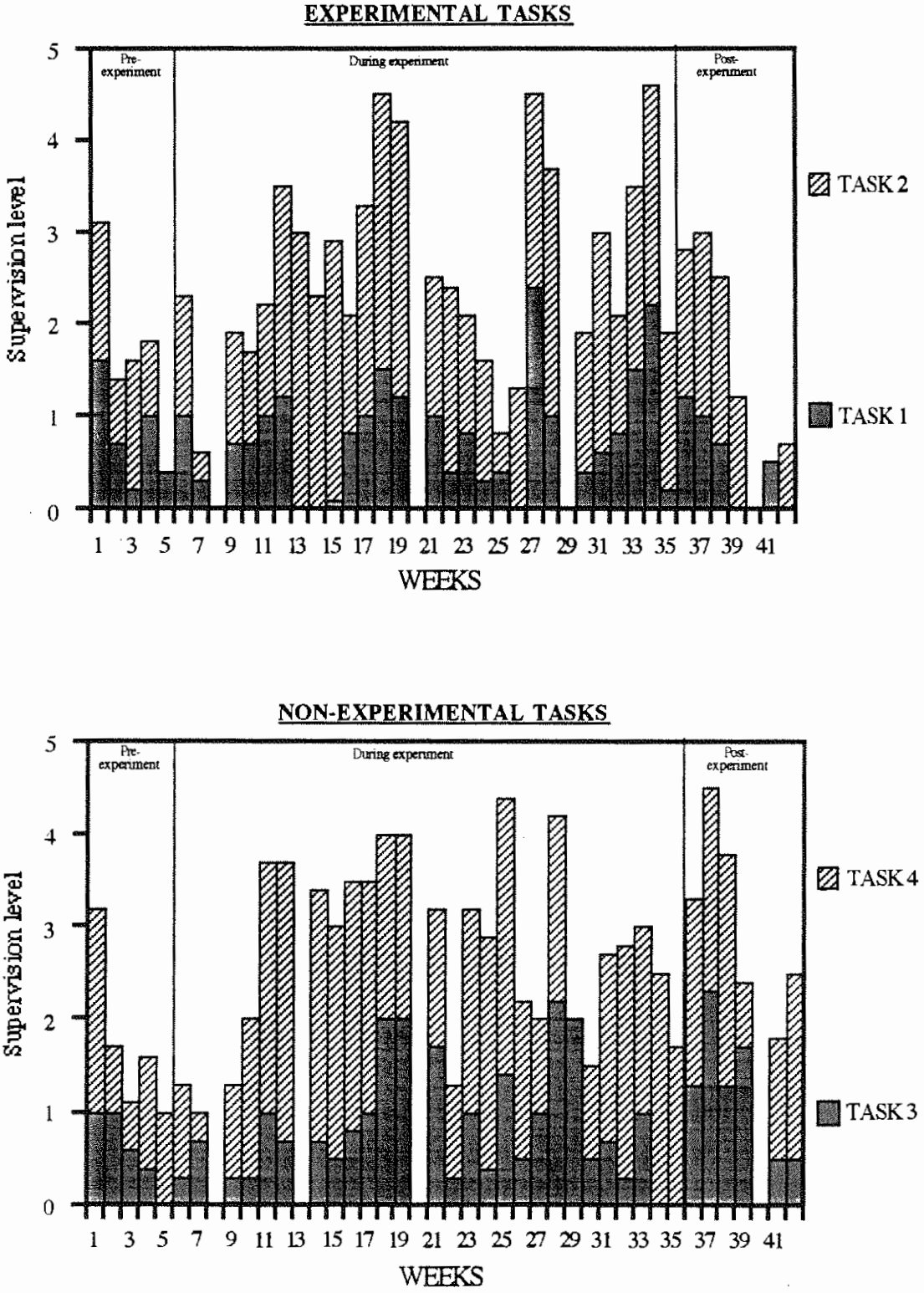


FIGURE 5

CLIENT EMPLOYEE 1: TRED DATA FOR SUPERVISION LEVELS



(iv) ***Summary***

The purpose of the present experiment was to examine the effects of a functionally positive reinforcer on discrete and non-discrete target behaviours when delivered at a frequent and a very frequent rate, and to investigate for transfer of training to non-experimental tasks.

Results from TrED's data for Client employee 1 demonstrate that gains in accurate production rate were maintained at eight weeks after the experiment. There was no evidence for transfer of training to non-experimental tasks.

Results from Experiment 1 during the first three conditions demonstrate that verbal praise was shown to be a functionally positive reinforcer of the Client employee's accurate production rate and the percentage of time spent in production. Rate of verbal praise increased accurate production rate and production time when delivered at an increased rate and, both these behaviours decreased to their baseline level when verbal praise was withdrawn. An increased delivery rate of verbal instructions in Condition B may have contributed to this reinforcement effect.

In the very frequent verbal praise conditions when the rate of verbal praise was further increased, it was initially associated with a further increase but a later decrease in the employee's accurate production rate and time spent in production. An increase in the delivery of verbal instructions may have contributed to the decreased accurate production rate in the final condition.

The results for Experiment 1 show that both target behaviours (production time and accurate production rates) became more variable with this Client employee and the positive reinforcer appears to lose its reinforcing properties when delivered at a very frequent rate. In addition, the overall activity level of the Trainer and the Client employee increased during the very frequent verbal praise conditions while time spent in production and accurate production rates decreased. In short, the reinforcing function did not remain stable when delivered at different rates.

The present results suggest that the variability in the target behaviours probably began to occur in the first very frequent verbal praise condition (C1). In this condition , the time spent in inappropriate behaviour increased when praise was introduced at a very frequent rate, rather than decreased as it had done when praise

was delivered at a rate of twice as much (Condition B). However, the correlational analysis of the data for the very frequent verbal praise conditions does not support a direct linear relationship between the rate of praise and inappropriate behaviour or, between the rate of praise and accurate production rate. Thus, it is not clear what is responsible for the apparent loss of the reinforcing properties of the reinforcer in the final condition when the highest rate of praise was delivered. The function of the reinforcer appeared to change when delivered at higher rates. This question will be explored further in the " Discussion" section beginning on page 67.

EXPERIMENT 2

(i) ***Subjects***

Client employee 2 was a twenty-seven year old female diagnosed as severely developmentally delayed. She is described by TrED staff as possessing very few communication skills but able to follow two and three step instructions. TrEd staff were uncertain about this subject's more general receptive language skills. Client employee 2 had been living in government run supervised accommodation for the past thirteen years and had been an employee at the TrED Centre for twenty-two months.

With Trainer 2a as respondent the Client employee was assessed during the experiment using the Scales of Independent Behaviour (Bruininks, Woodcock, Weatherman, & Hill, 1985). Her overall broad independence age score was 3 years 7 months and scores for the four areas of independent functioning were as follows;

Motor Skills Cluster Score: 3 years 2 months

Social and Communication Skills Cluster Score: 1 year 8 months

Personal Living Skills Cluster Score: 5 years 9 months

Community Living Skills Cluster Score: 4 years 2 months

The mean supervision level for Client employee 2 for the five weeks prior to the experiment was .82 on Task 1 and .35 on Task 2, and .59 for both tasks. As an indicator of reinforcement history this informs that the Client employee was being supervised between 0% and 25% of the total time of a work session and was performing at TrED's criteria for mastery (see page 25 for definition) on the experimental tasks.

Client employee 2 had been performing the experimental tasks for twenty-two months. The client employee performed the tasks more frequently when they were first introduced to her and mastery training was in progress. As mastery on a task(s) is achieved, TrED introduces additional tasks to provide variety of work for clients. The experimental tasks had remained a standard work task for this Client employee over her twenty-two months at the Centre. Client employee 2 performed the

experimental tasks approximately four to six times a week.

According to Trainer 2a, Client employee 2 had been supervised by Trainer 2a approximately 60 per cent of the time she had been at the TrED Centre prior to the experiment. Client employee 2 was supervised by Trainer 2b for the remaining 40 per cent of the time. Trainer 2a worked exclusively with Client employee 2 during the first three experimental conditions. Trainer 2b began and continued working exclusively with Client employee 2 during the third experimental condition.

Trainer 2a reports being at the TrED Centre since it opened in 1982 (eight years). This twenty-eight year old female Trainer had tertiary academic qualifications in Special Education and eleven years experience working with intellectually disabled clients. Trainer 2b was a twenty-six year old female with tertiary academic qualifications in Special Education. Trainer 2b reports being at the TrED Centre for three years and having a total of five years experience working with intellectually disabled adults. Both Trainers had been training the Centre's clients to carry out the experimental tasks for the whole of the time they had been at the Centre. Each Trainer received training in the Centre's structured training method.

(ii) ***Alterations to General Design and Procedure***

During the third condition (A2) the trainer chosen by TrED (2a) took holiday leave from her position and was replaced by a second trainer (2b). This change occurred during the withdrawal of twice as much verbal praise condition (A2) and the condition was extended to ensure that no significant change in the employee's target behaviour resulted from changing trainers.

(iii) ***Results***

Reliability :

The reliability test was carried out by the Experimenter as follows. The Experimenter coded a number of the experimental sessions twice. Once while the actual session was in progress and secondly, at a later time, from a videotaped recording of the same session. The discrete and durational data analysis (described in section (vi) (c) of the Experimental Data Analysis Method) was carried out on both

the real time recorded data and the data recorded from the videotaped session. This yielded two sets of data, each set comprised of rates of occurrences for the discrete responses and duration times for the continuous responses. The percentage agreement between corresponding variables in the two sets of data was then calculated using a handheld calculator. The formula used for this calculation was

$$100 - \frac{|X_1 - X_2|}{X_1} \times 100$$

where X_1 is the variable from the real time data and X_2 is the corresponding variable from the videotaped data. This reliability test was carried out in different conditions of the experiment (Baseline (A1) and Twice as much verbal praise (B)), and the results are listed below. Additional reliability test of the data were not possible because the video equipment was no longer available to the Experimenter. Results reported are the percentage agreement between rates of occurrence or duration times.

The overall mean percentage agreement when comparing the Experimenter's reliability in recording the two sets of data for Experiment 2 was 88.5 percent.

Experimenter Recorded Reliability Data

Condition/ Session/Task	Variable	Real Time Data	Videotaped Data	Percentage Agreement
A1/S10/T2	On task	82.86	83.41	99.3
	In production	77.14	78.54	98.2
	In proximity	18.81	12.93	68.7
	In phys. instr.	0	0	100
	Combined praise	1.14	1.17	97.4
	Verbal Instr.	2.29	2.05	89.6
	Reprimand	0.43	0	0
	Other	0	0	100
Mean Percentage Agreement in Condition A1, Session 10, T 2=81.7				
B/S11/T1	On task	83.65	80.72	96.5
	In production	62.98	60.48	96.0
	In proximity	20.9	22.2	94.0
	In phys. instr.	0	0	100
	Combined praise	39	34	87.2

Verbal Instruction	1.14	1.16	89.7
Reprimand	.14	.14	99.8
Other	0	0	100

Mean Percentage Agreement in Condition B, Session 11, T 1=95.4

Mean Percentage Agreement for Task 1 & 2 in Condition A1 & B =**88.5**

Experimental Data Results:

Table 4 shows the means for all variables per task for all six conditions in Experiment 2. The means were obtained by averaging over the number of experimental sessions pertaining to each condition.

As can be seen from the means for each experimental condition in Table 4, when instructed to increase or decrease the rate of delivering specific and general verbal praise, Trainers 2a and 2b followed the experimental instructions. Similar to Trainer 1 in Experiment 1, Trainer 2b delivered specific praise at a higher rate in the final very frequent verbal praise condition (C2) than in the first very frequent verbal praise condition (C1). Also similar to Trainer 1, Trainer 2b delivered less than baseline rates of general praise in the final very frequent verbal praise condition (C2). This decline is believed to be due to the operational definitions of specific verbal praise (delivered within 10 seconds of the behaviour being praised) and general verbal praise (delivered after more than 10 seconds of the behaviour being praised). The definitions obviously limit the occurrences of praise that could be defined as "general" under the very frequent verbal praise conditions.

When specific and general verbal praise rate is combined, Trainers 2a and 2b followed the reinforcer delivery rate schedule as instructed, although the highest rate of praise was delivered in the final condition. The relationship between the Trainer's rate of delivering (combined) verbal praise and the Client employee's rate of accurate production will be investigated in detail later in this section.

The rate at which the Trainer delivered reprimands to the Client employee, the rate at which the Trainer interacted with others (in addition to the Client employee) and the percentage of time the Trainer spent giving physical instruction to the Client employee were all very infrequent and relatively stable across all experimental conditions (see

TABLE 4

EXPERIMENT 2: MEANS OF DISCRETE AND CONTINUOUS VARIABLES

Condition	Task No.	Rate per Minute of;							% of Time Spent in;			
		Accurate Production	General Verbal Praise	Specific Verbal Praise	Combined Verbal Praise	Verbal Instruction	Reprimand	Other	On Task	Production	Trainer in Proximity	Trainer in Phys. Instr.
Baseline A1	1	3.8	.38	.206	.586	1.97	.31	.81	84.77	58.23	34.52	.07
	2	4.2	.63	.19	.82	1.97	.28	.01	86.82	59.01	25.14	0
Twice as Much Verbal Praise B	1	4.9	2.9	3.26	6.16	4.94	.26	.26	96	65.46	67.36	0
	2	5.6	3.06	3.8	6.86	4.2	.13	.18	90.13	68.13	82.3	0
Withdrawal A2	1	3.6	.41	.21	.62	1.75	.16	0	86.46	69.68	13.72	0
	2	4.1	.44	.12	.65	1.79	2.19	0	77.32	58.62	15.84	0
Very Frequent Verbal Praise C1	1	5	8.57	18.29	26.86	.72	.009	0	97.91	85.17	98.8	0
	2	5.9	2.87	12	14.87	.78	0	0	97.13	85.33	97.6	0
Withdrawal A3	1	2.8	.015	.133	.148	1.33	.145	.025	63.65	44.65	15.73	0
	2	5.7	.15	.26	.41	1.54	.22	.03	85.48	59.23	23.96	0
Very Frequent Verbal Praise C2	1	5.3	.2	27.6	27.8	1.52	.028	0	98.7	59.88	99.5	0
	2	6.2	0	27.62	27.62	2.4	.07	0	98.32	57.2	95.3	0

Note:
Task No. 1=Cutting Wire Tips
Task No. 2=Stripping Wire Tips

Table 4). These results were expected because each of the Trainers worked exclusively with Client employee 2 during the experiment and were interacting with others only very minimally. In addition, reprimands, interactions with others and, physical instruction occurred very infrequently during baseline and the Trainers were instructed to hold these interactions stable during all experimental conditions. The Trainers were able to follow the experimental instructions across all conditions for these behaviours.

The percentage of time each Trainer spent in proximity to the Client employee follows the reinforcer delivery rate schedule as expected. As reinforcer delivery rate was increased or decreased the Trainer spent correspondingly more or less time in proximity to the Client employee in order to deliver the rate of verbal praise appropriate to the experimental condition.

The Trainer did not hold constant the rate of delivering verbal instructions to the Client employee as per experimental instructions. The means for the rate of delivery of verbal instructions in Table 4 indicate that when instructed to deliver twice as much verbal praise (Condition B), the Trainer also increased the rate of verbal instructions, instead of holding verbal instruction rate constant. The Trainer again increased the rate of verbal instructions on Task 2 during the final very frequent verbal praise condition. In all other conditions the delivery rate of verbal instructions remained relatively stable. This result will be investigated in more detail later in this section by plotting the individual session data to look for trends in the data (see page 55).

Of the three Client employee behaviours, only the percentage of time spent in on task behaviour follows the reinforcer delivery rate schedule across all experimental conditions as expected. As reinforcer delivery rate was increased or decreased, it was associated with the Client employee spending more or less time attending to the task in accord with the experimental condition.

The percentage of time the Client employee spent in production behaviours did not follow the reinforcer delivery rate schedule as expected. As can be seen from the means in Table 4, on Task 2 during the withdrawal of twice as much verbal praise condition (A2), the amount of time the Client employee spent in production increased slightly rather than decreased as expected. The percentage of time the Client

employee spent in production decreased rather than increased as expected in the final very frequent verbal praise condition. This result will be further investigated later in this section on page 55.

The third Client employee behaviour, accurate production rate, follows the reinforcer delivery rate schedule across some but not all experimental sessions. The Client employee's accurate production rate did not increase further when praise was increased to a very frequent rate. Nor did the Client employee's accurate production rate decrease as expected on Task 2 in the withdrawal of very frequent verbal praise condition (A3) when the Trainer decreased the delivery rate of verbal praise.

To more closely examine the relationship between the independent variable (rate of delivery of verbal praise) and the dependent variable (accurate production rate) Figure 6 is presented below. Figure 6 graphically displays the employee's rate per minute of accurate production for each experimental session within the ABACAC reversal design across both experimental tasks (as described in Chapter 2).

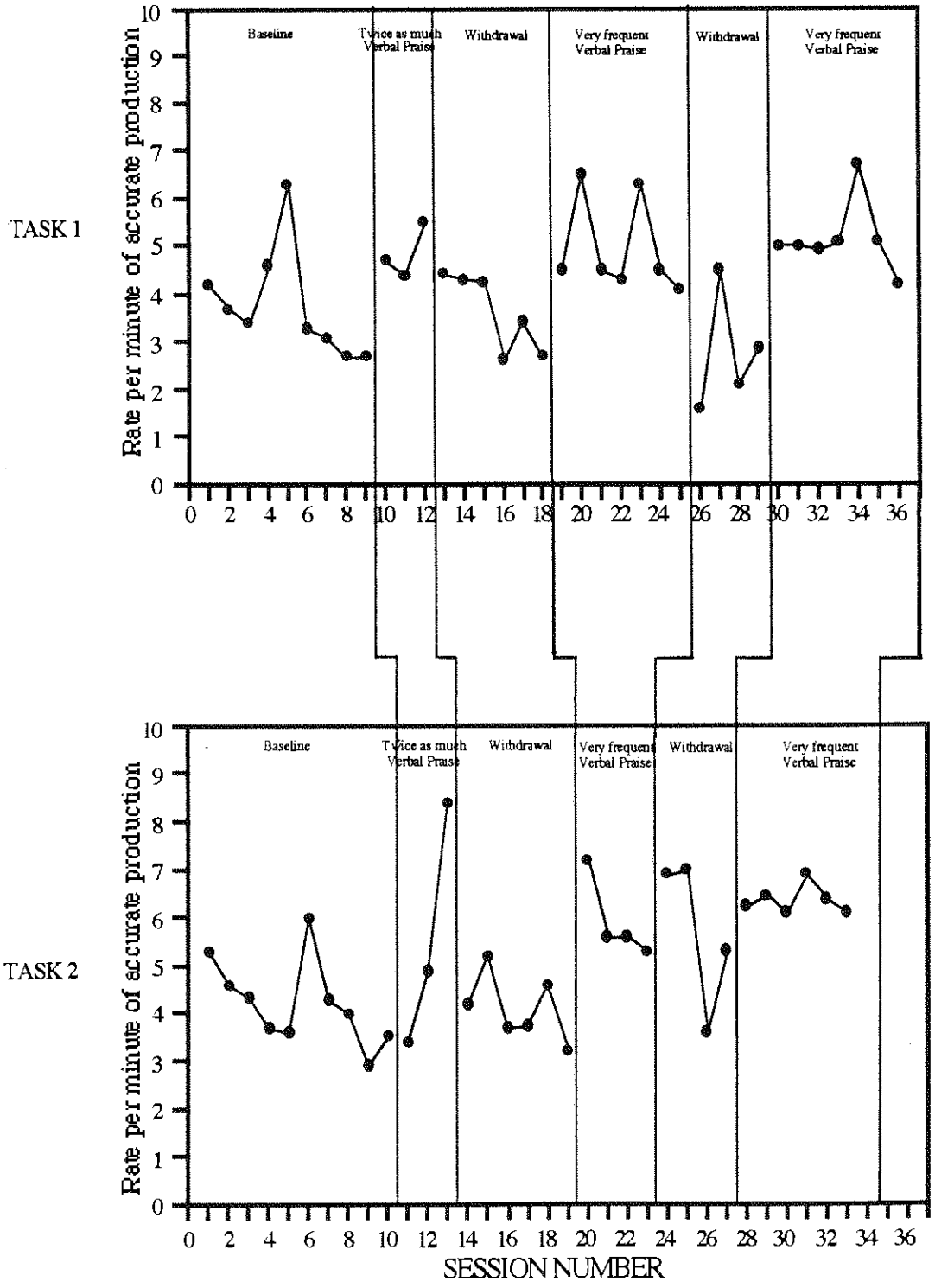
As can be seen from Figure 6, when the Trainer was instructed to deliver twice as much verbal praise (Condition B) there was an increase in the rate of accurate production on both tasks, and this increase was especially sharp on Task 2. During the third condition (A2) when the delivery of twice as much verbal praise was withdrawn the Client employee's rate per minute of accurate production returned to that which was observed during the baseline condition (A1). This result clearly demonstrates verbal praise as a functionally positive reinforcer of the employee's rate of accurate production.

During the fourth condition (C1) when the Trainer was asked to deliver praise at a very frequent rate the Client employee's rate per minute of accurate production increased on both tasks relative to the previous withdrawal condition. However, no further increase in mean rate of accurate production was observed between the twice as much verbal praise condition (B) and the very frequent verbal praise condition (C1). The individual session data do not show any specific trends in this condition.

When the delivery of very frequent verbal praise was withdrawn in the fifth condition (A3) the employee's mean rate per minute of accurate production decreased dramatically on Task 1 to below the baseline mean. This demonstrates that verbal

FIGURE 6

EXPERIMENT 2: ACCURATE PRODUCTION



praise rate remained a functional reinforcer when delivered at this rate. Rate per minute of verbal praise did not further increase accurate production rates for this Client employee.

On Task 2 in Condition A3 there was no change in the mean accurate production rate, which remained above the baseline mean. The session data for Task 2 shows a sharp decrease, followed by a slight increase when very frequent verbal praise was withdrawn. It cannot be concluded from these results that praise remained reinforcing when delivered at this rate on Task 2. It remains a possibility that the results for Task 2 in Condition A3, suggest maintenance of the reinforcing effect on this task or a possible loss of the contingent effect of the positive reinforcer. Further investigation of the data may clarify why the reversal was incomplete on this task.

In the final condition (C2) when the trainer was instructed to reintroduce the delivery of verbal praise at a very frequent rate, the employee's rate of accurate production on both tasks increased relative to the preceding withdrawal condition and then began to decrease but remained above all other preceeding conditions. The increase in mean rate of accurate production in this condition was dramatic on Task 1 but was only marginal on Task 2. These results suggests that the reinforcer remained effective when delivered at a higher rate on Task 1, where the preceding withdrawal condition was clearly evidenced. Similar to Condition C1, a significant increase in the rate of reinforcer delivery during this very frequent verbal praise condition did not further increase the target behaviour above that observed in Condition B (twice as much verbal praise).

In summary, the results of Experiment 2 demonstrate that the rate of verbal praise increased accurate production rate with this Client employee when its delivery rate was increased. When the rate of verbal praise was further increased, it was associated with maintaining, but not further increasing the employee's accurate production rate on both tasks. On Task 2, however, reversal of the maintenance effect was incomplete in Condtion A3. These results were demonstrated by both the mean rate of accurate production and the trends in the data for this Client employee .

In an attempt to clarify the results obtained for accurate production rates in Experiment 2, those variables which did not follow the reinforcer delivery rate

schedule as expected (verbal instructions and in production) will be further investigated.

The relationship between the Trainer's rate of delivering verbal instructions and delivering verbal praise is displayed graphically in Figure 7. As can be seen in Figure 7, when instructed to deliver twice as much verbal praise the Trainer also increased the rate of delivering verbal instructions on both Tasks. Thus, in Condition B both praise and verbal instructions were delivered at a higher rate by the Trainer. The Trainer also increased the delivery rate of verbal instruction on Task 2 in the final very frequent verbal praise condition (C2).

These results suggest that the delivery of verbal instructions may have contributed to the increase in the Client employee's accurate production rates on both tasks in the twice as much verbal praise condition (B). The delivery of verbal instructions may have also contributed to maintaining accurate production rate in the final very frequent verbal praise condition on Task 2. However, the data demonstrates that the rate of delivery of verbal instructions remained relatively stable in all other conditions (A1, A2, C1 & A3) and thus, was not associated with changes in the accurate production rates over all experimental conditions. Therefore, verbal instruction delivery rate is not responsible for the results obtained for accurate production rates in Experiment 2, but may have contributed to the effects during Condition B and C2.

To further investigate the possible reasons that another of the Client employee's responses did not follow the reinforcer delivery rate schedule, Figure 8 graphically displays the relationship between the Trainer's rate of delivering praise and the percentage of time the Client employee spent in inappropriate production behaviour. The percentage of time the employee spent in non-production behaviour (hereafter referred to as inappropriate behaviour) was calculated by subtracting from 100 the percentage of time the employee spent in production for each experimental session (from Table 4). As can be seen from Figure 8, inappropriate behaviour decreased across both tasks when twice as much verbal praise was delivered in Condition B. The Client employee's inappropriate behaviour on Task 1 initially increased and then decreased slightly during the subsequent withdrawal condition (A2). On Task 2 in this condition the Client employee's inappropriate behaviour increased to baseline

FIGURE 7

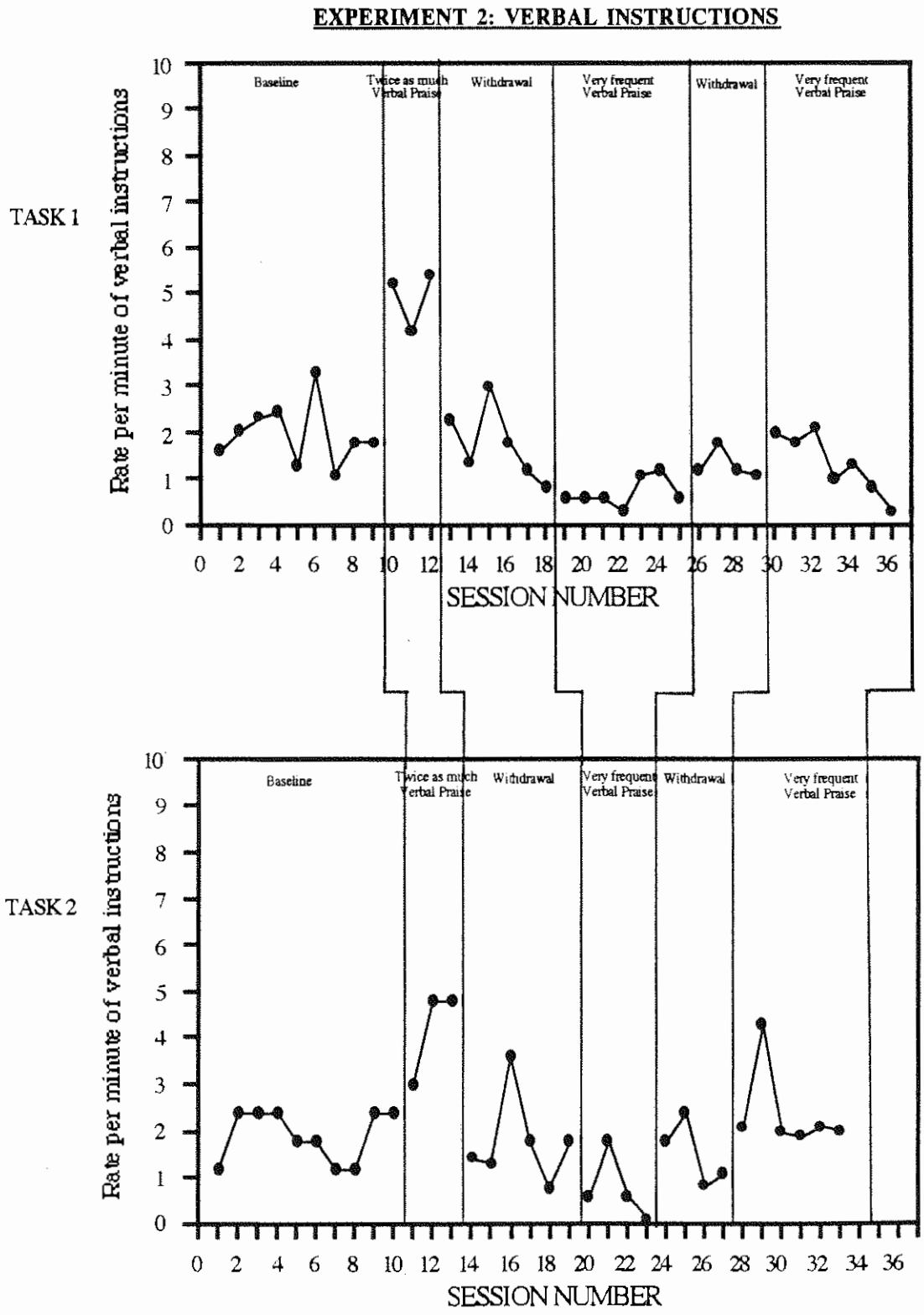
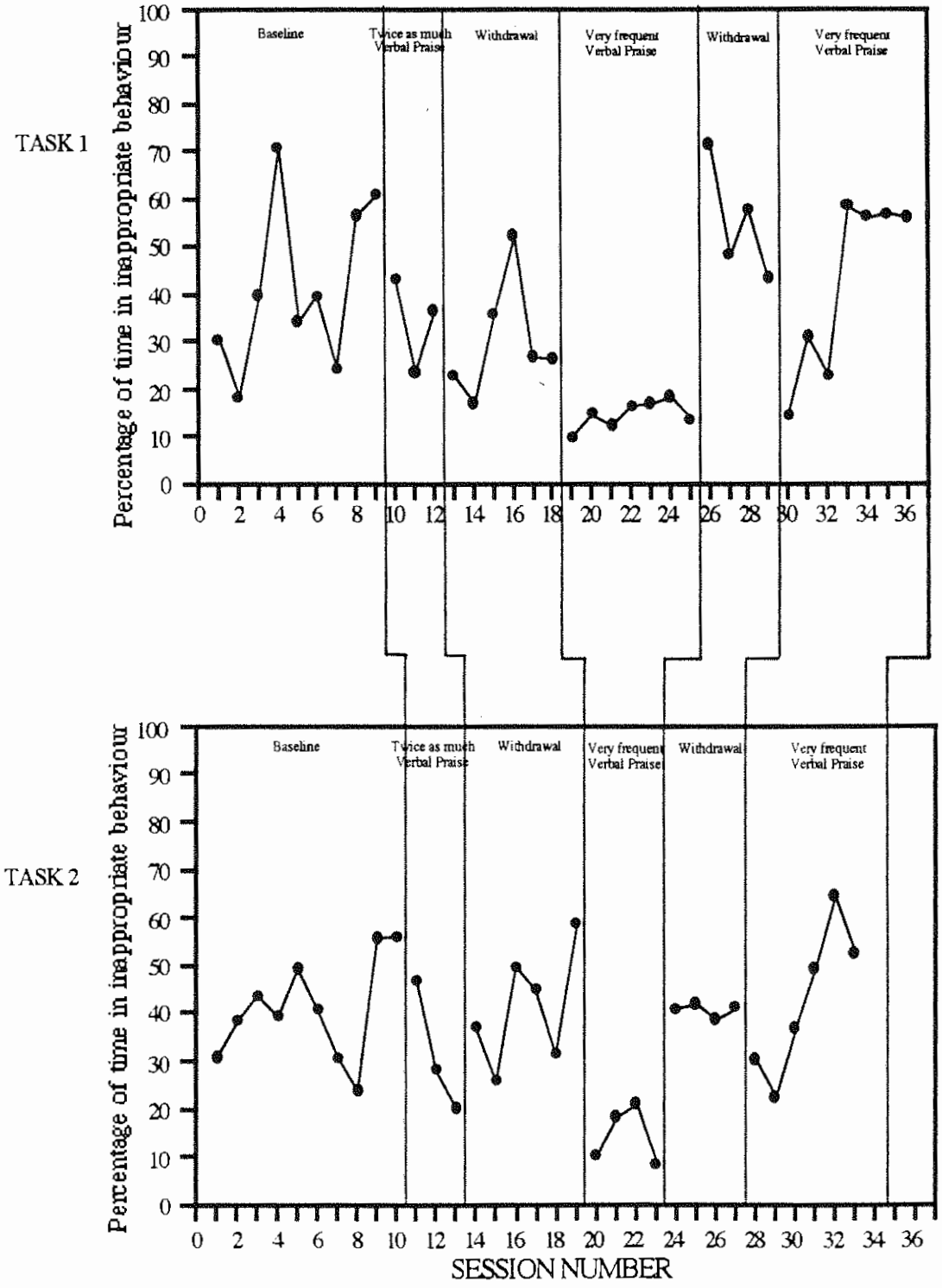

EXPERIMENT 2: VERBAL INSTRUCTIONS
TASK 1
TASK 2
Rate per minute of verbal instructions
Baseline
Twice as much Verbal Praise
Withdrawal
Very frequent Verbal Praise
Withdrawal
Very frequent Verbal Praise
SESSION NUMBER
0 1 2 3 4 5 6 7 8 9 10
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36

FIGURE 8

EXPERIMENT 2: INAPPROPRIATE BEHAVIOUR



levels.

In Condition C1, when very frequent verbal praise was introduced, the Client employee's inappropriate behaviour decreased further across both tasks to well below the baseline level. In Condition A3, when very frequent verbal praise was withdrawn, the Client employee's inappropriate behaviour increased to well above the baseline level on Task 1. On Task 2 in this condition inappropriate behaviour increased to the baseline rates.

When very frequent verbal praise was reintroduced in the final condition (C2), the Client employee's inappropriate behaviour increased sharply to baseline levels across both tasks.

These results demonstrate that verbal praise rate acted as a punisher for inappropriate behaviour and a positive reinforcer for it's opposite -time spent in production- during Experiment 2. Verbal praise rate was a positive reinforcer for time spent in production on Task 2 when its delivery rate was initially increased. When the delivery rate of verbal praise was further increased in Condition C1, rate of praise served as a reinforcer for production time across both tasks. When very frequent verbal praise was reintroduced in the final condition (C2), rate of praise was associated with a decrease in the Client employee's production time across both tasks. This decrease in Condition C2 demonstrates that the relationship between rate of praise and time spent in production became unstable for Client employee 2 when praise was reintroduced at a very frequent rate. Furthermore, it may be that this instability was beginning to occur in Condition A2 on Task 1. In that condition (A2), reversal of the reinforcement effect on production time was incomplete.

The means in Table 4 and the session data (Figures 6 & 8) suggest that the Client employee's inappropriate behaviour may have increased while accurate production rates remained remained relatively stable as the rate of delivery of praise was increased across the two very frequent verbal praise conditions (C1 & C2). To investigate this further, a correlational analysis was performed on the data in the very frequent verbal praise conditions to examine the relationship between the trainer's rate of delivering verbal praise and; i) the percentage of time the employee spent in inappropriate behaviour during Conditions C1 & C2 and, ii) the employee's rate of

accurate production per minute in Conditions C1 & C2. The correlations are presented in Table 5 and plots for each of the correlations listed are in Appendix 2.11.

TABLE 5

Experiment 2

Pearson-Product Moment Correlations in Very Frequent Reinforcement Conditions

	Task 1 %Time in Inappropriate Behaviour	Task 2 %Time in Inappropriate Behaviour	Task 1 Rate of Accurate Production	Task 2 Rate of Accurate Production
Specific Praise	+.90281	+.54821	+.078879	+.14652
Specific Praise above 30 per minute	*	*	*	*
Specific Priaise below 30 per minute	+.81793	+.41616	+.31286	+.26665
General Praise	-.468	-.48869	-.35796	+.07522
General Praise above 30 per minute	*	*	*	*
General Praise below 30 per minute	-.468	-.48869	-.35796	+.07522
Specific and General Praise combined	+.90016	+.48494	+.021354	+.21125
Combined Praise above 30 per minute	*	*	*	*
Combined Praise below 30 per minute	+.82593	+.30995	+.19125	+.44851

Notes

- indicates a negative correlation

+ indicates a positive correlation

* indicates a meaningless correlation due to insufficient data points

As can be seen from Table 5 there is a high positive linear correlation between inappropriate behaviour and rate of specific praise, and also between inappropriate behaviour and the rate of all praise combined on Task 1. As the delivery rate of praise was increased, the employee's inappropriate behaviour increased proportionally across the two very frequent verbal praise conditions on Task 1. Thus, time spent in production decreased in proportion to an increasing rate of praise with this Client employee on Task 1, as suggested earlier by the means and session data.

On Task 2 the correlations between inappropriate behaviour and rate of praise are

not strong, but are in the same positive direction as in Task 1. These results are suggestive but not conclusive, of a direct linear relationship between praise and inappropriate behaviour on Task 2.

The correlational data in Table 5 do not indicate a directly proportional relationship between the rate of delivering praise and the Client employee's accurate production. This does not rule out the possibility of a non-linear relationship between these variables.

The above results indicate that not all of the target (production) behaviours became unstable with this Client employee. Only percentage of time spent in production was demonstrated as unstable for Client employee 1. Accurate production rate did not become more variable and decrease for this Client employee under high rates of praise. Instead, it appears that this Client employee was able to achieve greater production output with less time spent in production under higher praise delivery rates.

TrED Data;

In an effort to investigate TrED's data for transfer of training from experimental to non-experimental tasks Table 6 shows the pre and post experiment means for accurate production rate per minute and supervision levels.

TABLE 6

TRED'S DATA FOR SUBJECT 2: MEAN ACCURATE PRODUCTION RATES AND SUPERVISION LEVELS

		Mean Production Rate per Minute				Mean Supervision Level per Task			
Tasks		1	2	3	4	1	2	3	4
Subject 2	Pre-Experiment	3.8	5.3	.7	.43	.82	.35	.53	.93
	Post-Experiment	4.9	5.8	.55	.35	.76	.76	.45	.13

Note: Tasks 1&2 are Experimental Tasks
Tasks 3&4 are Non-experimental Tasks

As can be seen from Table 6 the employee's mean production rate on Task 1

remained higher in the eight weeks following the experiment than during the four weeks preceding the experiment. This result demonstrates maintenance, at eight weeks, of production gains obtained during the experiment for Task 1. On Task 2, there is a slight increase from pre to post experimental weeks in production rate. Although not conclusive, this result is suggestive of maintenance. There is no change in production rate on non-experimental tasks (3&4) and thus, no evidence for transfer of training of the reinforcement effect to non-experimental tasks.

Figure 9 graphically displays TrED's cumulative data for weekly mean production rate for the four weeks preceding, the thirty-two weeks during and the eight weeks following the experiment. In this figure, post experiment maintenance of the reinforcement effect can be seen clearly for Task 1.

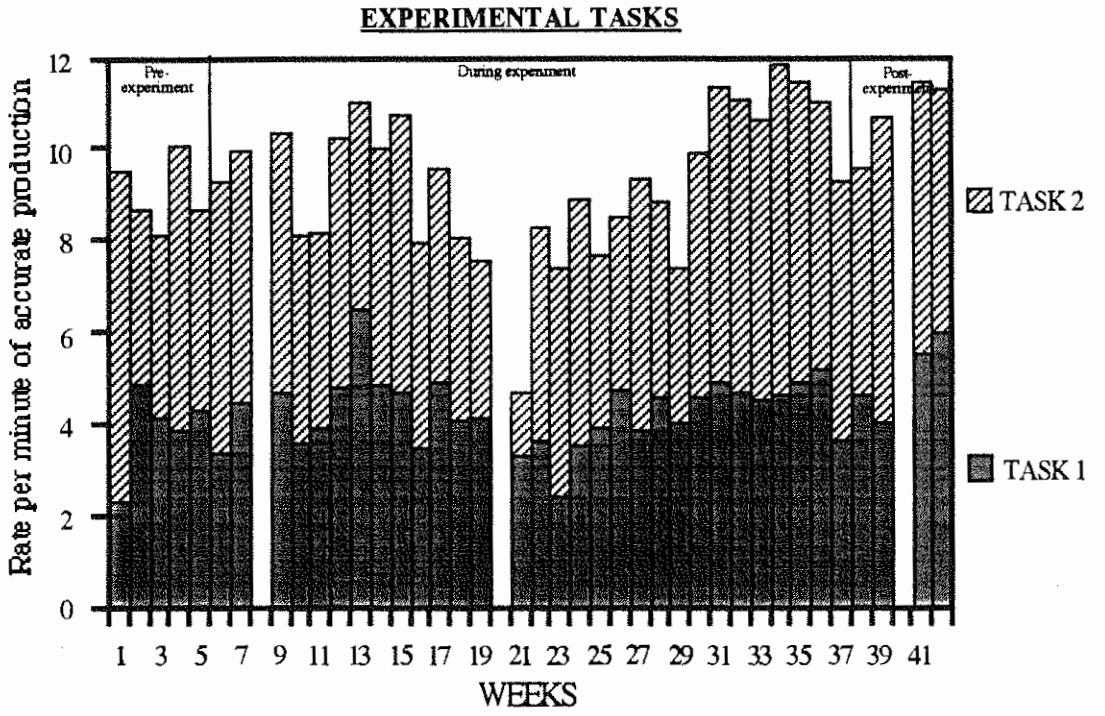
Supervision level is rated by TrED as a whole number ranging from 0 to 3. As can be seen from Table 6 there is no change in the mean supervision level on either experimental or non-experimental tasks from pre to post- experiment weeks and thus, no evidence suggested for transfer of training of supervision behaviours. This result is confirmed when the pre, during and post-experimental weekly mean supervision levels of experimental and non-experimental tasks are displayed graphically as in Figure 10.

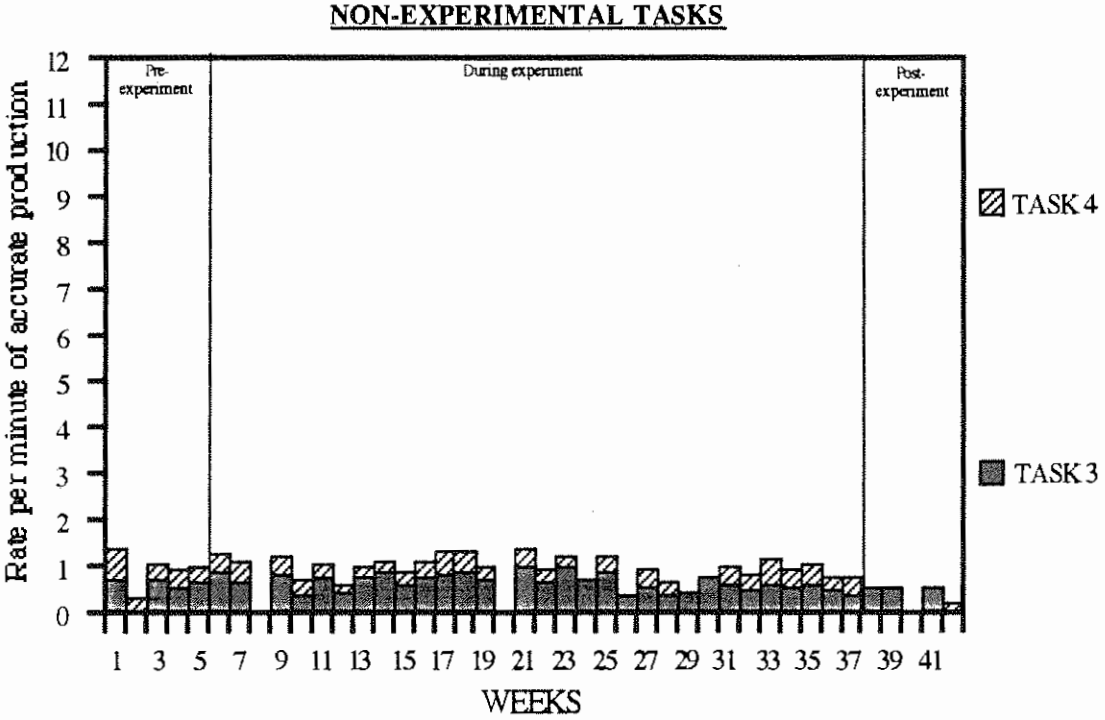
In summary, there is evidence which shows post-experiment maintenance of the reinforcement effect obtained for accurate production rate for Task 1. There is partial support for a maintenance effect on Task 2. There is no evidence for transfer of training for accurate production rate or supervision level to non-experimental tasks.

It should be noted that these results indicate that the student had not achieved mastery according to TrED's criteria (correct execution of all steps in the task analysis on five consecutive production trials at 0 supervision) on the experimental tasks. Since the employee showed improvement on Task 1 from pre to post-experiment weeks, TrED's supervision levels are not a complete measure of employee performance. In particular, employee mastery or increases in production could not be ascertained on the basis of TrED supervision levels alone.

FIGURE 9

CLIENT EMPLOYEE 2: TRED DATA FOR ACCURATE PRODUCTION RATES





(iv) ***Summary***

The purpose of the present experiment was to examine the effects of a functionally positive reinforcer on discrete and non-discrete target behaviours when delivered at a high and very high rate with another Client employee and Trainer, and also to investigate for transfer of training to non-experimental tasks.

Results from TrED's data for Client employee 2 shows that gains in accurate production were maintained at eight weeks after the experiment on Task 1, but that transfer of training to non-experimental tasks was not evidenced.

Results from Experiment 2 demonstrate that during the first three conditions of the experiment, delivery rate per minute of verbal praise was a functionally positive reinforcer of this Client employee's accurate production rate and production time. When delivered at an increased rate, verbal praise increased the Client employee's accurate production rate and the percentage of time spent in production, and both these behaviours decreased to their baseline levels when verbal praise was withdrawn. An increased rate of delivering verbal praise in Condition B may have contributed to this reinforcement effect.

In the very frequent verbal praise conditions when the rate of verbal praise was further increased, it maintained, but did not further increase, accurate production rate on Task 1 with this Client employee. On Task 2 the rate of delivery of verbal praise was associated with maintaining accurate production rate, since the reversal was incomplete in Condition A3.

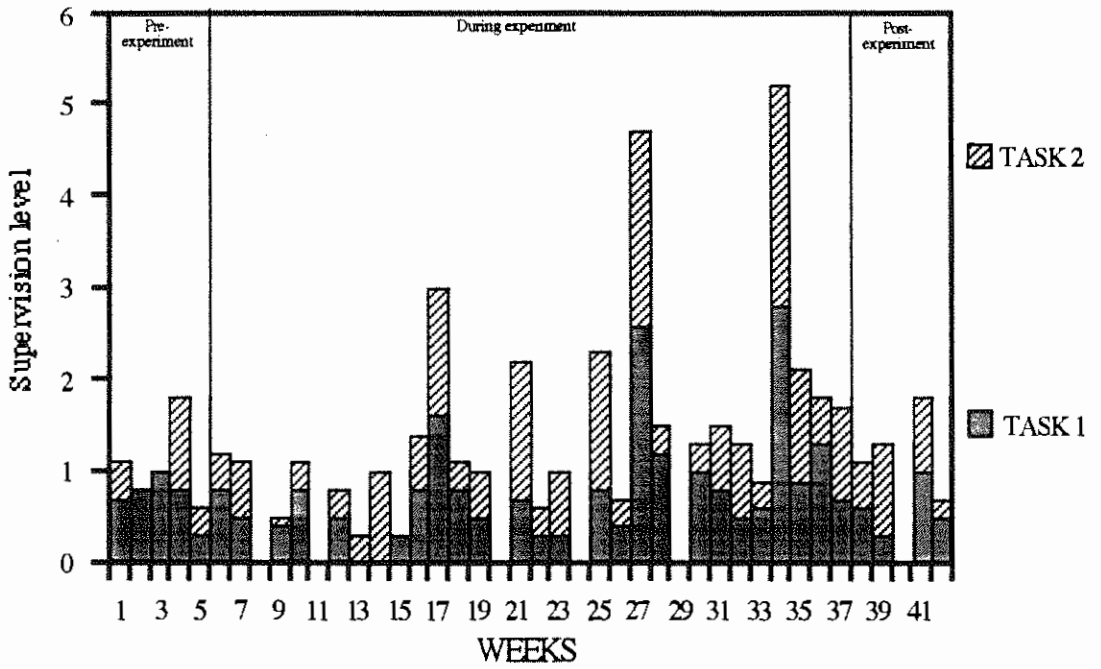
In the first three conditions when its rate of delivery was increased, praise was also shown to be a functional reinforcer of the percentage of time spent in production on Task 1. When initially introduced in Condition C1, a very frequent rate of praise was shown to increase time in production across both tasks. When reintroduced in Condition C2, praise delivered at a very frequent rate was associated with a decrease in this Client employee's time in production. An increased rate of verbal instruction may have contributed to the decrease in production time during Condition C2.

The results from Experiment 2 show that the reinforcer appears to loose its reinforcing power when delivered at a very frequent rate and the percentage of time spent in production decreased for Client employee 1. Accurate production rate did

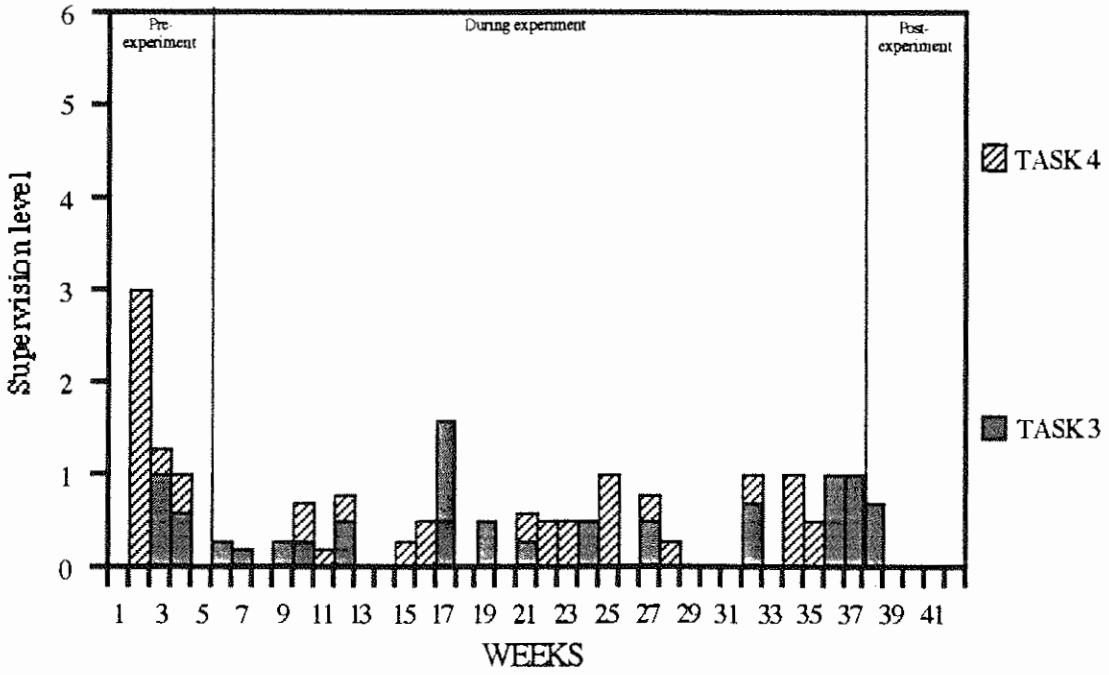
FIGURE 10

CLIENT EMPLOYEE 2: TRED DATA FOR SUPERVISION LEVELS

EXPERIMENTAL TASKS



NON-EXPERIMENTAL TASKS



not decrease for this Client employee under high rates of praise. Instead, Client employee 2 spent less time accurately producing a similar amount of wires under the highest praise delivery rate. In addition, the overall activity level of the Trainer and the Client employee increased during the very frequent verbal praise conditions while accurate production rate remained stable. It appears that the reinforcing properties of verbal praise affected different target behaviours when delivered at different rates.

The results suggest that the instability which occurred for one of the target behaviours (time spent in production) may have begun to occur in Condition A2 on Task 1, when an incomplete reversal of the reinforcement effect was evidenced. This instability was clearly seen in the final very frequent praise condition when inappropriate behaviour increased rather than decreased, as it had done in the previous conditions of increased verbal praise rate (B and C1).

The correlational analysis of the data in the very frequent verbal praise condition supports a direct linear relationship on Task 1 between rate of praise and time spent in inappropriate behaviour. The correlation analysis results is suggestive of a directly proportional relationship between these variables on Task 2, but is not conclusive. The higher the delivery rate of praise, the less time Client employee 2 spent engaging in production behaviours on Task 2. Thus, the properties of the reinforcer which served to reinforce the target behaviours did not remain stable when delivered at a higher rate. These results will be explored further in the " Discussion" section beginning on page 67 .

SUMMARY AND CONCLUSIONS

The purpose of the present research was to investigate the effects of delivering a functionally positive reinforcer at a high and a very high rate on the discrete and durational production behaviours of two severely developmentally delayed adults. The study consisted of two single subject experiments and was designed to; i) identify a functionally positive reinforcer, ii) investigate the effects of the reinforcer on discrete and durational target behaviours (production rate and duration of time spent in production) when delivered at two distinct rates of delivery, iii) investigate for transfer of training to non-experimental tasks and, iv) determine if results were similar in a second experiment with another subject.

In each Experiment, an A1 (baseline), B (twice as much verbal praise), A2 (withdrawal), C1(very frequent verbal praise), A3 (withdrawal), C2 (very frequent verbal praise) sequence of reinforcer delivery rate was employed.

Results in the first three conditions of Experiment 1 demonstrated that when initially increased, delivery rate per minute of verbal praise was a functionally positive reinforcer. This effect was demonstrated with the accurate production rate and time spent in production of a severely developmentally delayed adult. An increased rate of delivering verbal praise served to increase accurate production rate and production time, and both these target behaviours decreased to their baseline level when verbal praise was withdrawn.

When a very frequent rate of verbal praise was introduced, it was initially associated with a further increase but a later decrease in accurate production rate and production time. When the reinforcer delivery rate was very frequent, both production behaviours became more variable, and the reinforcing function of the positive reinforcer did not remain stable with Client employee 1. The stability of effect on the target behaviours probably began to break down when very frequent praise was introduced in Condition C1. This instability was even more noticeable with the second introduction of the delivery of praise at a very frequent rate. A correlational analysis of the data in the very frequent praise conditions however, does not support a proportional relationship between delivery rate of praise and

inappropriate behaviour or, between delivery rate of praise and accurate production rate. The function of the reinforcer appears to have changed when delivered at a higher rate with Client employee 1, although the results do not clearly demonstrate why this may have occurred.

Results in the first three conditions of Experiment 2 also demonstrated that when initially increased, delivery rate per minute of verbal praise was a functionally positive reinforcer. This effect was demonstrated with the accurate production rate and time spent in production of another severely developmentally delayed adult. An increased rate of delivering verbal praise served to increase accurate production rate and production time, and both these target behaviours decreased to their baseline level when verbal praise was withdrawn.

When a very frequent rate of verbal praise was introduced, it maintained the rate of accurate production on both tasks, but the reversal was incomplete on Task 2. In addition, when a very frequent rate of verbal praise was introduced, it also served as a functional reinforcer of time in production on Task 1. When reintroduced at a very frequent rate, praise was associated with a decrease in production time across both tasks.

When delivered at a very frequent rate with Client employee 2, one of the target behaviours (time in production) became less stable and more variable, and the reinforcer appeared to lose its reinforcing power. The other target behaviour (accurate production rate) remained stable with Client employee 2. Instead of accurate production rate decreasing in the very frequent verbal praise conditions, Client employee 2 maintained a stable production output with less time spent in production. It appears that the reinforcing properties of verbal praise rate affected different target behaviours in a different manner when delivered at a higher rate. The decrease in time spent in production was clearly evidenced in the final very frequent verbal praise condition with Client employee 2. A correlational analysis of the data in the very frequent verbal praise conditions supports a directly proportional relationship between rate of praise and time spent in inappropriate (non-production) behaviour for Task 1, and suggests a positive correlation between rate of praise and accurate production rate for Task 2. Thus, the properties of the reinforcer which served to

reinforce the target behaviours did not remain stable when the reinforcer was delivered at a very frequent rate.

Although the overall results of Experiment 1 and 2 are somewhat different, the rate of delivery was a significant property of the reinforcer with both Client employees. The function of the reinforcer did not remain stable across behaviours when delivered at an increased rate. In both experiments rate per minute of verbal praise served as a functional reinforcer of the target behaviours when delivered at a rate increased above the baseline rate. However, when the delivery of the reinforcer was increased to a very frequent rate, it was associated with decreases in one or both of the target behaviours across both Client employees. The instability which occurred in the target behaviours was most clearly evidenced in the final very frequent praise conditions for both Client employees. However, the results suggest that the variability began in different conditions for each Client employee.

Another similarity in the results from the two experiments is that both Client employees were most efficient in the first very frequent verbal praise condition (C1). That is, during this condition both Client employees achieved greater accurate output with less time spent in production than in other conditions. From the present results, it cannot be assumed that a reinforcer delivered at one rate will continue to positively reinforce a higher rate of responding across all behaviours. Results with these two Client employees provide evidence that the reinforcing function of a positive reinforcer may not remain stable across behaviours. Therefore, the rate of delivery of a reinforcer cannot be ruled out as an important parameter of the positive reinforcement process and needs to be specified and accounted for in experimental or treatment procedures in which it is used. This conclusion is in contrast to the general principle that increasing reinforcement (or a parameter of the reinforcer) leads to increases in responding.

Results from the correlational analysis of the data in the very frequent verbal praise conditions is not consistent across both Client employees, nor is it consistent with the session data. From the correlational analysis results, there was no evidence of a positive linear relationship between reinforcer delivery rate and response rate or durations with Client employee 1. Yet the session data suggested that as the

reinforcer delivery rate was increased across the very frequent verbal praise conditions, both target behaviours eventually decreased. Results from the correlational analysis for Client employee 2, on the other hand, demonstrated partial support across both tasks for a positive linear relationship between target behaviours and reinforcer delivery rate. The session data for Client employee 2 across the two very frequent verbal praise conditions, suggested a positive association for one of the target behaviours (time in inappropriate behaviour), but not for the other (accurate production rate).

Furthermore, the present research did not reliably find that further increases in reinforcer delivery rate serve to produce corresponding further increases in production rate or duration of time spent in production. Rather, results from the present research found that increasing reinforcer delivery rate was not necessarily associated with increases in responding across both Client employees. These results are in contrast to recent applied studies which independently investigated the effects of varying reinforcer magnitude. Waters (1979) reports a further increase in performance by further increasing reinforcer magnitude across all subjects, thereby suggesting a proportional relationship. Such contrasting findings do not adequately support a conclusion that a proportional linear relationship reliably exists between increases in reinforcer delivery rate and increases in responding. This conclusion is in contrast to results from early animal studies (e.g. Schrier, 1958) which conclude that the relationship between reinforcement and response rate is a positive and linear one.

That transfer of training to non-experimental tasks did not occur is not surprising since the two experimental tasks were topographically very similar and, transfer or discrimination training was not an aspect of the experimental procedures. This result may be seen as indicating experimental control over the variables.

TrED's training methods do not appear to maximize the Client employee's performance. The reinforcement effect obtained during the experiment and the maintenance of the effect at eight weeks, suggest that an employee's production could be improved by the Trainers simply giving verbal praise at a rate of 3 to 5 per minute during production sessions. Whether or not this rate of praise would have to be

continuous or could be thinned to an intermittent schedule and remain effective still requires investigation. Since increasing the rate of reinforcer delivery is not a complex or aversive procedure, it may be an acceptable and practical tool to initially and rapidly increase the accurate production rate of severely developmentally delayed clients.

The main difference in the results from the present studies with each Client employee is the effects of delivering verbal praise at a very frequent rate on accurate production rate and percentage of time spent in production. With both Client employees a reinforcement effect was obtained when rate of praise was initially increased. Both Client employees appeared to become more efficient when rate of praise was further increased. However, with Client employee 1 there was initially a further increase and a later decrease associated with both target behaviours across both tasks when praise was delivered at a very frequent rate. In the final condition, both target behaviours became unstable with Client employee 1. When praise was delivered at a very frequent rate with Client employee 2, there was no associated decrease in accurate production rates. In fact, a very frequent rate of verbal praise maintained the rate of accurate production on both tasks, but the reversal was incomplete on Task 2. In the final condition, accurate production did not decrease or become unstable with Client employee 2. However, percentage of time in production did eventually become unstable and decrease in the final condition with Client employee 2. In short, both target behaviours eventually decreased with Client employee 1, whereas only one target behaviour eventually decreased with Client employee 2.

The reasons for the difference in effects across the two Client employees is not clear but possible contributing factors may be the differences in the Trainer's behaviour. Trainer 1 delivered praise at a higher rate in the final very frequent verbal praise condition and this may have contributed to the different effects observed across Client employees. Only at the very highest rate of delivery was the rate associated with a response-suppressing effect for Client employee 1. Client employee 2 may not have found the rate of praise in the two very frequent verbal praise conditions discernibly different across all behaviours, and thus may not have responded

differently. Although rate of delivery was found to be an important property of a reinforcer, it may be that a large increase in already high rates is required to make the change in rate sufficiently discernible to change the function of a reinforcer across behaviours. It is not clear from the present results whether or not a similar effect would have been observed in Experiment 2 if a higher rate of praise had been delivered by Trainer 2 in the final condition.

Despite the differences in specific effects, the reinforcing function of the reinforcer did not remain stable across behaviours with both Client employees. There are several possible reasons for the decreases in the target behaviours observed in the final condition. The decrease in the target behaviours may be attributable to a satiation effect, i. e. an over-abundance of the reinforcer which leads to decreases in the target behaviour. Although the major difference between the reinforcer when it served to increase responding and when it was associated with decreased responding was its rate, a satiation effect does not fully account for the results obtained. A decrease in responding across all behaviours might be expected if satiation had occurred. This result was not observed with both Client employees. Also, maintenance of the reinforcement effect was observed at eight weeks after the experiment for both Client employees. The tasks used in the experiment were carried out by both client employees during those eight weeks. If satiation had occurred a post-experimental decrease in accurate production rate on these tasks might be expected. Thus, it is not likely that the results obtained in the present research represent a satiation effect.

The results obtained in the final condition when the target behaviours decreased also resemble a punishment effect. Functionally it is difficult to adequately distinguish between a satiation effect and a punishment effect, since a functional definition of satiation which distinguishes it from a punishment effect is lacking. Consequently, in this study it would be difficult to determine if a satiation or a punishment effect had occurred. However, punishers, by definition, do not serve to increase behaviours they consequent and thus, the results across the whole of the study cannot be accounted for by a punishment effect.

One possible explanation for the results is that the reinforcer may have interfered with the ability to respond. For example, a rat chewing food (the reinforcer) or

moving food off a food tray, may interfere with the rat pressing the lever (the response) which activates food delivery. However, in this study the Client employee's high rate of responding (production rate and/or time in production) is maintained and then decreases. An interference effect would not account for the results unless there is a cumulative effect of the reinforcer across all conditions. In addition, an interference effect would not explain why a high rate of the reinforcer interfered with one task but not the other.

It is also not likely that responding had reached a maximum or ceiling level since considerable variability and trends in the data were observed. A high level of responding might be expected to be sustained by a known reinforcer if a ceiling or maximum had been reached. No sustained plateau of responding was observed in the very frequent verbal praise conditions with either Client employee.

Results from the present studies also suggest that the variability in the target behaviours may be due to a loss of the contingent relationship between the reinforcer and the target behaviours. This contingent relationship was clearly supported in the initial conditions of the experiment when praise delivered at an increased rate served as a functional reinforcer for the target behaviours. The major difference in the reinforcer across experimental conditions when it served to increase responding and when it was associated with decreases in responding, was the rate at which the reinforcer was delivered. At a lower rate of delivery, the contingency between rate of praise and production may be easier to discriminate for these Client employees. At a higher rate of delivery, discrimination may be more difficult and serve to breakdown the contingent relationship. This account is supported by the variability observed in the results, both across and within behaviours and the two Client employees. Results from the present research do not allow firm conclusions about the contingent relationship because it is not clear that the contingency was maintained under more than one rate of delivery of the reinforcer. Further research on the contingent relationship itself is needed.

Results from this research relate closely to studies which found that a known reinforcer can decrease responding under conditions in which high response rates would normally occur (Skinner & Morse, 1958), and also relates to studies which

suggest that a known reinforcer can function as a punisher when delivered at a high magnitude (Ayllon,1963). Results from these and other studies (Skinner, 1953; Kelleher, 1958b) suggest that rate may be a response-suppressing property of a reinforcer. This suggestion may also apply to the current research. The present results however, are only suggestive and are insufficient to draw firm conclusions.

In summary, results form the present research may be interpreted as suggesting a loss in the contingent relationship between reinforcer delivery rate and responding or as suggesting that rate may be a response-suppressing property of a reinforcer when delivered at very high rates. However, conclusions concerning interpretation of the results cannot be made due to satiation or punishment effects possibly accounting for some of the results obtained. Further research would be required to assess and rule out such possible alternative accounts of the present results. Despite being unable to draw conclusions concerning interpretations, the results form this research do support the conclusion that not enough is known about the parameters of reinforcement and reinforcers. The vague limits and poorly defined "general rules" of reinforcement in applied behaviour analysis texts and "how to" books are inadequate to meet the cautions set by the authors when implementing reinforcement procedures. The evidence from the experimental and applied research is not sufficient to assume the generality of the principle that increasing reinforcer magnitude serves to increase response rate. Results from the current research did not support a stable reinforcing function of a reinforcer at increased rates of delivery.

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APPENDICES

APPENDIX 2.1

TrED Centre Task Analysis of Wire Stripping: Experimental Task 2

TrED CENTRE	TRAINING PROGRESS CHART
LEVELS OF ASSISTANCE 5 Performs independently 4 Requires verbal prompt 3 Requires physical prompt 2 Constant verbal/physical assistance. Some attempt made. 1 Full physical guidance	Name: Program: Wire Strip (blue & Yellow) 42 Date Commenced: Date Completed

STEPS	Trials / Date & Initial	5	10	15
1. Pick up wire & hold 4 cm from end	5 4 3 2 1			
2. Hold strippers by the bottom of the handles with hand in correct position (jaws facing inwards)	5 4 3 2 1			
3. Insert the wire into the strippers until it touches the guard	5 4 3 2 1			
4. Squeeze the handles. Release.	5 4 3 2 1			
5. Look at wires if good put in basket, if bad leave on table.	5 4 3 2 1			
	5 4 3 2 1			
	5 4 3 2 1			
	5 4 3 2 1			
	5 4 3 2 1			

APPENDIX 2.2

TrED Centre Task Analysis of Wire Tip Cutting: Experimental Task 1

TrED CENTRE — TRAINING PROGRESS CHART

Name:

Program: Cutting Tips No. 5

LEVELS OF PERFORMANCE

5 Performs independently.
4 Requires verbal prompting.
3 Requires physical prompting
2 Needs constant assistance
1 Dependent/Unresponsive.

Date Commenced:

Date Completed:

STEPS	Trials / Date & Initial	5	10	15
1. Pick up wire in left hand and orient to stripped end	5 4 3 2 1			
2. Hold wire with pincer grip (L.H) near stripped end	5 4 3 2 1			
3. Cut wire (cutting edge on outside) through insulation close to stripped part	5 4 3 2 1			
4. Put cut wire in tray	5 4 3 2 1			
	5 4 3 2 1			
	5 4 3 2 3			
	5 4 3 2 1			
	5 4 3 2 1			
	5 4 3			

APPENDIX 2.3

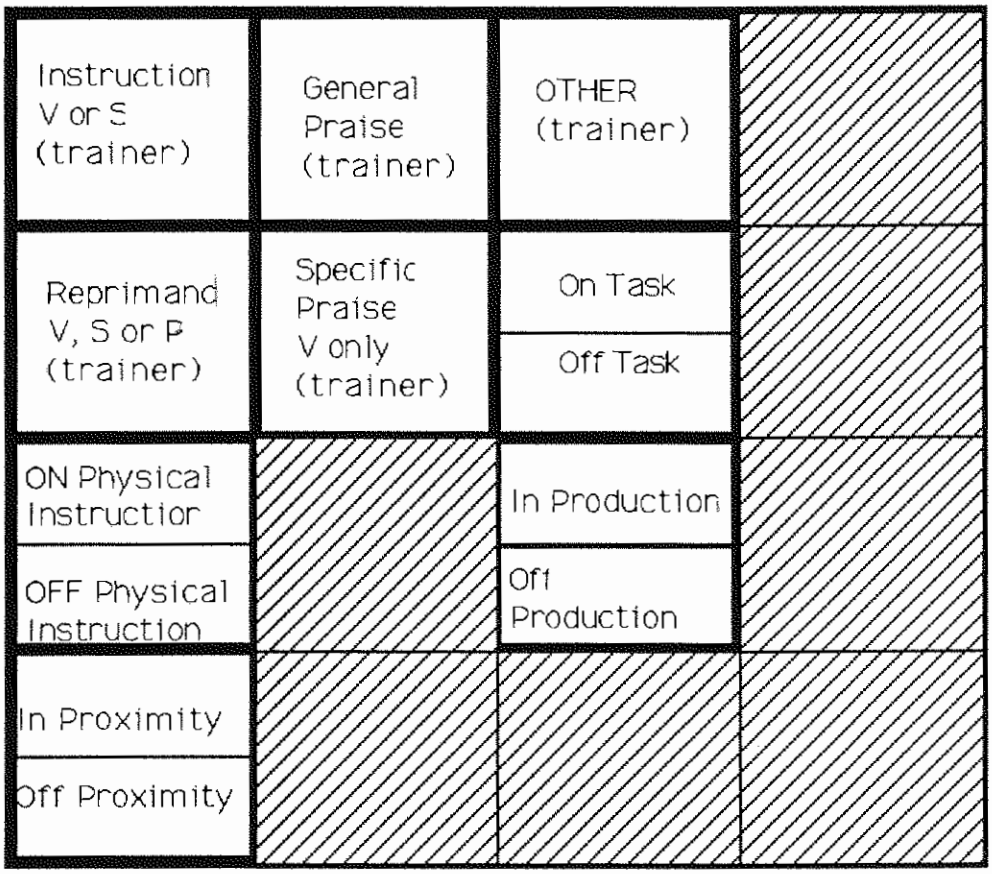
Data Collection Program for the Sharp PC-1600 in BASIC

```
5:MAXFILES=3
10:REM
20:REM SET UP DATA FILES
30:REM
70:OPEN "S1:CODES.DAT" FOR OUTPUT AS #1
80:OPEN "S1:TIMES.DAT"FOR OUTPUT AS #2
90:OPEN "S1:NAMES.DAT" FOR OUTPUT AS #3
100:REM
110:REM ENTER CODE NAMES FOR TRAINER AND STUDENT
120:REM
125:INPUT "ENTER RUN CODE";RC
128:PRINT #3, "RUN CODE:  ";RC
130:INPUT "ENTER TR CODE";TR
140:PRINT #3, "TRAINER CODE:  ";TR
150:INPUT "ENTER ST CODE";ST
160:PRINT #3, "STUDENT CODE:  ";ST
170:REM
180:REM START DATA RECORDING
190:REM
200:INPUT "ENTER B TO BEGIN SESSION";BEGIN$
201:N0=0
202:N1=0
203:N3=0
204:N6=0
206:M0$="OFF"
207:M1$="OFF"
208:M3$="OFF"
209:M6$="OFF"
210:IF BEGIN$="B"THEN 240
220:PRINT "YOU HIT THE WRONG KEY"
230:GOTO 200
235:PRINT "ENTER E TO END SESSION"
240:PRINT "ENTER CODES"
250:REM
260:REM RECORD CODES AND TIMES
270:REM
280:PRINT "0 PROX ";M0$;": 1 PH INSTR ";M1$
300:PRINT""
```

```
310:PRINT "3 PROD ";M3$;": 6 ATTENTN ";M6$
315:A$=INKEY$
320:IF A$=""THEN 315
330:NC$=A$
335:IF NC$="E"GOTO 900
340:PRINT #1,NC$
350:PRINT #2,TIME
355:J=J+1
360:REM
370:REM UPDATE STATUS OF DURATION KEYS
380:REM
390:IF NC$="0"THEN 500
400:IF NC$="1"THEN 520
410:IF NC$="3"THEN 540
420:IF NC$="6"THEN 560
430:GOTO 600
500:N0=N0+1
510:GOTO 600
520:N1=N1+1
530:GOTO 600
540:N3=N3+1
550:GOTO 600
560:N6=N6+1
600:IF (-1)^N0=ABS ((-1)^N0)THEN LET M0$="OFF"ELSE LET M0$="ON"
610:IF (-1)^N1=ABS ((-1)^N1)THEN LET M1$="OFF"ELSE LET M1$="ON"
620:IF (-1)^N3=ABS ((-1)^N3)THEN LET M3$="OFF"ELSE LET M3$="ON"
630:IF (-1)^N6=ABS ((-1)^N6)THEN LET M6$="OFF"ELSE LET M6$="ON"
640:PRINT""
650:PRINT "0 PROX ";M0$;": 1 PH INSTR ";M1$
660:PRINT ""
670:PRINT "3 PROD ";M3$;": 6 ATTENTN ";M6$
700:GOTO 315
900:PRINT "END OF SESSION"
```

APPENDIX 2.3a

NUMERIC KEYPAD CODES FOR THE PC 1600



APPENDIX 2.3b

INSTRUCTIONS FOR RUNNING THE DATA COLLECTION PROGRAM ON THE PC 1600;

1 TURN ON THE COMPUTER (in Run mode)
2 Input LOAD"S1:BB.BAS", then press **enter**
3 In log book, date, subjects, name time, run number beginning at 1, 2...
4 In RUN mode input 'run', press **enter.**
5 Input the run number beginning at 1,2,3...
6 Input the trainer code as requested (001, 002...), press **enter**
7 Input the student code as requested (001, 002...), press **enter**
8 Input B to begin session,press **enter**
Computer screen should now display;
'enter codes
0 prox off; 1 ph instr off
3 prod off; 6 attentn off'
9 Input 0, 1, 3, or 6 to begin recording prox, ph instr, prod or attentn.

DO NOT PRESS ENTER AFTER INPUTING CODES

10 continue inputing codes without pressing enter
11 to end session input 'E'

The computer has now stored;
(1) the run, trainer, student codes in a file called "***names.dat***"
(2) the behaviour codes in a file called "***codes.dat***"
(3) the times that the behaviours occured in a file "***times.dat***"
These files reside in the S1 module.

12 BEFORE YOUR NEXT RUN, RENAME THESE FILES AS FOLLOWS;
(1) "S1:Names.dat" as "S1:Nn.dat"
(2) "S1:Codes.dat" as "S1:Cn.dat"
(3) "S1:Times.dat" as "S1:Tn.dat"
where n is the run number (1,2,3...)

13 Check the contents of the S1 module by inputing, in either mode,
FILES" S1:"
(can use arrow key to search down through the list to find the files you just created)
14 In run mode, now ready to begin another session, go back to step 3 (put information in log book)

APPENDIX 2.4

TRANSFERING DATA FILES FROM THE PC 1600 THROUGH A MACINTOSH PLUS TO THE VAX 8700 COMPUTER FOR DATA ANALYSIS ON THE VAX 8700

A. UPLOADING FILES FROM THE PC 1600 TO THE MACINTOSH PLUS

1 Connect the two computers with the cable, mini din 8 plug into telephone on the back of the Mac.

2. Turn on the Mac and choose the 'VersaTerm Pro' application from the hard disk to optn the folder.

3. Click again on 'VersaTerm Pro' to open the application.

4. Click on 'Emulation' menu and pull down to 'Clear Page' (even if page is clear.

5. Click on 'Settings' menu and check the baud rate (1200).

MAC IS NOW READY TO RECEIVE A FILE FROM THE PC 1600

6. Click on 'File', move down to 'Save Stream', and click it.

7. Name the stream according to the file name used on the PC 1600 and 'Save as' that file name.

8 In either mode on the PC 1600, input Copy "S1:filename" to "COM1:"where file name is one of Cn.DAT, Tn.DAT, or Nn.DAT.

9. Click on 'File', move down to 'Save Stream', click it.

10 Repeat this process from step 6.

B. TO TRANSFER DATA FILES FROM THE MAC TO THE MAINFRAME TO READ AND SAVE FILE CONTENTS

A. Log onto mainframe via the modem;

1. Set up Mac by plugging in modem to Mac (phone outlet)
2. Turn on modem after connecting computer, look for light on modem.
3. Click to hard disk (20 plus)
   Click on Versa term pro
4. Click on emulation, drag down to 'clear page' (even if page is clear)
5. Check baud setting (1200)
6. Go to phone and drag down to MICOM (should hear phone being dialed)
7. Wait for computer to print 'Enter Class'
8. Type "CSC1", return

9. Hit Return twice, should ask for user name, otherwise repeat 9.
10. Type BAB655
Password: Schedules
wait for $ displayed before proceeding

B. Open a file to receive data from the Mac, send data & close file;

11. Type 'edit file name e.g. N32,dat, Hit Return
will get 'input file does not exist
(EOB)
*'
12. Type "C", hit return
will get ' (EOB)'
13. Use mouse to click on file and drag down to **"SEND STREAM"**
14. Double click on 'Barb's Data' (if not already on it)
15. Double click on folder that file is in.
16. Click once on file to be sent.
17. Click on 'SEND'
data will write onto mainframe
will get "(EOB)
*"
18. Type "EXIT", hit return, (exit saves file, quit doesn't)
19. Go back to step 11 and repeat process until all data is written onto mainframe.

C. Display all files on mainframe;

20. Type 'DIR' to get directory and check that transfer has been successful.

D. Log off

21. When finished, log off main frame by typing 'log'.
22. Click on PHONE and drag down to hang up to complete session. (will be hung up on if you log off and don't hang up).

APPENDIX 2.5

Time Conversion Program in Fortran

```
      program time
c
c   This program converts the times of events from PC1600
c   format to seconds.
c   Times are input in tn.dat and output in sn.dat
c   where n is the run number
c
      implicit real*8(a-h,o-z)
      dimension times(1000),isec(1000),ncode(1000)
      character*4 run
c
c   read in run number
c
      print*, ' Enter run number in quotes'
      read(6,*) run
  100 format(1x,f10.4)
      open(unit=10,file='t'//run//'.dat',status='old')
      open(unit=20,file='s'//run//'.dat',status='new')
      open(unit=30,file='c'//run//'.dat',status='old')
      nt=0
   10 nt=nt+1
      read(10,100,end=20) times(nt)
      go to 10
   20 continue
      nt=nt-1
      start=times(1)
      is=start
      do 1 i=1,nt
      t=times(i)
      if(t.lt.times(i-1)) t=int(times(i-1)+1)
      it=t
      ihh=it-is
      fmmdss=100.*(t-it)+.0000000001d0
      mm=fmmdss
      iss=100*(fmmdss-mm)
      isec(i)=iss+60*mm+3600*ihh
    1 continue
      istart1=isec(1)
      mt=0
      do 2 i=1,nt
      isec(i)=isec(i)-istart1
      if(isec(i).le.0) go to 2
      mt=mt+1
    2 continue
      do 987 i=2,mt
      if(isec(i).ge.isec(i-1)) go to 987
      iwrong=i-1
      print*,' Questionable data !'
      print*,' Check the ',iwrong
     c,'th data value in s#.dat and t#.dat'
  987 continue
      write(20,*) (isec(i),i=1,mt)
      do 3 i=1,mt
      read(30,*) ncode(i)
    3 continue
      rewind 30
      do 4 i=1,mt
      write(30,*) ncode(i)
    4 continue
      stop
      end
```

APPENDIX 2.6

Data Plots Program in Fortran

```
      program plot
c
c   This program plots codes and times
c
      dimension ncode(1000),nsecs(1000)
      dimension x(1000),y(1000),xxx(2),yyy(2)
      character*4 run
c
c   read in run number
c
      print*, ' Enter run number (between single quotes)'
      read(6,*) run
      print*,' Re-enter run number without quotes'
      read(6,*) ru
      print*,' Enter trainer code'
      read(6,*) tr
      print*,' Enter student code'
      read(6,*) st
c
c   set time limits
c
      print*,' Enter graph start time in seconds'
      read(6,*) nstart
      print*,' Enter graph end time in seconds'
      read(6,*) nend
      open(unit=10,file='c'//run//'.dat',status='old')
      open(unit=20,file='s'//run//'.dat',status='old')
      nt=0
   10 nt=nt+1
      read(10,*,end=20) ncode(nt)
      go to 10
   20 continue
      nt=nt-1
      read(20,*) (nsecs(i),i=1,nt)
      CALL HP7475
      CALL GOPEN
      xx=20.
      yy=20.
      call bgraf(xx,yy,60.,120.)
      call baxlab(4.,3.,0,0)
      call baxend(2)
      call baxis(1,0.,10.,5.,'$')
      call baxlab(4.,3.,0,0)
      call baxend(2)
      call baxis(2,0.,50.,20.,'$')
      xin=0.
      yin=21.
      call brxyv(xin,yin,xout,yout)
      call gchar('RUN: $',xout,yout,4.)
      call gnumb(ru,xout+15.,yout,4.,0)
      call gchar('TRAINER: $',xout+55.,yout,4.)
      call gnumb(tr,xout+90.,yout,4.,0)
      call gchar('STUDENT: $',xout+130.,yout,4.)
      call gnumb(st,xout+165.,yout,4.,0)
      xin=.5
      yin=14.0
      call brxyv(xin,yin,xout,yout)
      call gchar('Trainer in prox.$',xout,yout,3.)
      xin=.5
      yin=11.5
      call brxyv(xin,yin,xout,yout)
      call gchar('General praise$',xout,yout,3.)
      xin=.5
      yin=10.0
      call brxyv(xin,yin,xout,yout)
```

```
      call gchar('Specific praise$',xout,yout,3.)
      xin=.5
      yin=18.
      call brxyv(xin,yin,xout,yout)
      call gchar('Student on task$',xout,yout,3.)
      xin=.5
      yin=16.5
      call brxyv(xin,yin,xout,yout)
      call gchar('Student in prod.$',xout,yout,3.)
      xin=.5
      yin=8.5
      call brxyv(xin,yin,xout,yout)
      call gchar('Verbal instr.$',xout,yout,3.)
      xin=.5
      yin=6.
      call brxyv(xin,yin,xout,yout)
      call gchar('Physical instr.$',xout,yout,3.)
      xin=.5
      yin=3.5
      call brxyv(xin,yin,xout,yout)
      call gchar('Reprimand$',xout,yout,3.)
      xin=.5
      yin=1.5
      call brxyv(xin,yin,xout,yout)
      call gchar('Other$',xout,yout,3.)
      xx=80.
      yy=20.
      call bgraf(xx,yy,120.,120.)
      call baxlab(4.,3.,0,0)
      call baxend(2)
      call baxis(2,0.,50.,20.,'$')
      call baxlab(4.,3.,0,0)
      start=nstart
      end=nend
      step=60
      call baxis(1,start,step,end,'Time (in seconds)$')
      xend=start
      k=0
      kk=0
      yyy(1)=14.
      yyy(2)=14.
      do 99 i=1,nt
      if(ncode(i).eq.0) go to 9
      go to 99
    9 continue
      k=k+1
      x(k)=nsecs(i)
      if(nsecs(i).lt.0) go to 99
      if(nsecs(i).gt.nend) go to 99
      kk=k
      if(nsecs(i).lt.nstart) go to 99
      xend=nsecs(i)
      if(k*2/2.ne.k/2*2) go to 99
      xxx(1)=x(k-1)
      if(xxx(1).lt.start) xxx(1)=start
      xxx(2)=x(k)
      call bmark(14,1)
      call bline(xxx,yyy,2)
   99 continue
      if(kk*2/2.eq.kk/2*2) go to 909
      xxx(1)=xend
      xxx(2)=end
      call bmark(14,1)
      call bline(xxx,yyy,2)
  909 continue
```

```
      xend=start
      kk=0
      k=0
      yyy(1)=6.
      yyy(2)=6.
      do 11 i=1,nt
      if(ncode(i).eq.1) go to 1
      go to 11
    1 continue
      k=k+1
      x(k)=nsecs(i)
      if(nsecs(i).lt.0) go to 11
      if(nsecs(i).gt.nend) go to 11
      kk=k
      if(nsecs(i).lt.nstart) go to 11
      xend=nsecs(i)
      if(k*2/2.ne.k/2*2) go to 11
      xxx(1)=x(k-1)
      if(xxx(1).lt.start) xxx(1)=start
      xxx(2)=x(k)
      call bmark(14,1)
      call bline(xxx,yyy,2)
   11 continue
      if(kk*2/2.eq.kk/2*2) go to 101
      xxx(1)=xend
      xxx(2)=end
      call bmark(14,1)
      call bline(xxx,yyy,2)
  101 continue
      xend=start
      kk=0
      k=0
      yyy(1)=16.5
      yyy(2)=16.5
      do 22 i=1,nt
      if(ncode(i).eq.3) go to 2
      go to 22
    2 continue
      k=k+1
      x(k)=nsecs(i)
      if(nsecs(i).lt.0) go to 22
      if(nsecs(i).gt.nend) go to 22
      kk=k
      if(nsecs(i).lt.nstart) go to 22
      xend=nsecs(i)
      y(k)=16.5
      if(k*2/2.ne.k/2*2) go to 22
      xxx(1)=x(k-1)
      if(xxx(1).lt.start) xxx(1)=start
      xxx(2)=x(k)
      call bmark(14,1)
      call bline(xxx,yyy,2)
   22 continue
      if(kk*2/2.eq.kk/2*2) go to 202
      xxx(1)=xend
      xxx(2)=end
      call bmark(14,1)
      call bline(xxx,yyy,2)
  202 continue
      xend=start
      kk=0
      k=0
      yyy(1)=18.
      yyy(2)=18.
      do 33 i=1,nt
```

```
      if(ncode(i).eq.6) go to 3
      go to 33
    3 continue
      k=k+1
      x(k)=nsecs(i)
      if(nsecs(i).lt.0) go to 33
      if(nsecs(i).gt.nend) go to 33
      kk=k
      if(nsecs(i).lt.nstart) go to 33
      xend=nsecs(i)
      if(k*2/2.ne.k/2*2) go to 33
      xxx(1)=x(k-1)
      if(xxx(1).lt.start) xxx(1)=start
      xxx(2)=x(k)
      call bmark(14,1)
      call bline(xxx,yyy,2)
   33 continue
      if(kk*2/2.eq.kk/2*2) go to 303
      xxx(1)=xend
      xxx(2)=end
      call bmark(14,1)
      call bline(xxx,yyy,2)
  303 continue
      k=0
      do 44 i=1,nt
      if(ncode(i).eq.4) go to 4
      go to 44
    4 continue
      if(nsecs(i).lt.nstart.or.nsecs(i).gt.nend) go to 44
      k=k+1
      x(k)=nsecs(i)
      y(k)=3.5
   44 continue
      call bmark(14,-1)
      call bline(x,y,k)
      k=0
      do 55 i=1,nt
      if(ncode(i).eq.5) go to 5
      go to 55
    5 continue
      if(nsecs(i).lt.nstart.or.nsecs(i).gt.nend) go to 55
      k=k+1
      x(k)=nsecs(i)
      y(k)=10.
   55 continue
      call bmark(14,-1)
      call bline(x,y,k)
      k=0
      do 88 i=1,nt
      if(ncode(i).eq.8) go to 8
      go to 88
    8 continue
      if(nsecs(i).lt.nstart.or.nsecs(i).gt.nend) go to 88
      k=k+1
      x(k)=nsecs(i)
      y(k)=11.5
   88 continue
      call bmark(14,-1)
      call bline(x,y,k)
      k=0
      do 66 i=1,nt
      if(ncode(i).eq.7) go to 6
      go to 66
    6 continue
      if(nsecs(i).lt.nstart.or.nsecs(i).gt.nend) go to 66
```

```
      k=k+1
      x(k)=nsecs(i)
      y(k)=8.5
   66 continue
      call bmark(14,-1)
      call bline(x,y,k)
      k=0
      do 77 i=1,nt
      if(ncode(i).eq.9) go to 7
      go to 77
    7 continue
      if(nsecs(i).lt.nstart.or.nsecs(i).gt.nend) go to 77
      k=k+1
      x(k)=nsecs(i)
      y(k)=1.5
   77 continue
      call bmark(14,-1)
      call bline(x,y,k)
      xxx(1)=200.
      yyy(1)=140.
      xxx(2)=200.
      yyy(2)=20.
      call gvect(xxx,yyy,2)
      call gwicol(-1.,1)
      xxx(1)=20.
      xxx(2)=200.
      yyy(1)=140.
      yyy(2)=140.
      call gvect(xxx,yyy,2)
      CALL GCLOSE
      STOP
      END
$
```

APPENDIX 2.7

Discrete and Durational Data Analysis Program in Fortran

```
      program freq
c
c   This program counts the number of incidences of
c   discrete behaviours and the relative frequencies of
c   continuous behaviours
c
      dimension ncode(1000),nsecs(1000)
      character*4 run
c
c   read in run number
c
      print*, ' Enter run number (between single quotes)'
      read(6,*) run
      open(unit=10,file='c'//run//'.dat',status='old')
      open(unit=20,file='s'//run//'.dat',status='old')
      open(unit=30,file='f'//run//'.dat',status='new')
      nt=0
    1 nt=nt+1
      read(10,*,end=2) ncode(nt)
      go to 1
    2 continue
      nt=nt-1
      read(20,*) (nsecs(i),i=1,nt)
      i0=0
      i1=0
      i3=0
      i6=0
      i4=0
      i5=0
      i8=0
      i7=0
      i9=0
      id0=0
      id1=0
      id3=0
      id6=0
      do 3 i=1,nt
      if(ncode(i).eq.4) i4=i4+1
      if(ncode(i).eq.5) i5=i5+1
      if(ncode(i).eq.8) i8=i8+1
      if(ncode(i).eq.7) i7=i7+1
      if(ncode(i).eq.9) i9=i9+1
      if(ncode(i).eq.0) go to 10
      go to 11
   10 i0=i0+1
      if(i0*2/2.ne.i0/2*2) go to 100
      go to 111
  100 is0=nsecs(i)
      go to 11
  111 ie0=nsecs(i)
      id0=(ie0-is0)+id0
   11 continue
      if(ncode(i).eq.1) go to 20
      go to 22
   20 i1=i1+1
      if(i1*2/2.ne.i1/2*2) go to 200
      go to 222
  200 is1=nsecs(i)
      go to 22
  222 ie1=nsecs(i)
      id1=(ie1-is1)+id1
   22 continue
      if(ncode(i).eq.3) go to 30
      go to 33
   30 i3=i3+1
```

```
    if(i3*2/2.ne.i3/2*2) go to 300
    go to 333
300 is3=nsecs(i)
    go to 33
333 ie3=nsecs(i)
    id3=(ie3-is3)+id3
 33 continue
    if(ncode(i).eq.6) go to 40
    go to 44
 40 i6=i6+1
    if(i6*2/2.ne.i6/2*2) go to 400
    go to 444
400 is6=nsecs(i)
    go to 44
444 ie6=nsecs(i)
    id6=(ie6-is6)+id6
 44 continue
  3 continue
    if(is0.gt.ie0) id0=id0+nsecs(nt)-is0
    if(is1.gt.ie1) id1=id1+nsecs(nt)-is1
    if(is3.gt.ie3) id3=id3+nsecs(nt)-is3
    if(is6.gt.ie6) id6=id6+nsecs(nt)-is6
    d0=float(id0)/float(nsecs(nt))*100.
    d1=float(id1)/float(nsecs(nt))*100.
    d3=float(id3)/float(nsecs(nt))*100.
    d6=float(id6)/float(nsecs(nt))*100.
    write(30,*) ' PROGRAM FREQ CALCULATES THE FOLLOWING:'
    write(30,*) ' 1. THE NUMBER OF TIMES A PARTICULAR BEHAVIOUR'
    write(30,*) '    IS RECORDED IN A RUN'
    WRITE(30,*) ' 2. THE RATE OF EACH BEHAVIOUR = NUMBER OF TIMES'
    WRITE(30,*) '    A PARTICULAR BEHAVIOUR IS RECORDED IN A RUN'
    WRITE(30,*) '    DIVIDED BY THE TOTAL TIME FOR THE WHOLE RUN'
    WRITE(30,*) ' 3. THE TOTAL AMOUNT OF TIME FOR A PARTICULAR'
    WRITE(30,*) '    BEHAVIOUR IN A RUN'
    WRITE(30,*) ' 4. THE PERCENTAGE OF TIME FOR A PARTICULAR'
    WRITE(30,*) '    BEHAVIOUR = TOTAL AMOUNT OF TIME FOR THIS'
    WRITE(30,*) '    BEHAVIOUR IN THE RUN DIVIDED BY THE TOTAL'
    WRITE(30,*) '    TIME FOR THE WHOLE RUN AND MULTIPLIED BY 100'
    WRITE(30,888)
    write(30,*) 'Run: ',run
    rmsec=float(nsecs(nt))/60.
    write(30,*) ' Total time for this run = ',nsecs(nt),' seconds  ='
   c,rmsec,'minutes'
    write(30,888)
    write(30,*) ' Total time student on task'
    rm6=float(id6)/60.
    write(30,777) id6,d6,rm6
    write(30,888)
    rm3=float(id3)/60.
    write(30,*) ' Total time student in production'
    write(30,777) id3,d3,rm3
    write(30,888)
    rm0=float(id0)/60.
    write(30,*) ' Total time trainer in proximity'
    write(30,777) id0,d0,rm0
    write(30,888)
    rm1=float(id1)/60.
    write(30,*) ' Total time trainer gives physical instruction'
    write(30,777) id1,d1,rm1
    i0stop=i0
    i0=(i0+1)/2
    i0stop=i0stop-i0
    i1stop=i1
    i1=(i1+1)/2
    i1stop=i1stop-i1
```

```
      i3=(i3+1)/2
      i6=(i6+1)/2
      r0=float(i0)/float(nsecs(nt))
      rm0=r0*60.
      r0stop=float(i0stop)/float(nsecs(nt))
      rm0s=r0stop*60.
      r1=float(i1)/float(nsecs(nt))
      rm1=r1*60.
      r1stop=float(i1stop)/float(nsecs(nt))
      rm1s=r1stop*60.
      r3=float(i3)/float(nsecs(nt))
      rm3=r3*60.
      r6=float(i6)/float(nsecs(nt))
      rm6=r6*60.
      r4=float(i4)/float(nsecs(nt))
      rm4=r4*60.
      r5=float(i5)/float(nsecs(nt))
      rm5=r5*60.
      r8=float(i8)/float(nsecs(nt))
      rm8=r8*60.
      r7=float(i7)/float(nsecs(nt))
      rm7=r7*60.
      r9=float(i9)/float(nsecs(nt))
      rm9=r9*60.
      write(30,888)
      write(30,*) ' Number of times student (re)starts task'
      write(30,999) i6,r6,rm6
      write(30,888)
      write(30,*) ' Number of times student (re)starts production'
      write(30,999) i3,r3,rm3
      write(30,888)
      write(30,*) ' Number of times trainer moves into proximity'
      write(30,999) i0,r0,rm0
      write(30,888)
      write(30,*) ' Number of times trainer moves out of proximity'
      write(30,999) i0stop,r0stop,rm0s
      write(30,888)
      write(30,*) ' Number of times trainer gives general praise'
      write(30,999) i8,r8,rm8
      write(30,888)
      write(30,*) ' Number of times trainer gives specific praise'
      write(30,999) i5,r5,rm5
      write(30,888)
      write(30,*) ' Number of times trainer gives verbal instruction'
      write(30,999) i7,r7,rm7
      write(30,888)
      write(30,*) ' Number of times trainer starts physical instruction'
      write(30,999) i1,r1,rm1
      write(30,888)
      write(30,*) ' Number of times trainer stops physical instruction'
      write(30,999) i1stop,r1stop,rm1s
      write(30,888)
      write(30,*) ' Number of times trainer gives reprimand'
      write(30,999) i4,r4,rm4
      write(30,888)
      write(30,*) ' Number of occurrences of other'
      write(30,999) i9,r9,rm9
  777 format(10x,'Seconds =', i6,10x,'Percent =',f10.5,5x,'Minutes =',
     cf10.5)
  999 format(10x,'Number =', i6,10x,'Rate/sec =',f10.5,5x,'Rate/min =',
     cf10.5)
  888 format(//)
      STOP
      END
$
```

APPENDIX 2.8

Trainer Response Rate Per Client Employee Response Rate Analysis Program in Fortran

```
      program hist
c
c   This program calculates the percentage that a trainers
c   behaviour occurs when the student is:
c   (i) in production
c   (ii) not in production
c
      dimension ncode(1000),nsecs(1000)
      character*4 run
c
c   read in run number
c
      print*, ' Enter run number (between single quotes)'
      read(6,*) run
      open(unit=10,file='c'//run//'.dat',status='old')
      open(unit=30,file='h'//run//'.dat',status='new')
      nt=0
    1 nt=nt+1
      read(10,*,end=2) ncode(nt)
      go to 1
    2 continue
      nt=nt-1
      i0=0
      i1=0
      ion0on=0
      ion1on=0
      ioff0on=0
      ioff1on=0
      i3=0
      i4on=0
      i5on=0
      i8on=0
      i7on=0
      i9on=0
      ion0off=0
      ion1off=0
      ioff0off=0
      ioff1off=0
      i4off=0
      i5off=0
      i8off=0
      i7off=0
      i9off=0
      do 3 i=1,nt
      if(ncode(i).eq.3) i3=i3+1
      if(ncode(i).eq.4.and.i3*2/2.ne.i3/2*2) i4on=i4on+1
      if(ncode(i).eq.5.and.i3*2/2.ne.i3/2*2) i5on=i5on+1
      if(ncode(i).eq.7.and.i3*2/2.ne.i3/2*2) i7on=i7on+1
      if(ncode(i).eq.8.and.i3*2/2.ne.i3/2*2) i8on=i8on+1
      if(ncode(i).eq.9.and.i3*2/2.ne.i3/2*2) i9on=i9on+1
      if(ncode(i).eq.4.and.i3*2/2.eq.i3/2*2) i4off=i4off+1
      if(ncode(i).eq.5.and.i3*2/2.eq.i3/2*2) i5off=i5off+1
      if(ncode(i).eq.7.and.i3*2/2.eq.i3/2*2) i7off=i7off+1
      if(ncode(i).eq.8.and.i3*2/2.eq.i3/2*2) i8off=i8off+1
      if(ncode(i).eq.9.and.i3*2/2.eq.i3/2*2) i9off=i9off+1
      if(ncode(i).eq.0) go to 4
      go to 5
    4 continue
      i0=i0+1
      if(i0*2/2.ne.i0/2*2.and.i3*2/2.ne.i3/2*2) ion0on=ion0on+1
      if(i0*2/2.ne.i0/2*2.and.i3*2/2.eq.i3/2*2) ion0off=ion0off+1
      if(i0*2/2.eq.i0/2*2.and.i3*2/2.ne.i3/2*2) ioff0on=ioff0on+1
      if(i0*2/2.eq.i0/2*2.and.i3*2/2.eq.i3/2*2) ioff0off=ioff0off+1
    5 continue
      if(ncode(i).eq.1) go to 6
```

```
      go to 7
    6 continue
      i1=i1+1
      if(i1*2/2.ne.i1/2*2.and.i3*2/2.ne.i3/2*2) ion1on=ion1on+1
      if(i1*2/2.ne.i1/2*2.and.i3*2/2.eq.i3/2*2) ion1off=ion1off+1
      if(i1*2/2.eq.i1/2*2.and.i3*2/2.ne.i3/2*2) ioff1on=ioff1on+1
      if(i1*2/2.eq.i1/2*2.and.i3*2/2.eq.i3/2*2) ioff1off=ioff1off+1
    7 continue
    3 continue
      i4tot=i4on+i4off
      i5tot=i5on+i5off
      i7tot=i7on+i7off
      i8tot=i8on+i8off
      i9tot=i9on+i9off
      ion0tot=ion0on+ion0off
      ioff0tot=ioff0on+ioff0off
      ion1tot=ion1on+ion1off
      ioff1tot=ioff1on+ioff1off
      if(i4tot.eq.0) go to 11
      p4on=float(i4on)/float(i4tot)*100.
      p4off=float(i4off)/float(i4tot)*100.
      go to 12
   11 continue
      p4on=0.
      p4off=0.
   12 continue
      if(i5tot.eq.0) go to 21
      p5on=float(i5on)/float(i5tot)*100.
      p5off=float(i5off)/float(i5tot)*100.
      go to 22
   21 continue
      p5on=0.
      p5off=0.
   22 continue
      if(i7tot.eq.0) go to 31
      p7on=float(i7on)/float(i7tot)*100.
      p7off=float(i7off)/float(i7tot)*100.
      go to 32
   31 continue
      p7on=0.
      p7off=0.
   32 continue
      if(i8tot.eq.0) go to 41
      p8on=float(i8on)/float(i8tot)*100.
      p8off=float(i8off)/float(i8tot)*100.
      go to 42
   41 continue
      p8on=0.
      p8off=0.
   42 continue
      if(i9tot.eq.0) go to 51
      p9on=float(i9on)/float(i9tot)*100.
      p9off=float(i9off)/float(i9tot)*100.
      go to 52
   51 continue
      p9on=0.
      p9off=0.
   52 continue
      if(ion0tot.eq.0) go to 61
      pon0on=float(ion0on)/float(ion0tot)*100.
      pon0off=float(ion0off)/float(ion0tot)*100.
      go to 62
   61 continue
      pon0on=0.
      pon0off=0.
```

```
 62 continue
    if(ioff0tot.eq.0) go to 71
    poff0on=float(ioff0on)/float(ioff0tot)*100.
    poff0off=float(ioff0off)/float(ioff0tot)*100.
    go to 72
 71 continue
    poff0on=0.
    poff0off=0.
 72 continue
    if(ion1tot.eq.0) go to 81
    ponlon=float(ionlon)/float(ion1tot)*100.
    ponloff=float(ionloff)/float(ion1tot)*100.
    go to 82
 81 continue
    ponlon=0.
    ponloff=0.
 82 continue
    if(iofflltot.eq.0) go to 91
    pofflon=float(iofflon)/float(iofflltot)*100.
    poffloff=float(iofffloff)/float(iofflltot)*100.
    go to 92
 91 continue
    pofflon=0.
    poffloff=0.
 92 continue
    write(30,*) ' PROGRAM HIST CALCULATES THE PERCENTAGE'
    write(30,*) ' OF TIMES THAT THE TRAINER DOES A PARTICULAR'
    write(30,*) ' BEHAVIOUR WHEN:'
    WRITE(30,*) ' 1. THE STUDENT IS IN PRODUCTION'
    WRITE(30,*) ' 2. THE STUDENT IS NOT IN PRODUCTION'
    WRITE(30,888)
    write(30,*) 'Run: ',run
    write(30,888)
    write(30,*) ' TRAINER BEHAVIOUR            % WITH STUDENT
   c            % WITH STUDENT'
    WRITE(30,*) '                                IN PRODUCTION
   C              NOT IN PRODUCTION'
    WRITE(30,888)
    WRITE(30,*) ' moves out off proximity     ',poff0on,
   c'           ',poff0off
    WRITE(30,888)
    write(30,*) ' moves into proximity        ',pon0on,
   c'           ',pon0off
    WRITE(30,888)
    write(30,*) ' stops physical instruction  ',pofflon,
   c'           ',poffloff
    WRITE(30,888)
    write(30,*) ' starts physical instruction ',ponlon,
   c'           ',ponloff
    WRITE(30,888)
    write(30,*) ' gives reprimand             ',p4on,
   c'           ',p4off
    WRITE(30,888)
    write(30,*) ' gives specific praise       ',p5on,
   c'           ',p5off
    WRITE(30,888)
    write(30,*) ' gives verbal instruction    ',p7on,
   c'           ',p7off
    WRITE(30,888)
    write(30,*) ' gives general praise        ',p8on,
   c'           ',p8off
    WRITE(30,888)
    write(30,*) ' other                       ',p9on,
   c'           ',p9off
888 format(/)
```

```
STOP
END
```

APPENDIX 2.9

Interval Data Analysis Program in Fortran

```
      program prepost
      dimension ncode(1000),nsecs(1000),tm(1000),tp(1000)
     c,sm(100),sp(100)
      character*4 run
      character*13 anst
      character*20 antr
      print*, ' Enter run number (between single quotes)'
      read(6,*) run
      open(unit=10,file='c'//run//'.dat',status='old')
      open(unit=20,file='s'//run//'.dat',status='old')
      open(unit=30,file='p'//run//'.dat',status='new')
      WRITE(30,*) ' PROGRAM PREPOST CALCUALTES THE FOLLOWING:'
      WRITE(30,*) ' THE PRECENTAGE OF TIME THAT THE STUDENT IS'
      WRITE(30,*) ' RECORDED ON BEHAVIOUR'
      WRITE(30,*) ' IN AN INTERVAL OF CHOSEN LENGTH BOTH IMMEDIATELY'
      WRITE(30,*) ' PRECEDING A PARTICULAR TRAINER BEHAVIOUR AND IN'
      WRITE(30,*) ' AN INTERVAL OF THE SAME LENGTH IMMEDIATELY'
      WRITE(30,*) ' FOLLOWING A PARTICULAR TRAINER BEHAVIOUR'
      WRITE(30,*) ' THE PERCENTAGE IS = TIME THAT STUDENT IS ON'
      WRITE(30,*) ' BEHAVIOUR IN THE INTERVAL DIVIDED BY THE'
      WRITE(30,*) ' LENGTH OF THE INTERVAL AND MULTIPLIED BY 100'
      WRITE(30,900)
      write(30,*) 'Run: ',run
      write(30,600)
  600 format(' Percentage of time for student behaviour in an interval')
      write(30,601)
  601 format(' before trainer intervention and
     c after trainer intervention')
      nt=0
    1 nt=nt+1
      read(10,*,end=2) ncode(nt)
      go to 1
    2 continue
      nt=nt-1
      read(20,*) (nsecs(i),i=1,nt)
      print*,' Enter functional relation interval'
      read(6,*) delta
      write(30,602) delta
  602 format(' The sampling interval is ',f4.1,' seconds')
      do 123 ijk=1,2
      nst=3*ijk
      if(nst.eq.3) anst='IN PRODUCTION'
      if(nst.eq.6) anst='ON TASK      '
      write(30,900)
      write(30,603) anst
  603 format(' INTERVAL ANALYSIS FOR THE STUDENT ',a13)
      ncount=0
  999 ncount=ncount+1
      if(ncount.eq.9) go to 1000
      if(ncount.ge.2) go to 100
      go to 200
  100 continue
      write(30,900)
  900 format(//)
      if(ntr.eq.0) antr='Proximity           '
      if(ntr.eq.1) antr='Physical Instruction'
      if(ntr.eq.4) antr='Reprimand           '
      if(ntr.eq.5) antr='Specific Praise     '
      if(ntr.eq.7) antr='Verbal Instruction  '
      if(ntr.eq.8) antr='General Praise      '
      if(ntr.eq.9) antr='Other               '
      write(30,500) antr
  500 format(' Trainer ',a20)
      if(ntr.eq.0.or.ntr.eq.1) go to 707
      go to 808
```

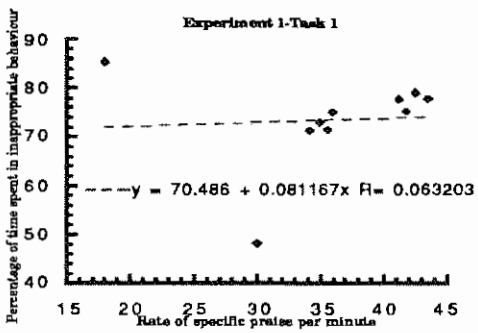
```
  707 continue
      write(30,909)
  909 format(' Trainer starting behaviour')
      m=m-1
      tmav=0.
      tpav=0.
      mav=0
      write(30,700)
  700 format(' Before intervention
     cAfter intervention')
      do 993 j=1,m
      if(j*2/2.eq.j/2*2) go to 993
      mav=mav+1
      tm(j)=tm(j)/delta*100.
      tmav=tmav+tm(j)
      tp(j)=tp(j)/delta*100.
      tpav=tpav+tp(j)
c      write(30,800) tm(j),tp(j)
  993 continue
      if(mav.eq.0) go to 994
      tmav=tmav/float(mav)
      tpav=tpav/float(mav)
      write(30,991)
  991 format(' Averages')
      write(30,800) tmav,tpav
  994 continue
      write(30,500) antr
      write(30,404)
  404 format(' Trainer finishing behaviour')
      m=m-1
      tmav=0.
      tpav=0.
      mav=0
      write(30,700)
      do 995 j=1,m
      if(j*2/2.ne.j/2*2) go to 995
      mav=mav+1
      tm(j)=tm(j)/delta*100.
      tmav=tmav+tm(j)
      tp(j)=tp(j)/delta*100.
      tpav=tpav+tp(j)
c     write(30,800) tm(j),tp(j)
  995 continue
      if(mav.eq.0) go to 996
      tmav=tmav/float(mav)
      tpav=tpav/float(mav)
      write(30,991)
      write(30,800) tmav,tpav
  996 continue
      go to 200
  808 continue
      write(30,700)
      m=m-1
      tmav=0.
      tpav=0.
      do 300 j=1,m
      tm(j)=tm(j)/delta*100.
      tmav=tmav+tm(j)
      tp(j)=tp(j)/delta*100.
      tpav=tpav+tp(j)
c    write(30,800) tm(j),tp(j)
  300 continue
      if(m.eq.0) go to 992
      tmav=tmav/float(m)
      tpav=tpav/float(m)
```

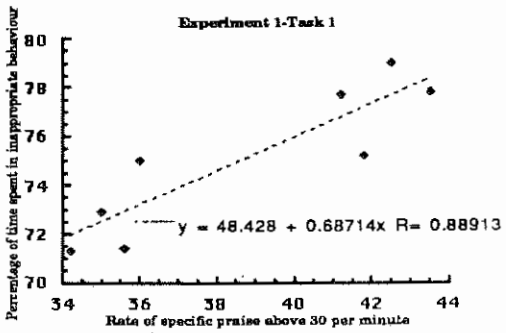
```
      write(30,991)
      write(30,800) tmav,tpav
  992 continue
  200 continue
  800 format(5x,f5.1,15x,f5.1)
      if(ncount.eq.1) ntr=4
      if(ncount.eq.2) ntr=5
      if(ncount.eq.3) ntr=8
      if(ncount.eq.4) ntr=7
      if(ncount.eq.5) ntr=9
      if(ncount.eq.6) ntr=0
      if(ncount.eq.7) ntr=1
      i=0
      k=0
      m=0
  222 m=m+1
      tm(m)=0
      tp(m)=0
  888 i=i+1
      if(i.eq.nt) go to 999
      if(ncode(i).eq.nst) k=k+1
      if(ncode(i).ne.ntr) go to 888
      jm=0
      jp=0
      km=0
      kp=0
      if(k*2/2.eq.k/2*2) go to 777
      km=1
      kp=1
      sm(km)=nsecs(i)
      sp(kp)=nsecs(i)
  777 jm=jm+1
      if(i-jm.eq.0) go to 666
      if(ncode(i-jm).ne.nst) go to 777
      km=km+1
      sm(km)=nsecs(i-jm)
      si=nsecs(i)
      if(sm(km).lt.si-delta) sm(km)=si-delta
      if(sm(km).ne.si-delta) go to 777
  666 nm=0
      kkm=km-1
      if(kkm.le.0) go to 444
  555 nm=nm+1
      if(nm*2/2.ne.nm/2*2) tm(m)=tm(m)+sm(nm)-sm(nm+1)
      if(nm.eq.kkm) go to 444
      go to 555
  444 jp=jp+1
      if(i+jp.eq.nt) go to 333
      if(ncode(i+jp).ne.nst) go to 444
      kp=kp+1
      sp(kp)=nsecs(i+jp)
      si=nsecs(i)
      if(sp(kp).gt.si+delta) sp(kp)=si+delta
      if(sp(kp).ne.si+delta) go to 444
  333 np=0
      kkp=kp-1
      if(kkp.le.0) go to 222
  111 np=np+1
      if(np*2/2.ne.np/2*2) tp(m)=tp(m)+sp(np+1)-sp(np)
      if(np.eq.kkp) go to 222
      go to 111
 1000 continue
  123 continue
      STOP
      END
```

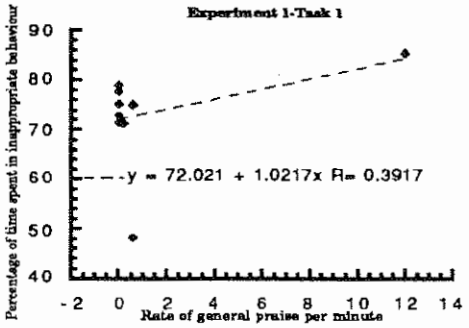
APPENDIX 2.10a

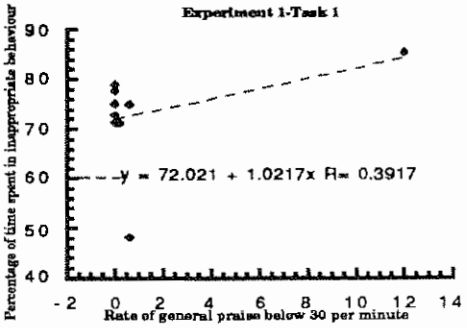
EXPERIMENT 1-TASK 1

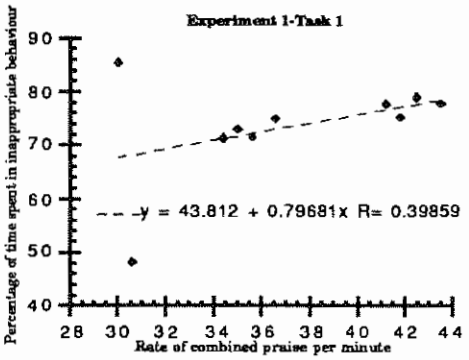
Peason-Product Moment Correlations Between Rate of Delivery of Verbal Praise and the Percentage of Time the Employee Spent in Inappropriate Behaviour in Very Frequent Reinforcement Conditions

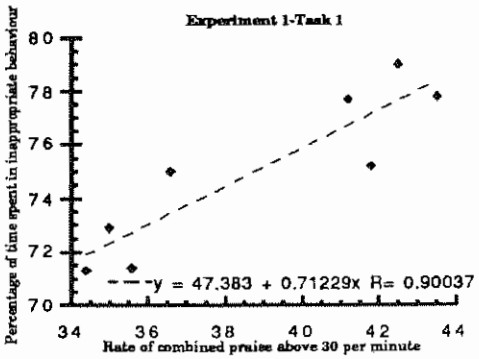








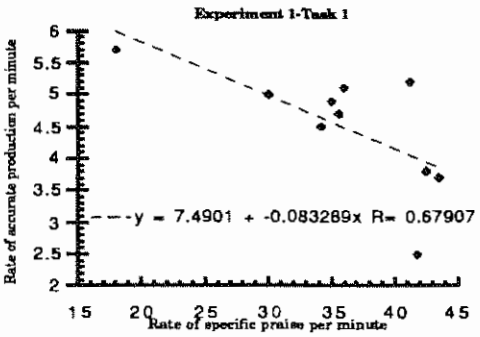


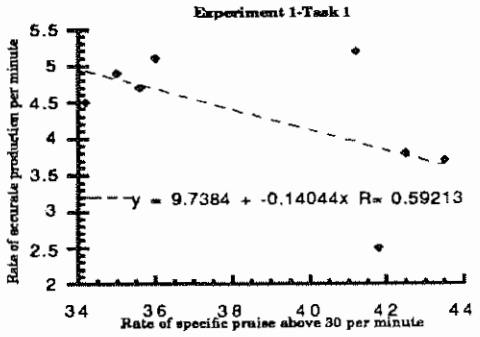


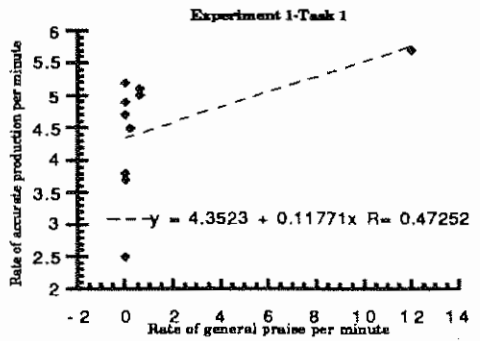
APPENDIX 2.10b

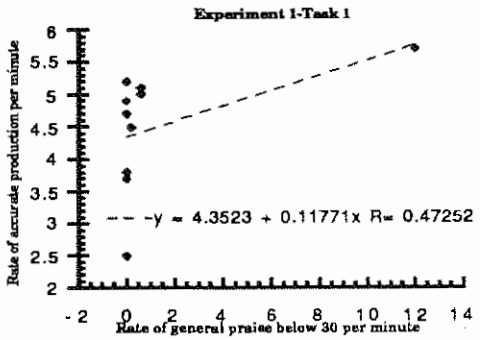
EXPERIMENT 1-TASK 1

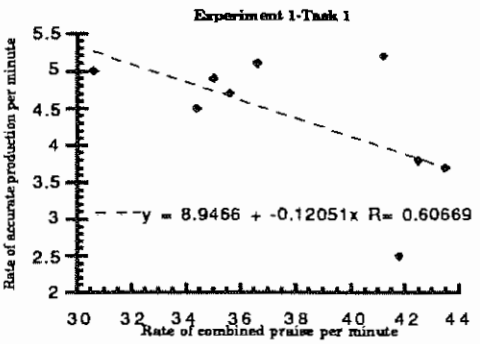
Pearson-Product Moment Correlations Between Rate of Delivery of Verbal Praise and Rate of Accurate Production in Very Frequent Reinforcement Conditions

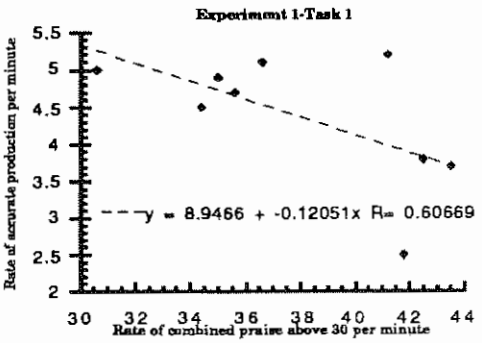








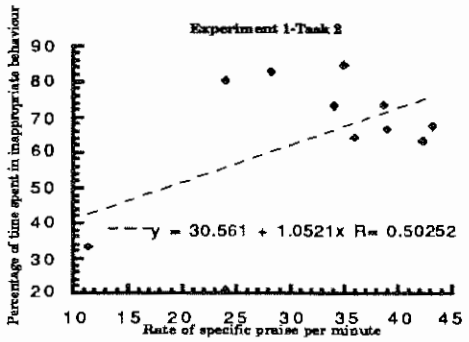


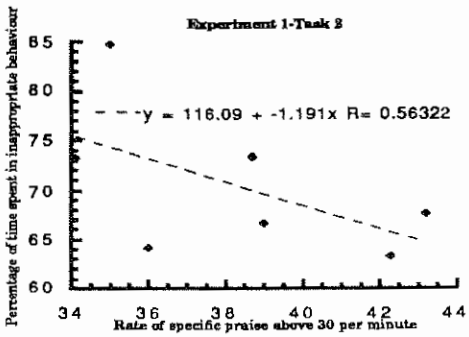


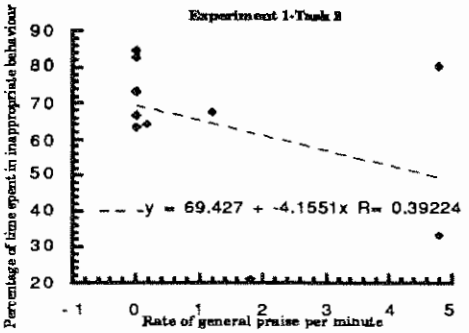
APPENDIX 2.10c

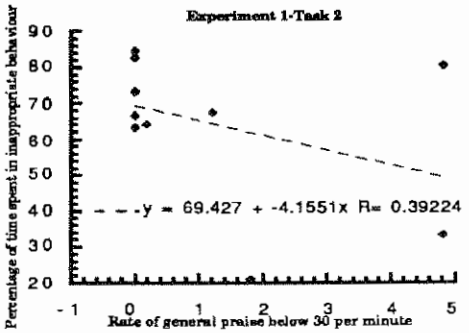
EXPERIMENT 1-TASK 2

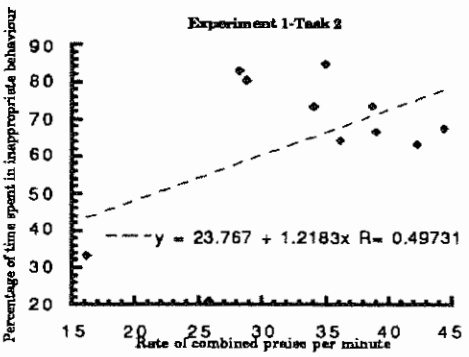
Pearson-Product Moment Correlations Between Rate of Delivery of Verbal Praise and the Percentage of Time the Employee Spent in Inappropriate Behaviour in Very Frequent Reinforcement Conditions

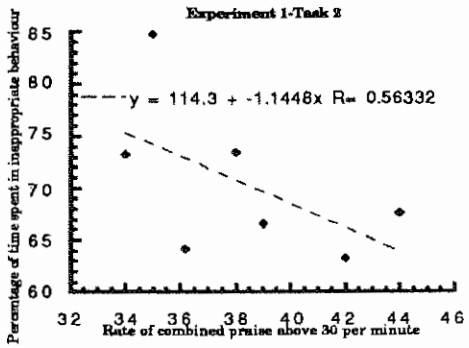








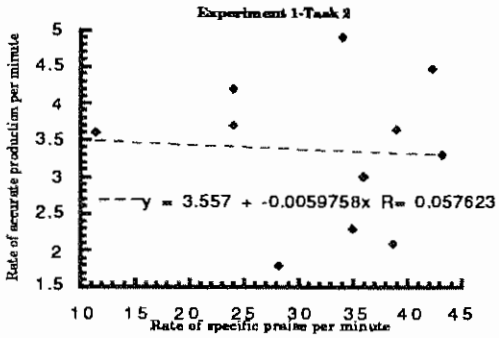


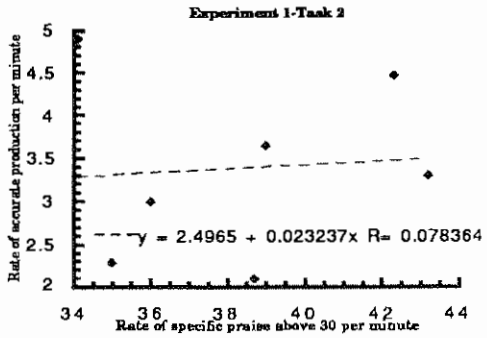


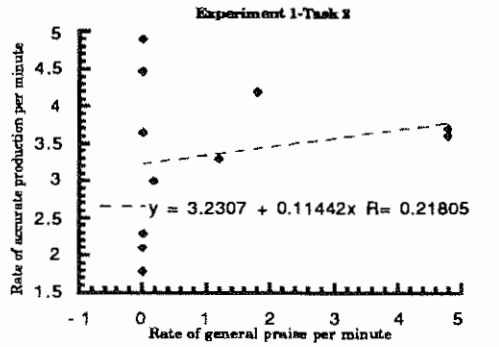
APPENDIX 2.10d

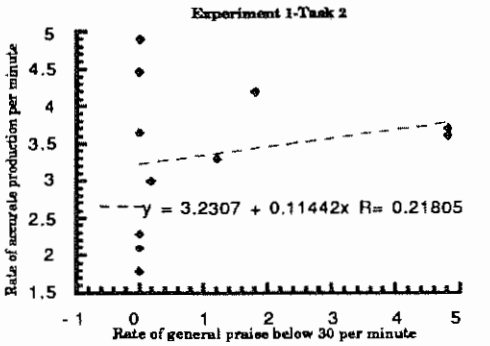
EXPERIMENT 1-TASK 2

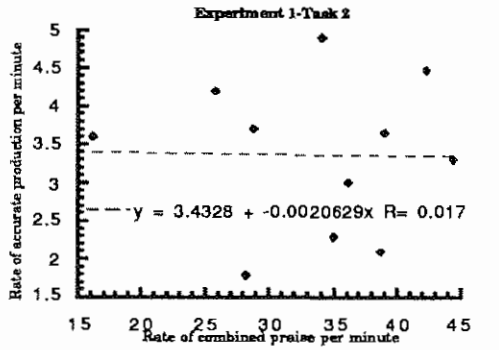
Pearson-Product Moment Correlations Between Rate of Delivery of Verbal Praise and Rate of Accurate Production in Very Frequent Reinforcement Conditions

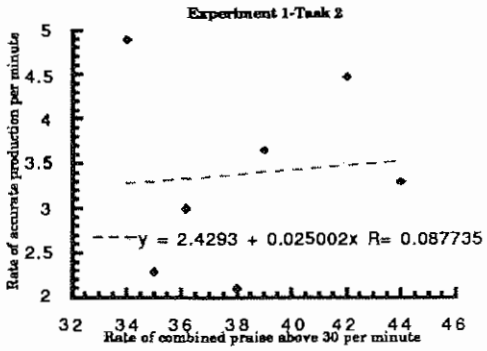








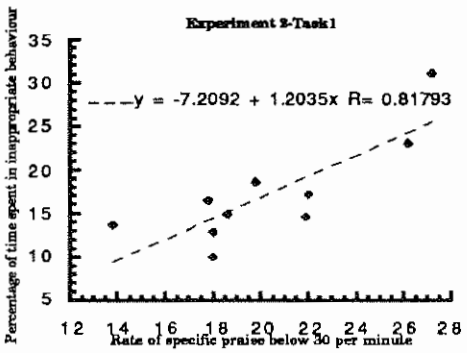


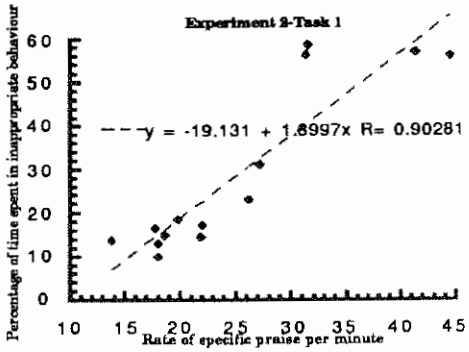


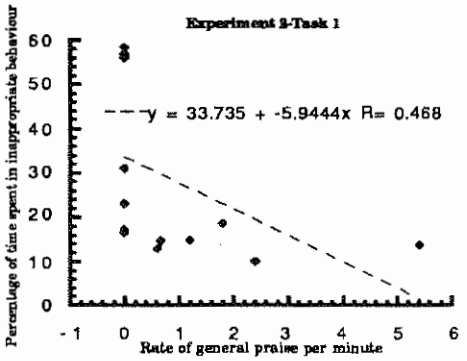
APPENDIX 2.11a

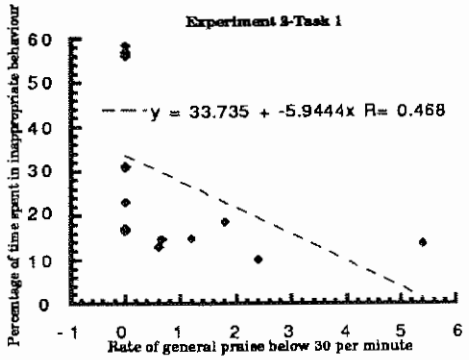
EXPERIMENT 2-TASK 1

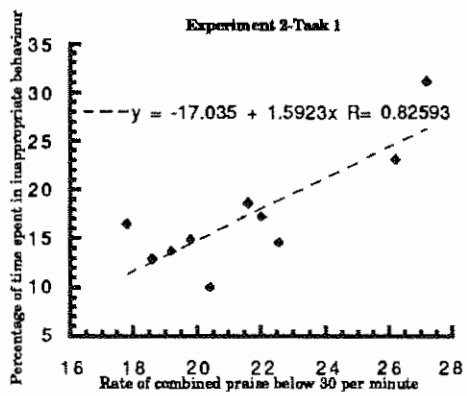
Pearson-Product Moment Correlations Between Rate of Delivery of Verbal Praise and the Percentage of Time The Employee Spent in Inappropriate Behaviour

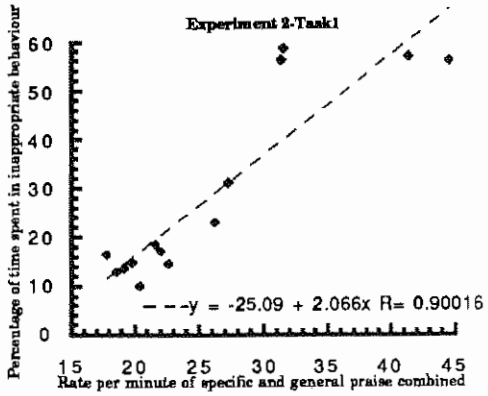








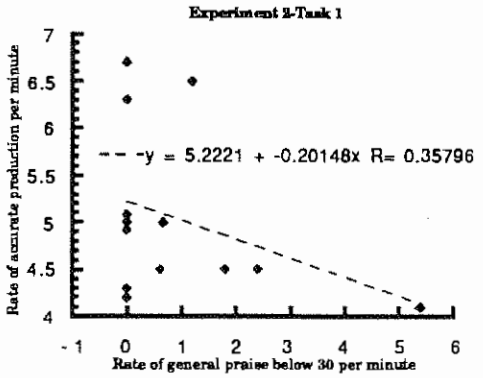


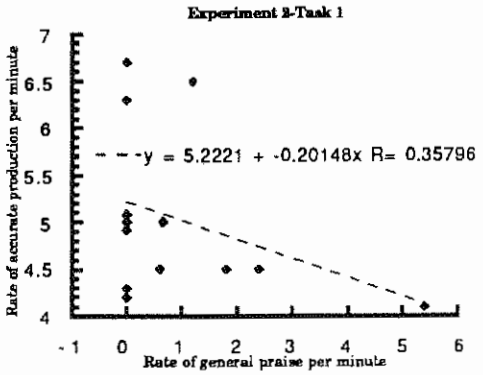


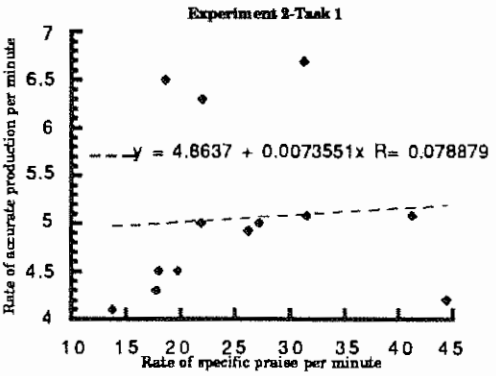
APPENDIX 2.11b

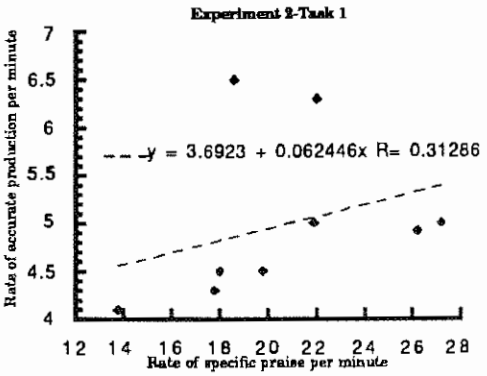
EXPERIMENT 2-TASK 1

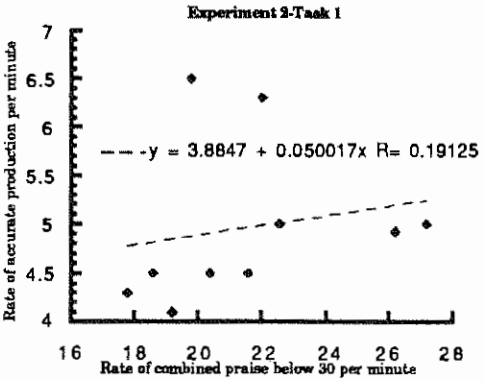
Pearson-Product Moment Correlations Between Rate of Accurate Production Per Minute and Rate of Delivery of Verbal Praise in Very Frequent Reinforcement Conditions

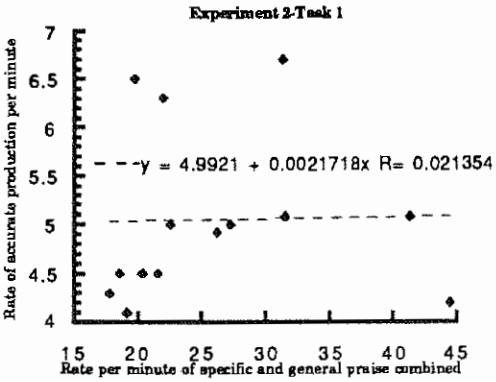








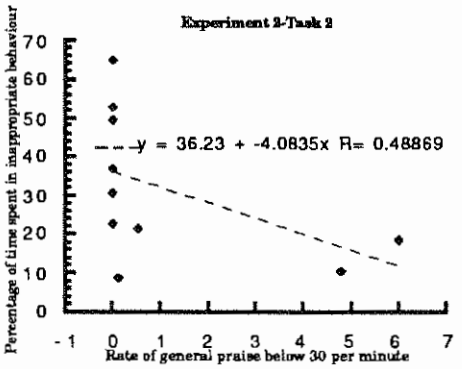


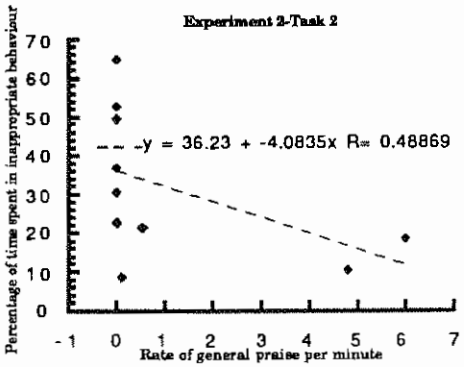


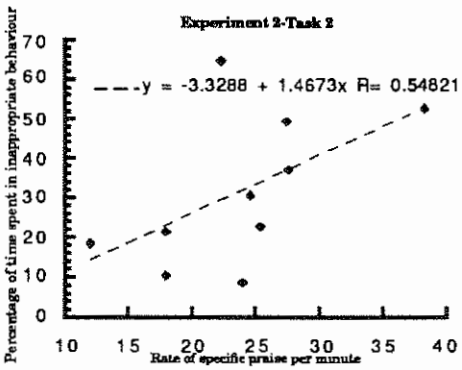
APPENDIX 2.11c

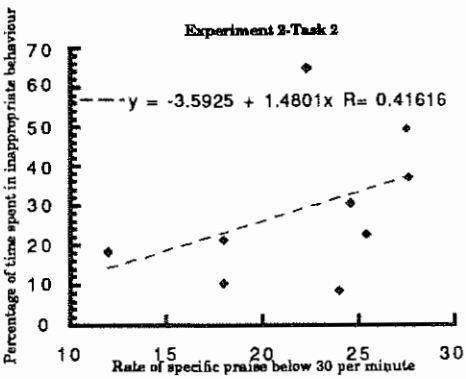
EXPERIMENT 2-TASK 2

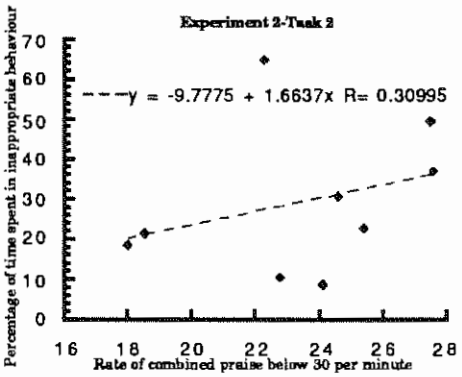
Pearson-Product Moment Correlations Between Rate of Delivery of Verbal Praise and Percentage of Time the Employee Spent in Inappropriate Behaviour in Very Frequent Reinforcement Conditions

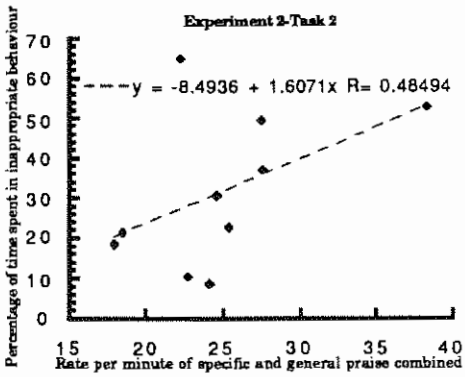








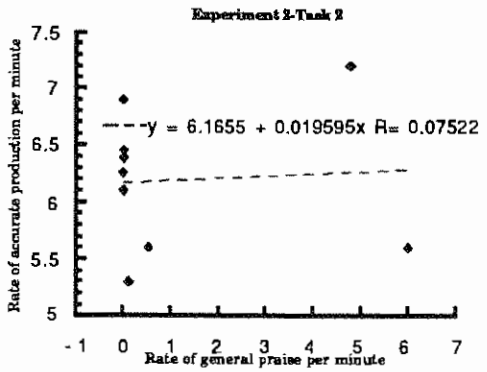


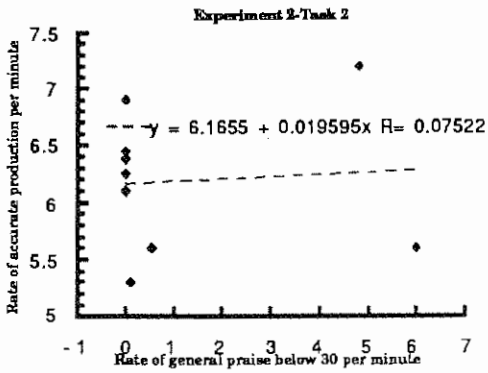


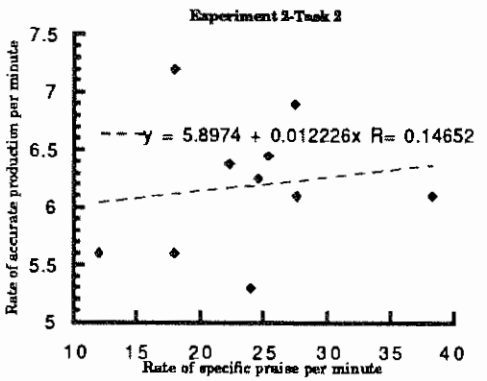
APPENDIX 2.11d

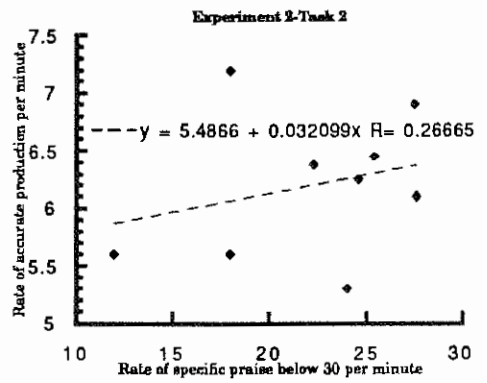
EXPERIMENT 2-TASK 2

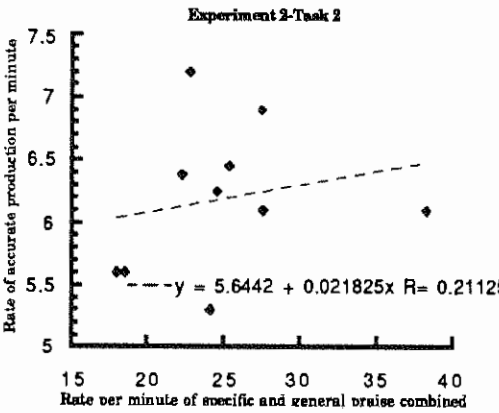
Peason-Product Moment Correlations Between Rate of Delivery of Verbal Praise and Rate of Accurate Production in Very Frequent Reinforcement Conditions

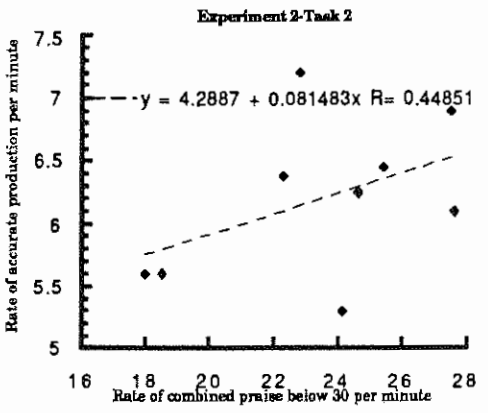












APPENDIX 2.12a

Letter to Director of TrED Centre Concerning the Study

The Australian National University
GPO Box 4, Canberra, ACT 2601, Australia
Telegrams & cables NATUNIV Canberra
Telex AA 62760 NATUNIV
Facsimile 062-489062
Telephone 062-492795(Departmental Secretary)

Clinical Masters Programme
Department of Psychology
Faculty of Science

15 June 1989.

David Zilbar
Coordinator
Training Evaluation and Demonstration Centre
Canberra College of Advanced Education

Dear David,

I, Barbara A. Baylis, am applying for authorisation to carry out the research project outlined below under the supervision of Dr. J. Holman, ANU and Dr. S. Plummer, CCAE, from approximately June until October 1989.

Project Outline

The project proposed will consist of individual case studies with two TRED trainers and two TRED trainees. Initially, I wish to make observations of trainers giving verbal praise to trainees. Following this, I will ask the trainers to increase the frequency of giving verbal praise and assess the effects of these changes.

The purpose of the study is to determine if changes in the trainer's verbal praise leads to increased trainee production.

Participants

Two trainees will be verbally offered the opportunity to learn a new work skill and asked if they would like to participate. Two trainers will be provided with a brief written explanation of the study and invited to participate (copy attached).

Confidentiality

Participants will be identified by a code number only. Their names will not appear on any record other than the attached consent form (trainers only). Thes consent forms, along with any other record of names which may become necessary during the study, will be kept in a locked filing cabinet in Dr. Holman's office and destroyed immediately upon completion of the study.

Feedback to TRED

Upon completion of the above outlined project, I will be happy to provide TRED with a discussion and copy of the results. It is hoped that the study will be of benefit to the Training Demonstration and Evaluation Centre.

Thank you for your assistance.

Sincerely,

Barbara Baylis

Barbara Baylis, Psychologist.

I give authorisation to Barbara Baylis to carry out the research project described above.

APPENDIX 2.12b

Letter to TrED Trainers Concerning the Study

The Australian National University

GPO Box 4, Canberra, ACT 2601, Australia
Telegrams & cables NATUNIV Canberra
Telex AA 62769 NATUNIV
Facsimile 062-489062
Telephone 062-492795(Departmental Secretary)

Department of Psychology
Faculty of Science

15 June 1989.

Training Staff
Training Evaluation and Demonstration Centre
Canberra College of Advanced Education

Dear Staff Member,

As you know from our previous discussions, I wish to carry out a research project at TRED as part of a Masters of Clinical Psychology programme I am currently enrolled in at the ANU.

This letter is to invite you to participate in this study. Initially I wish to observe your verbal interactions with the individuals you are vocationally training. Following this I will ask you to change some of your interactions with the trainees and assess the effects of these changes. At the completion of the study I will be providing feedback to TRED on the results.

Your participation in this study is entirely voluntarily and you may withdraw at any time during the study.

Should you decide to participate, you will be assigned a code number to identify you. Please be assured that any record on which your name appears (including this one) will be kept in a locked filing cabinet in Dr. J. Holman's office at the ANU for the duration of the study and then destroyed.

Thank you for your assistance.

Sincerely,

Barbara Baylis

Barbara Baylis
Psychologist.

I do agree to participate in the research project described above.

Signed_____ Date_____

I do not agree to participate in the research project described above._____(tick only)