CHAPTER 1

INTRODUCTION

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The use of behaviour modification procedures to change the academic performance of school children is both well-established and widespread. There are many studies which report the successful application of direct contingent rewards as reinforcers for classroom activities, and it would be no exaggeration to estimate that many teachers have, at some time, employed operant methodologies in their classrooms. However, there are also instances where seemingly inexplicable performance decrement has followed teachers' use of these procedures and resulted in the comment that "I tried behaviour mod., but it didn't work" (Irvine & Sharpley, 1980). The present study is concerned with one example of behaviour modification procedures "not working" as predicted.

Chapter two presents a review of literature concerning some rewarding procedures which occur in many classroom-based uses of operant methodologies. The relative effectiveness of vicarious vs implicit rewards is raised, and the review which follows focusses upon studies using "implicit reward" procedures in classrooms. Although the majority of studies report vicarious reinforcement effects when implicit rewards are used, two studies are presented which contradict these results. These two studies form the basis for the research reported in this thesis.

Chapter three considers several theoretical viewpoints relevant to the issue in question and theoretical postulates are drawn which in turn lead to directional hypotheses for testing. Two main studies are carried out using dependent variables which have previously been trialled in a series of preliminary studies. Chapters four to seven deal with the methodology, data collection and results of this investigation of implicit rewards, and findings are integrated in Chapter eight.

The issues involved in this research are seen as relevant to both general and special education, although data are collected in "typical" schools only. The upsurge in concern for basic skills of numeracy and literacy which characterized the last decade (e.g., Baum, 1976; Corbin, 1976; Hogan & Judy, 1976) is still of central interest to educators and parents alike. Public legislation (PL 94/142) in the United States and less formal local pressures have required that educators became accountable for their programs. Resulting from this are teaching procedures which are based upon rigorous principles of learning. While the proponents of operant methodologies claim that behaviour modification procedures do work, it has been noted above that there are reports from those in the field to the contrary.

On a more theoretical level, the last decade has witnessed a rise in interest in models of operant learning which encompass cognitive aspects of human responses (e.g., Bandura, 1977a, 1977b, 1978, 1979; Brewer, 1974). The present investigation focusses upon a typical operant paradigm wherein cognitive evaluations of reward conditions are apparent. As Bandura (1979, p. 1) has noted, "The social interdependence of reinforcement effects is an important phenomenon that surprisingly has received no attention."

CHAPTER 2

A REVIEW OF THE LITERATURE

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2.1 Introduction

The review of relevant literature in this chapter defines the phenomena which are under scrutiny, examines the contribution of previous studies in the area, and raises several issues for empirical investigation. The effectiveness of direct rewards in changing classroom behaviour is noted, as well as the relevance of "vicarious" reward procedures when teachers are unable to directly reward all children because of logistic limitations. However, when all children are performing a set task, selective rewarding of some children constitutes a variation on the basic vicarious process. Bandura's (1971) definition of this variation, which he terms "implicit" rewards, is discussed and several studies which have examined this process in classrooms are evaluated. While the majority of studies suggest that implicit rewards function as vicarious rewards, there are some serious methodological limitations inherent in these studies which preclude reliable generalization. Two studies which contradict the above findings are examined and evaluation of them suggests that there are several issues which have yet to be adequately investigated. These are discussed and lead to a treatment of the theoretical bases of the phenomena under scrutiny in the following chapter.

2.2 Direct vs indirect rewards

2.21 Direct vs vicarious rewards

Skinner (1938, p. 62) defined reinforcers as follows:

> A reinforcing stimulus is defined as such by its power to produce the resulting change ... some stimuli are found to produce the change, others are not and they are classified as reinforcing and non-reinforcing accordingly.

This distinction between stimuli which do reinforce and others which may be expected to reinforce but do not has been succinctly put by Kazdin (1975, p. 26), who classified such non-reinforcing stimuli as "rewards": "although rewards are highly valued, at least subjectively, they do not necessarily increase the probability of the behavior they follow ".

The application of "rewards" for specific behaviours found in classroom situations has demonstrated a range of reinforcing properties in many instances. For example, in modifying the attending behaviours of children, some studies have demonstrated the reinforcing power of teacher-administered rewards (e.g. , Becker, Madsen, Arnold & Thomas, 1967; Deitz & Repp, 1974; Geis & Clark, 1971; Hall, Lund & Jackson, 1968; Schutte & Hopkins, 1970; Walker & Buckley, 1968). Similar effects have been noted in academic areas of the school curriculum (Hopkins, Schutte & Garton, 1971; Lovitt, Guppy & Blattner, 1969; Marholin, McInnes & Heads, 1974), as well as in modifying the classroom behaviour of atypical children (Bailey, Timbers, Phillips & Wolf, 1971; Birnbrauer, Wolf, Kidder & Tague, 1965). In reducing the incidence of inappropriate behaviours, the removal of rewards and/or the application of aversive consequences ("punishment") has also proven effective (Clark, Rowbury, Baer & Baer, 1973; Hall, Axelrod, Foundopolous, Shellman, Campbell & Cranston, 1971; Patterson, 1965; Mitchell & Crowell, 1973; McLaughlin & Malaby, 1972; Thomas, Becker & Armstrong, 1968).

In all of these studies the rewards or punishers have been applied directly, i.e., to the person whose behaviour change is sought. However, when using groups of subjects, the effect of "vicarious" rewards has been noted (Bandura, 1969; Kazdin, 1975). Bandura (1971) defines the effects of vicarious reinforcement "as a change in the behaviour of

observers as a function of witnessing the consequences accompanying the performance of others" (p. 230). More explicitly, vicarious reinforcement refers to the reinforcing effect the application of a reward has upon not only the performance of the subject who receives the reward, but also upon the future performance of a presently non-performing observer (Flanders, 1968; Kanfer, 1965; Kanfer & Marston, 1963; Siegel & Steinman, 1971). Flanders (1968) has reviewed over fifty studies which replicate this vicarious reinforcement effect in which rewarding a performer (often referred to as the "target" subject) positively affects the future performance of an observer (the "peer"). Flanders suggests that the peer subject rationalizes,"if he got rewarded for that, then I'll be rewarded for that if I do it." (p. 320) Kazdin (1975, p. 139) adds that theoretical explanations of vicarious learning need to be based upon the notion of "discriminative stimuli (S^D), ...praise to one child is often a signal that other children will be praised if they are behaving appropriately." The role of cognitive judgment or "central processes" (Bandura, 1969) is therefore suggested as powerful within this learning paradigm.

2.22 Vicarious <u>vs</u> implicit rewards

While there is evidence to suggest that cognitive decisions underlie subjects' choices of responses in vicarious situations, these situations are dramatically altered in the typical rewarding procedures adopted in many classrooms. Teachers may only reward those children who complete a set task in either the shortest period of time or with least errors because of logistic restrictions on teacher-time, number of children in class, and the need to supervise many activities at once. In this case, the peers are not only observers (as in a purely vicarious situation), but are also performing the task, even though they may not receive the reward.

Bandura (1965a, 1971) made a distinction between this (which he termed "implicit reinforcement") and vicarious reinforcement:

> In the latter phenomenon, observers do not perform any responses during the influence period and, therefore, the model's outcomes have no immediate personal consequences for observers. By contrast, in implicit reinforcement, individuals perform responses that are explicitly reinforced in some members and implicitly rewarded or punished in others. When the same deserving performances are praised in one case and ignored in the other, the slighted person is not only exposed to observed outcomes, but he experiences immediate direct consequences to his own behavior, which can have rewarding, punishing, or extinctive effects.
>
> (Bandura, 1971, p. 234)

Bandura does not suggest how to predict whether these effects will be "rewarding, punishing or extinctive". This thesis examines this "implicit" reward condition in some depth to determine if such predictions are possible. It should be noted at this point that Bandura's use of the term "implicit reinforcement" may be a misnomer if the reward applied implicitly does not, in fact reinforce the prescribed behaviour (see Skinner's 1938, p. 62 definition quoted earlier in this chapter). To avoid this possible contradiction in terms, the condition in question will be referred to herein as "implicit rewards". Since the definition of "reward" lies in the eye of the rewarder (rather than the rewardee), no implications are drawn as to the reinforcing or punishing effects of such implicit consequences upon the behaviour of either "target" or "peer" subjects by the use of this terminology. An operational definition of the term is useful at this point.

Direct/Implicit rewards

> Direct rewards are defined as contingent rewards received by a target subject. Implicit rewards refer to the observation of another subject's receiving contingent rewards but the observer (who is also performing the rewarded task activity) not receiving direct rewards. This observer will be referred to as the "peer" subject.

2.3 The relevant literature

2.31 Definition

As previously emphasized, this investigation focusses on the effects of implicit rewards administered to children in typical classroom situations. The following review therefore will concentrate on those studies which have been set in such classrooms and the data collected therein. While studies concerned with other age-groups or settings may have used implicit rewards (e.g. Kazdin, 1973a: moderately retarded adults in a sheltered workshop; Weiner and Weiner, 1973: university undergraduates in a laboratory setting), they were concerned neither with children nor with classrooms and will therefore not be reviewed. Eleven studies were found which examined the effects of implicit rewards in typical classrooms, and these are reviewed in detail. Seven further studies used implicit rewards in special classrooms, and data from these are presented in summary form. Because the development of issues arising from the typical classroom studies becomes the central focus of this chapter, the atypical classroom studies are presented in summary form first.

2.32 Atypical classroom studies summary

Christy (1974) found that sweets delivered to remedial reading target children for "in seat behavior" resulted in increases in this behaviour for peers. Kazdin (1973b) showed that contingent verbal praise administered to two mentally retarded boys for on-task behaviour had powerful reinforcing effects upon the on-task behaviour of two peers. Kazdin, Silverman and Sittler (1975) reinforced the attending behaviour of two moderately mentally retarded children by rewarding the paired peer of each child. Verbal praise and patting were used as rewards and results showed increases in attending behaviour of 68 per cent for targets and 94 per cent for peers. Patterson (1974)

studied Oregon boys with behaviour problems (14 targets, 14 peers). Disruptive behaviour decreased for both targets and peers when a token system of rewards (for free time, movies and story time) was used to modify target on-task behaviour. Strain and Pierce (1977) noted that social praise effectively reinforced the attending behaviour of both targets and peers in two pairs of mentally retarded boys, even though the reward was only administered to target subjects. Strain, Shores and Kerr (1976) praised the positive social behaviour of three pre-school boys in a special school for children experiencing "behavior problems". Increases in positive social behaviour were noted for peers (n = 7) as well as for targets. Strain and Timm (1974) found that teacher-delivered verbal praise and physical contact markedly increased the positive social behaviour of one (target) pre-school girl classified as hyperactive and her 17 peers who received the rewards only implicitly.

2.33 Typical classroom studies

Of these eleven studies, nine produced results which coincided with the findings of the previous atypical classroom studies, i.e., increases/decreases in peer performance parallel to targets. However, two studies showed data contrary to this, and these two will be reviewed last to enhance a comparison of methodologies.

2.331 Studies in which implicit rewards acted as vicarious reinforcers[1]

Broden, Bruce, Mitchell, Carter and Hall (1970) applied implicit rewards in the form of direct and contingent teacher attention to the attending behaviour of two second-class boys. Data were collected

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[1]The detailed literature review which follows is largely drawn from applied behaviour analysis studies, and as such needs to be conducted with careful scrutiny of experimental design. The descriptive system used represents baseline (or "no intervention") phases by "A"; intervention by "B". If intervention varies, then subscript numerals depict this, e.g., AB_1AB_2A.

by two observers in 5-second interval recordings over 30 minutes/day for 60 days (interobserver agreement = .82 to .93). This study was set in a Kansas primary school, although both boys had low academic achievement records and were borderline mildly mentally retarded (Stanford-Binet I.Q. = 60; 72). Following a baseline condition in which the first boy was noted to be attending for 31 per cent of the time and the second boy for 33 per cent of the time, the teacher increased the amount of attention given to the first boy's attending behaviour from 2.6 times/session to 7.9 times/session. Although teacher attention to the second boy rose only slightly (1.4 to 2.9 times/session), the attending behaviour of both boys increased (boy one to 73 per cent, boy two to 47 per cent). During the next phase of the study, teacher attention to the second boy rose to 15.2 times/session and decreased to 1.6 times/session for the first boy. There was an accompanying rise in the attending behaviour of the second boy (to 82 per cent) and a drop for the first boy (to 62 per cent). A return to baseline phase (teacher attention = 1.7 times/session for both boys) showed reductions in both boys' attending behaviour (boy one to 41 per cent, boy two to 48 per cent). A final reward-to-both-boys phase resulted in rises for both boys: 71 and 74 per cent. The application of teacher attention under implicit reward conditions within this $AB_1B_2AB_3$ design was claimed by the authors to act as a reinforcer for the peer (increases of 14 and 31 per cent over baseline) as well as for the target subject (increases of 46 and 49 per cent). By themselves, these means do not allow reliable inferences to be drawn, and the lack of supporting statistical analyses severely limits the generalizability of these data.

In a similarly designed study (ABAB), Drabman and Lahey (1974) used teacher verbal praise to one disruptive ten-year-old Florida girl (who had been referred for "behavior problems") as the implicit reward

to her peers. Data were once again collected by observation of 10-second intervals in 5-minute blocks for 45 minutes/day over the 37 days of the study (interobserver agreement = .86). Following the baseline phase (disruptive behaviour: target = 1.39 per interval; peers = .71 per interval), the teacher contingently praised the target child for decreased disruptive behaviour. Both target (.49 per interval) and peers (.55 per interval) decreased disruptive behaviour during this phase. A return to baseline showed increases in disruptive behaviour (target = 1.77, peers = .78), but reinstatement of direct rewards to the target in the final phase was accompanied by reductions in disruptive behaviour again (target = .37, peers = .50). As reported by Drabman and Lahey (1974, p. 595), "Although only Charlotte (target) was exposed to contingencies, repeated measures analysis of variance indicated that the changes in her classmates' disruptive behavior were significant ($F(3,33) = 4.04$, $p < .05$)."

In an early study, Kounin and Gump (1958) found what they termed "ripple effects" in disciplining one target pre-school child. When a specific child who was misbehaving was verbally disciplined for the misbehaviour, peers who were also misbehaving decreased their misbehaviour as well ($p < .001$). Although this study was conducted in a normal classroom in Detroit, there was only one observation taken and no experimental control or design implemented. As an anecdotal indicator, this study appears to support the two previously discussed, although generalizability is low.

Repucci and Reis (1970) investigated the effects upon eight peers of teacher verbal praise and of tokens for reductions in four target children's disruptive behaviour. All children were referred for "behavior problems" and were from classes one to three of a "lower-middle-class suburban school" in the U.S.A.. The authors used an AB design and data

were collected by a naive observer during an average of 7 x 10-minute periods over each school day for the seven weeks of the study. Inter-observer data were available only for pre-baseline (r = .88) and post-treatment (r = .99) measures. Target subjects decreased disruptive behaviour (F = 10.29, p < .001) and increased task-relevant behaviour (F = 15.22, p < .001). Peers did not show a significant decrease in disruptive behaviour, but did show a trend to increase task-relevant behaviour (F = 2.86, p < .10). A control group of non-disruptive peers showed an increase in task-relevant behaviour (F = 3.78, p < .05). Although the effects upon the control group were significant, this was not the case with those peers who were also referred for "behavior problems". The generalizability of implicit reward effects to those children who shared the characteristics of the targets in this study is not demonstrated.

In a study designed to investigate the relative effects of varied lengths of teacher contact with target children upon the on-task behaviour of peers, Scott and Bushell (1974) selected four boys and two girls from a third-grade public school in Kansas, all of whom had been referred for low levels of work-completion and on-task behaviour. Five peer children were selected from the rest of the class for observation on the task-activity of mathematics. Both target and peer children were observed for off-task behaviour by two observers every 15 seconds for the 20-minute maths period over the 28 days of the study (interobserver agreement = .92). Following the baseline phase wherein the length of teacher-pupil contact was not stipulated, contact was set at 50-second length for the second phase and 20-second length for the third phase. Data regarding off-task behaviour were not reported separately for targets and peers except by a graph which indicated that peer subjects were responding as if they were receiving the same consequences as targets over the three phases of the study. Unfortunately, little reliance can be placed on purely

descriptive data such as these.

Sechrest (1963) examined performances of 15 target and 30 peer children (age unspecified) on puzzle-completion. All subjects were timed at puzzles over a single intervention. There is a lack of detail in the report of this study as regards procedures, but children were in pairs, one child receiving verbal praise from a female stranger upon completion of the puzzle and the other child receiving no praise. Results reported are in accordance with those reported by previous studies, although lack of detail seriously hinders examination of the methodology of this study.

Sugimura (1966) investigated the effects of implicit rewards under competitive and noncompetitive situations with 20 boys and 20 girls from four normal fifth-grade classes in Japan. The design used was AB over two days with the task of digit-symbol matching for four minutes each day rewarded by verbal praise or punished by verbal reprimand during the second day only. That is, the first day's performances were reported to target subjects prior to the commencement of the second day's trial. Peers did not receive either report or verbal consequence. Results showed that, for those subjects who were given competitive instructions, there was increased task-response for both target and peer subject data reported together ($F = 4.70$, df = 1, 152, $p < .05$). These results were not replicated for noncompetitive condition subjects.

Weiner, Weiner and Hartsough (1971), found results which once again concur with the previous studies. In a study involving 64 pre-school children (CA $\overline{X}$ = 5.5 years) in the mid-west of the U.S.A., data were collected on the copying of abstract figures from the Developmental Test of Visual Motor Integration (Beery, 1967) under conditions of baseline and rewards over two days. On day one there were three baseline trials, followed by three intervention trials. Day two consisted of three more baseline trials. Consequences were administered under the following

five conditions: i) neutral--no comment; ii) direct positive; iii) implicit positive; iv) direct negative; and v) implicit negative consequences. Differences between effects in pairs or in small groups of four were also investigated, with half of the subjects in each case being targets and half peers. Data collected showed that implicit negative consequences were more powerful as reinforcers of correct performance than any of the other conditions ($p < .05$). No differences were found between paired or small-grouped subjects. These data indicate that powerful effects were noted when consequences (albeit negative) were delivered implicitly for the task-activities. Comparisons between direct negative, indirect positive and other conditions were not reported but treatment means indicated that there were no marked differences between direct and implicit conditions for either positive or negative consequences.

Werstlein (1978) compared the effects of direct and implicit rewards for arithmetic problems completed correctly by 29 male and female grade two pupils in Alabama. Using teacher-corrected problems as the measure of performance, the study was carried out with three groups. For group one, conditions were baseline, direct rewards to target ($n = 1$) and implicit rewards to peers ($n = 9$), baseline, direct to all subjects. Group two had baseline, direct to target ($n = 1$) and implicit to peers ($n = 9$), return to baseline, return to direct to target only. Group three were a control group and experienced baseline for all trials ($n = 9$). Data indicated that both direct rewards (group 1) and implicit rewards (group 2) significantly increased correct performances over the control group ($p < .05$). Implicit rewards once again appeared to possess reinforcing power.

2.332 Contradictory studies

Two studies present data which contradict those from the previous studies. The first of these two studies (Ward & Baker, 1968) is described

immediately below, followed by a summary and brief critique of all of the ten studies reviewed so far. The second contradictory study (Sharpley, 1978; Sharpley, Irvine & Hattie, 1980) was designed to overcome the methodological inadequacies of the previous studies and is therefore presented last and in detail explaining how these methodological problems were overcome.

2.3321 Ward and Baker (1968)

In a study designed to reduce the disruptive behaviour of four first-grade Boston negro children referred for "behavior problems", Ward and Baker (1968) observed the disruptive behaviour of these target children and four of their peers for 4 x 15 minute periods each week over five weeks of baseline and five weeks of intervention conditions. Observers were three female postgraduate students (interobserver agreement = .81). At the commencement of the intervention condition, teachers ignored disruptive behaviour and praised task-relevant behaviour from the targets, but did not change their responses to peers. Data reported showed a drop in disruptive behaviour by targets from baseline to intervention ($\overline{X}_1$ = 74 per cent, $\overline{X}_2$ = 57 per cent; $\underline{t}$ = 3.91, df = 3, $\underline{p}$ = .03). No similar drop was noted for peers ($\overline{X}_1$ = 37, $\overline{X}_2$ = 41, $\underline{t}$ = .32, df = 3, n.s.), suggesting that there were no significant effects upon peers of rewarding target on-task behaviour. This study therefore presents data which are not similar to that from the other studies reviewed so far.

2.3322 Critique of studies reviewed so far

Table 1 presents a summary of the studies reviewed. From this table, it may be seen that, with the exception of the studies by Ward and Baker (1968) and Sharpley (1978), peers and targets changed behaviours similarly as targets were rewarded. In other words, rewards which acted as reinforcers for targets also acted as reinforcers for peers even though administered implicitly to the peers. However, some reservation needs to be expressed in regard to these studies. First, almost all have been

Table 1

Summary of direct vs implicit reward studies reviewed

AUTHOR	YEAR	SOURCE	PLACE	DESIGN STRUCTURE	PERIOD DAYS	CONTROLS	POPULATION AGE	GRADE	SETTING[1,2]	FEATURES	REWARD VERBAL	REWARD NON-VERBAL	REWARD TANGIBLE	REWARD TOKEN	MEASUREMENT PROCEDURE[3]	MEASUREMENT RELIABILITY TYPE[4]	MEASUREMENT RELIABILITY LEVEL	BEHAVIOUR EXAMINED[5] CONDUCT	BEHAVIOUR EXAMINED[5] ACADEMIC	SAMPLE SIZE TARGET	SAMPLE SIZE PEERS	OUTCOMES TARGET CHILDREN	OUTCOMES PEER	STATISTICAL ANALYSES[6]
SPECIAL CLASSROOMS																								
Christy	1974	Ph.D.	Utah, USA	$AB_1AB_2B_3$	25	*	4.5	p.s.	S	Remedial			*		O	Io	.98	I		1	4	Both targets and peers increased		g
Kazdin	1973	J.A.B.A.	Pennsylvania,USA	$AB_1AB_2B_1$	36		10	n.r.	S	Mod. Mental Retarded	*				O	Io	.95	A		2	2	Increased attending behaviour	Increased attending behaviour	g
Kazdin, et. al.	1975	J.A.B.A.	Pennsylvania,USA	$AB_1B_2AB_3$	36		7-9	n.r.	S	Behaviour Problems, I.Q.=70-76	*	*			O	Io	.92	A		2	2	Increased attending behaviour	Increased attending behaviour	g
Patterson	1974	J. Consult. & Clin. Psych.	Oregon, USA	AbA	40		n.r.	n.r.	S	Behaviour Problems			*	*	O	Io	.85	D		14	14	Decreased disruptive behaviour	Decreased disruptive behaviour	RM/ANO g
Strain & Pierce	1977	Psych. in the Schools	Washington, D.C.,USA	AbABA	63		4.0	p.s.	S	Mentally Retarded	*				O	Io	.95	A		2	2	Increased attending behaviour for both		g
Strain, et. al.	1976	J.A.B.A.	Tennessee, USA	ABABA	75	*	4.3	p.s.	S	Behaviour Problems	*	*			O	Io	.84	S		3	7	Increase in positive behaviour	Increase in positive behaviour	g
Strain & Timm	1974	J.A.B.A.	Tennessee, USA	ABABA	40	*	3.8	p.s.	S	Hyperactive Anti-social	*	*			O	Io	.96	S		1	17	Increase in positive behaviour	Increase in positive behaviour	g
NORMAL CLASSROOMS																								
Broden, et. al.	1970	J.A.B.A.	Kansas, USA	$AB_1B_2AB_3$	60	*	n.r.	2	N	Behav. & Academic Problems, I.Q.=60,72	*				O	Io	.88	A		1	1	Increased attending behaviour	Increased attending behaviour	g
Drabman & Lahey	1974	J.A.B.A.	Florida, USA	ABAB	37		10	n.r.	N	Behaviour Problems	*				O	Io	.86	D		1	12	Decreased disruptive behaviour	Decreased disruptive behaviour	RM/ANO g
Kounin & Gump	1958	Elem.Sch. Journal	Detroit, USA	Observ. x 1	n.r.		n.r.	p.s.	N	Normal	*				O	Io	.81	D		n.r.	n.r.	Not stated	Decrease of disruptive behaviour	χ^2
Reppucci & Weis	1970	APA Annual Convention	? USA	AB	35		n.r.	1-3	N	Behaviour Problems	*				O	Io	.93	A		4	8	Decrease disruptive, increased attending	Decrease disruptive, increased attending	ANO g
Scott & Bushell	1974	J.A.B.A.	Kansas, USA	$B_1B_2B_3$	28		n.r.	3	N	Low Maths Levels	*	*			O	Io	.91	O	Ma	6	5	Not stated separately	Increased, 65 to 72 per cent	g
Sechrest	1963	Journal of Ed. Psych.	? USA	B	n.r.	*	n.r.	n.r.	N	n.r.	*				TC	n.r.	n.r.		P	15	30	Increase of task behaviour, but no significant differences between targets and peers		ANO
Sharpley	1980	Alberta J. of Ed. Research	Brisbane, Australia	AB_1AB_2A $B_3B_4B_3A$	140		9-11	4,5	N	Normal	*			*	TC	Io	.98		M	11 17	11 17	Implicit Rewards acted as extinguishers for targets and peers ($p < .01$)		RM/ANO g, SC
Sugimura	1966	Jap.J.of Ed.Psych.	? Japan	AB	2		n.r.	5	N	Normal	*				TC	n.r.	n.r.		M	20	20	Increased task behaviour for both, but only in noncompetitive situations		ANO
Ward & Baker	1968	J.A.B.A.	Boston, USA	AB	60	*	n.r.	1	N	Behaviour Problems	*				O	Io	.81	D		4	8	Decreased disruptive behaviour	No significant change noted	t,g
Weiner, et. al.	1971	J. of Sch. Psych.	Mid-West, USA	AB	2		5.5	p.s.	N	Normal	*				TC	n.r.	n.r.		M	32	32	Greatest increase for peers receiving negative comments		RM/ANO
Werstlein	1978	Dis.Abs.	Alabama, USA	$ABAB_1$ AB_1AB_1	29	*	n.r.	2	N	Normal	*				TC	n.r.	n.r.		Ma	2	18	Increased attending behaviour for both		n.r.

KEY

1. Grade: p.s. = preschool, otherwise grade shown
2. Setting: N = Normal Classroom
   S = Special Classroom
3. Measurement Procedure: O = Observer
   TC = Task corrected
4. Reliability: Io = Interobserver
5. Behaviour examined:
   Conduct: D = disruptive behaviour
   S = social interaction
   O = off-task behaviour
   A = attending behaviour
   I = in-seat behaviour
   Academic: Ma = mathematics
   P = problem-solving
   M = perceptual motor task
   H = handwriting
6. Statistical Analyses:
   g = graph
   ANO = analysis of variance
   RM/ANO = repeated measures
   t = t-test
   χ^2 = chi-square

* = present in study, n.r. = not reported in study

carried out in the U.S.A. (except Sugimura, 1966) and, whereas this is not a methodological weakness of these studies, the question of cross-cultural generalizability of findings does arise. Second, several do have design inadequacies. It is experimentally necessary for applied behaviour analysis studies (such as those reviewed) to incorporate several elements which are specifically required to lend validity to the design of the study (Campbell & Stanley, 1966; Cook & Campbell, 1979). Studies with designs such as those used by Kounin and Gump (1958), Reppucci and Reis (1970), Sechrest (1963), Sugimura (1966), Ward and Baker (1968) and Weiner, et al. (1971) are open to extraneous effects from sources such as history, maturation and selection. Generalizing from such studies is extremely risky. Of those remaining, Drabman and Lahey (1974), Kazdin, (1973b), Kazdin, et al. (1975), Patterson (1974), and Scott and Bushell (1974) employ no cross-validation or control measures. This leaves two studies (apart from Sharpley, 1978) which were set in "typical" classrooms -- Broden et al. (1970) and Werstlein (1978). Broden, et al. (1970) examined conduct behaviours and Werstlein (1978) studied arithmetic performance. While Broden and his colleagues' statistical analyses prevent firm conclusions being drawn, these two studies imply that rewards received implicitly possess reinforcing qualities. In order to overcome the lack of generalizability incurred by design inadequacies mentioned above and to investigate reliably the effects of implicit rewards for an academic task performed in a typical classroom, a study was carried out prior to this present investigation.

2.3323 Sharpley, 1978; Sharpley, Irvine and Hattie, 1980[2]

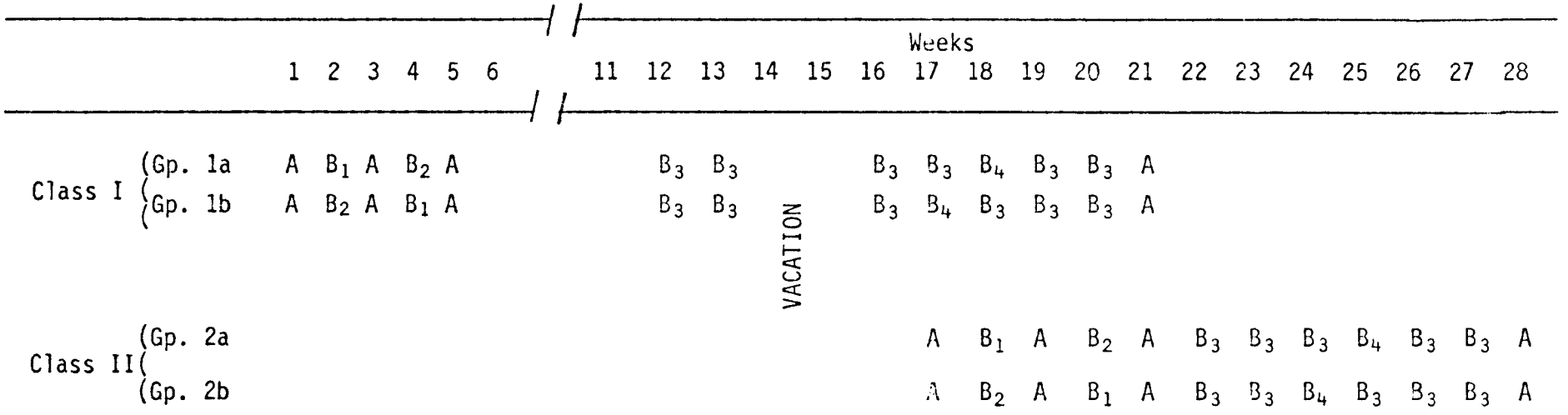
Twenty-two fifth-grade girls (CA $\overline{X}$ = 10.5) and 22 girls and 12 boys from a fourth grade (CA $\overline{X}$ = 9.7) in a private school in Brisbane, Australia, were subjects for the study. Teachers were naive as to the actual purpose of the study. A multiple time-series design was used (see Figure 1) as a method of avoiding sources of variability in subjects'

[2] Although originally performed in 1978, this study is most easily retrieved in Sharpley, Irvine and Hattie (1980).

performances which were extraneous to the experimental variables (Campbell & Stanley, 1966). The use of repeated measurements of each subject's responses over multiple interventions overcame the problem of spuriously high levels of variability which is often encountered in experimental work in the behavioural sciences, by using each subject as its own control (Winer, 1971). This use of repeated measurements of the chosen task-activity, plus the matching of the phases in each of the two classes over differing time periods contributed strongly to the validity of the study by reducing effects due to history, maturation, testing, and selection (Figure 1). The absence of the two-week vacation period from class II, and the inclusion of the six-week gap in intervention in class I, reduced the probability of spurious results due to history or maturation effects. Randomization (after matching) helped to overcome invalidity due to selection and statistical regression. The implementation of baseline phases before, between, and after intervention phases helped to overcome invalidity due to history, maturation and testing. There were no drop-outs from any subject-group, thus avoiding possible invalidity due to mortality, and the method of measurement remained constant throughout, thus overcoming invalidity due to instrumental changes. The first five weeks of each class' treatment was designed to collect data regarding another issue-- contingent vs non-contingent rewards. Further details of the rationale for this aspect of the study are available in Sharpley (1978) and Sharpley, Irvine and Hattie (1980).

Procedure

Subjects were tested for handwriting performance prior to the study, and were matched according to this in pairs. Each class was then randomly split into two groups of equal performance on this pretest. Each day during the study, every member of the class receiving the treatment performed the task-activity during a normal classroom period between 9.00 a.m. and 10.30 a.m., All subjects were required to perform the task on a piece of appropriately lined paper approximately 8 x 21 cm, and write their names



Key

A = Baseline

B_1 = Direct noncontingent rewards

B_2 = Implicit noncontingent rewards

B_3 = Direct contingent rewards

B_4 = Implicit contingent rewards

Figure 1: Intervention conditions (Sharpley, 1978; Sharpley, Irvine & Hattie, 1980)

on the reverse side of the paper. The teacher then collected all subjects' papers while giving the appropriate intervention-phase response.

Dependent variables

Handwriting was evaluated each day by the following measure:

> a count of the number of letters written correctly according to the standard and style set down in the Queensland Department of Education Syllabus for Schools, Language Arts (the syllabus from which the children had been taught).

Each letter was scored only on its first occurrence in the daily sentence for the particular day in question. These five sentences each contained every letter of the alphabet in lower-case script at least once. Capitals were not assessed. The content of these sentences was devised by a panel of three teachers experienced with grade 4 and 5 children, to ensure that the levels of grammar, spelling and cognitive content were appropriate. The particular sentence for each day was presented to the class in the manner usual for writing exercises in that class.

Independent variables

Verbal approval and token rewards were given to the individual subjects of the target group in the form of the teacher's comment: "That's good writing 'X' (subject's name). Take a house point."[3] The alternative subject-group received no approval or points, the teacher's only comment to them being "Thank you" as the daily response-sheets were collected. Details of these procedures are described below. The choice of the reward of teacher approval and house points was based on the previous successful use of these rewards in these classes to reinforce mathematics skills activities. Used within an AB design over 12 daily trials, (baseline = 6 days, rewards = 6 days) these rewards effectively reinforced mental arithmetic problem-solving at a significant level ($p < .01$).

[3]Each child in the school was allocated to one "House" on the basis of intramural groupings. House points were totalled at the end of each school term and the winning house members awarded special privileges of their choice.

Experimental phases: (see Figure 1)

Section (a) Noncontingent rewards:

Baseline 1

Handwriting behaviour was recorded for each subject for five days with the teacher's only comment being "Thank you" as the separate pieces of writing paper were collected. Any questions were politely answered in a non-committal fashion by the teacher.

Intervention 1 (Noncontingent rewards 1a/2a)

During this phase the teacher responded to group 1a/2a subjects individually by picking up each subject's writing sheet, scanning it for approximately three seconds, and saying the standard reward sentences mentioned above. For group 1b/2b the teacher picked up each subject's writing-sheet scanned it for approximately three seconds and said "Thank you". The teacher kept all writing sheets.

Baseline 2

Conditions during this phase were as in Baseline 1.

Intervention 2 (Noncontingent rewards 1b/2b)

During this phase, the conditions of Intervention 1 were enacted, but with the groups reversed. That is, group 1b/2b received the reward regardless of performance, and group 1a/2a received no reward.

Baseline 3

Conditions during this phase were as in Baseline 1.

Section (b) Contingent rewards:

Intervention 3 (Direct rewards 1a+1b/2a+2b)

On the first day of this phase, each teacher told her class that she wanted them to try the writing exercises again, and re-presented the daily sentences as before. Upon completion of each day's task, the teacher said: "I don't have time to correct these now, but I'll give them back to you tomorrow with the results on them", and then collected

each subject's task-sheet, only saying "Thank you" as she did so. The next day, immediately prior to asking the children to write the daily sentence on their sheets, the teacher returned each subject's sheet from the previous day with the subject's score of letters correct/total letters written on it. The teacher explained that if the subject had improved over the previous day's performance there would also be a "plus" on the sheet; if the score was equal to the previous day, there would be an "equals" sign; if less than the previous day, there would be a "minus" sign on the sheet. The teacher handed out each subject's sheet individually and commented to those who had scored a plus: "That's good writing 'X'. Take a house point ." Perfect scores (26/26) were always awarded a plus and the reward. These sheets were collected after a few minutes' discussion, and the teacher then instructed the class to complete the day's exercise which she then collected.

Intervention 4 (Direct 1a+2a: Implicit 1b+2b)

During this phase, the teacher rewarded only group 1a/2a, contingent on their results as in Intervention 3. Group 1b/2b were not rewarded, but the teacher explained: "I've only got time to correct some of your writing for a few nights because I'm so busy, but I want you all to do as well as you can. I don't know which ones I'll choose to correct each night, so you all had better try hard ." Only group 1a/2a had their previous day's task-sheets returned the next day, even though <u>all</u> subjects were given to expect that they might be the ones to receive the reward on any day.

Intervention 5 (Direct 1b+2b: Implicit 1a+2a)

During this phase, Intervention 4 was replicated but with group 1b and 2b receiving the reward.

Intervention 6 (Direct 1a+1b/2a+2b)

This was a return to Intervention 3 conditions.

Baseline 4

This was a return to Baseline 1 conditions.

Reliability measures

Hall (1970) suggests that direct measurement of data which may be re-assessed at any time has the advantages of precision and permanency over many observer-recorded forms of data. Daily measures were collected of each subject's performance on prepared slips of paper and retained for later cross-checking and re-sorting.

The correction of the daily task-activity was carried out each day after school-hours by the researcher with an independent evaluation on at least one day of each week. All corrections were performed by qualified teachers experienced at the grade 4 and 5 level. The independent evaluation was "blind", i.e., previous subject scores and the researcher's evaluation were unknown. The independent evaluator was also unaware of the intervention-procedures and the groups to which subjects belonged. The choice of which day was to be the checking day was performed by a third party on a random-choice basis. There was no feedback to either the researcher or the independent evaluator as to the respective scoring during the study. Inter-rater reliability was calculated and data appear below.

At the end of the study the researcher performed a posttest rescoring on one day's activities from each of the preceding weeks. Conditions regarding reliability were as for inter-rater evaluation procedures. Correlations for both inter-rater and posttest rescoring reliability were calculated by Pearson's Product Moment Correlation.

Results

Reliability

Reliability checks were conducted on days 3, 7, 8, 13, 18, 19, 23, 56, 58, 63, 79, 82, 94, 96, 98, 102 for groups 1a and 1b, and on days 84, 87, 91, 100, 103, 109, 111, 118, 124, 130, 134, 136 for groups 2a and

2b by inter-evaluator methods. Post-checks were conducted for groups 1a and 1b on days 3, 8, 13, 18, 23, 58, 63, 78, 83, 88, 94, 100, 103, and on days 83, 89, 94, 99, 104, 109, 114, 119, 131, 126, 134, 136, for groups 2a and 2b. Inter-rater reliability ranged from .94 to .99 (1a and 1b) and from .98 to .99 (2a and 2b). Post-check reliability was similar (.95 to .99 for 1a and 1b; .99 for 2a and 2b).

Data from the Study

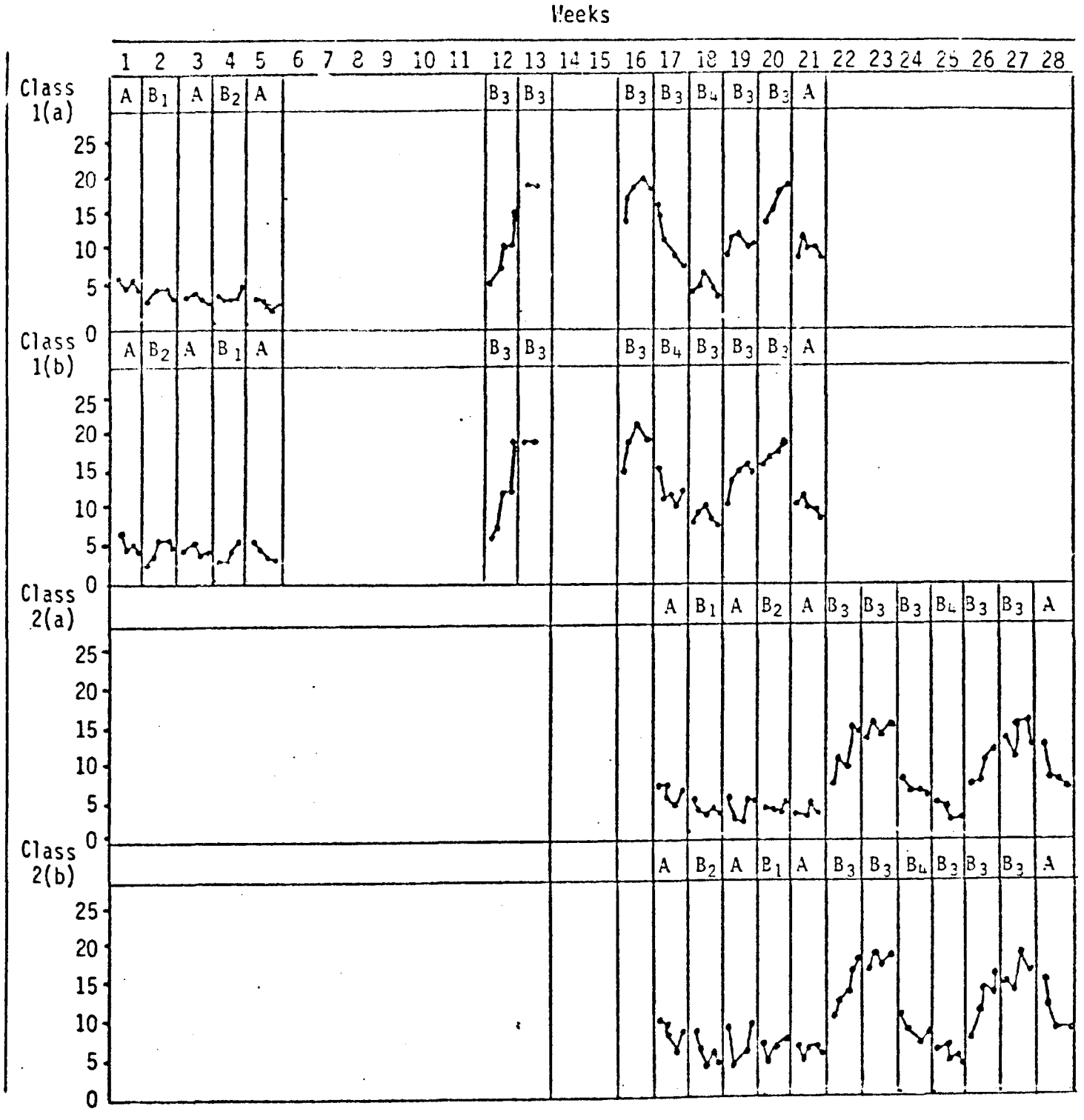
Figure 2 shows the total data collected during the 29 weeks of the study, with lack of apparent change in the levels of target-activity response during weeks 1-5 (groups 1a and 1b), and weeks 17-21 (groups 2a and 2b) being evident. Marked variations in response-levels for the target-activity do appear in the weeks following this initial noncontingent phase in all groups. It would appear that response-levels for the target-activity rose when rewards were direct and contingent for both groups, but fell at all other phases. Statistical analyses of this apparent change in response-level are discussed below.

The use of teacher-praise and house-points as contingent rewards proved effective in changing handwriting behaviour with this sample of children. Change in response on the dependent variable of letters correct over interventions ($F_{1a+1b}(12,240) = 155.4$, $p < .01$; $F_{2a+2b}(11,352) = 134.0$, $p < .01$). pointed to a significant change in response when the independent variable of contingency was altered.

"Between subjects" effects were not significant. That is, within each class, both groups reacted similarly to intervention.

Contingent vs noncontingent rewards

The hypothesized relationship between contingent and noncontingent reward conditions was verified by Scheffé contrasts on the data (contrasts 1a vs 1b = 18.35, $p < .01$, 2a vs 2b = 15.89, $p < .01$),



KEY: (i) Intervention Conditions

A = Baseline

B_1 = Direct noncontingent rewards

B_2 = Implicit noncontingent rewards

B_3 = Direct contingent rewards

B_4 = Implicit contingent rewards

KEY: (ii) Data

——● = Number of letters correct

Figure 2: Data from Sharpley (1978) for number of letters correct over phases

indicating that contingent rewards were more effective in producing correct handwriting bheaviour than noncontingent rewards, for all groups.

Direct vs implicit rewards

Scheffé contrasts showed that direct contingent rewards produced significantly higher levels of correct handwriting responses than implicit contingent rewards (contrasts 1a vs 1b = 10.38, $p < .01$; 2a vs 2b = 18.28, $p < .01$).

From Figure 2 it is seen that, during weeks 17 (1a + 1b) and 24 (2a + 2b), one group in each class received direct rewards as it had during the previous two (2a) or three (1a) weeks of intervention, whilst the other group in each class (1b, 2b) received implicit rewards. Both groups in each class declined equally during this week (Class I: 1a $\overline{X}_1$ = 18.37; $\overline{X}_2$ = 11.61; 1b $\overline{X}_1$ = 19.02; $\overline{X}_2$ = 12.56. Class II: 2a $\overline{X}_1$ = 14.59; $\overline{X}_2$ = 7.82; 2b $\overline{X}_1$ = 17.58, $\overline{X}_2$ = 9.29, F_{1a+1b} = .43 (1,20), n.s.; F_{2a+2b} = 1.87, (1,32), n.s.). Similarly, during weeks 18 (1a + 1b), and 25 (2a + 2b), the alternative group (1b, 2b) received direct rewards as it had prior to the week immediately previous, whilst the other group (1a, 2a) received implicit rewards. Both groups again declined equally as during the previous week (Class I: 1a $\overline{X}_1$ = 11.61, $\overline{X}_2$ = 5.60; 1b $\overline{X}_1$ = 12.56; $\overline{X}_2$ = 8.74; Class II: 2a $\overline{X}_1$ = 7.82, $\overline{X}_2$ = 4.12; 2b $\overline{X}_1$ = 9.29, $\overline{X}_2$ = 5.36).

Discussion

The data from this study supported the previous literature in relation to the issue of contingent vs noncontingent rewards. Verbal praise and house points proved effective reinforcers of correct handwriting responses in two normal elementary school classrooms. Noncontingent rewards were ineffective as reinforcers of the same task activity.

With regard to the issue of direct vs implicit rewards, data from this study demonstrated that, when implicit rewards were applied to one group, the performance of that group declined. However, the performance of the alternative group also declined during this phase, although it received (hitherto reinforcing) direct rewards. Following this, direct application to both groups reproduced earlier reinforcing effects on all subjects. It should be noted that this reward:

(1) was chosen because of its effectiveness as a reinforcer in a similar situation (arithmetic skills);

(2) proved to be an effective positive reinforcer on the performance of a chosen academic-skills task (handwriting);

(3) was shown to possess extinguishing properties when used as an implicit reward; and then

(4) was once more an effective reinforcer for the same academic-skills task.

These data seriously challenge the findings reported by previous studies.

2.4 Issues arising from the literature

An apparent contradiction exists between those studies reviewed previously (section 2.331) and both Ward and Baker (1968) and Sharpley (1978). While Ward and Baker (1968) failed to replicate the results of the previous studies, the Sharpley (1978) study showed positive disagreement with data from those studies. Close inspection of Table 1 reveals that, as well as methodological considerations, there are several fundamental differences between Sharpley (1978) and the preceding studies.

First, the temporal ordering of the implicit reward phase varies. In those studies where implicit rewards have been shown to possess reinforcing properties, the implicit reward phase has followed baseline and preceded any direct-reward-to-targets-and-peers phase. However, in Sharpley (1978), the implicit reward phase has followed the direct-to-both-groups phase.

Two different sets of results imply two different conditions. When implicit rewards are applied before a direct-to-both-groups phase, vicarious reinforcement processes occur for the peer subjects. Alternatively, when implicit rewards are applied to peers after they have received direct rewards, vicarious extinction effects are noted for targets.

Second, many of the previous studies examined implicit reward effects with groups of children who did not form a homogeneous entity, such as the typical classes used in Sharpley (1978). It may be that children who form a unit such as a school class react more cohesively than children who do not share the same sense of unity.

Third, the presence of the teacher as a reward-giver may affect the reactions of children. Teachers who work with the same class all day for the school year (and who join in extra-curricular activities with their classes as these two teachers did) constitute important adults in children's lives. The question of whether the data noted in Sharpley (1978) are related to such "teacher effects" requires investigation.

Because of the logically prior need to determine if the contradictory effects noted by Sharpley (1978) were due to isolated experimental variables or were dependent upon the social unity of classroom life plus teacher influence, these two variables were investigated in the first of two studies. Effects due to the temporal order of the implicit reward phase were examined in the second study.

The rationale for this replication is presented in Chapter 4. However, prior to that, several relevant theoretical perspectives are discussed in the next chapter in order to clarify the issues involved.

CHAPTER 3

THEORETICAL PERSPECTIVES

CHAPTER 3

THEORETICAL PERSPECTIVES

3.1 Introduction

In order to formulate testable hypotheses which are based upon relevant theoretical grounds as well as issues arising from the previous literature, the present chapter examines those theoretical considerations which arise from Operant theory, Social Learning theory, Equity theory, Attribution theory and Piagetian concepts of cognitive-moral growth. In the light of the design deficiencies of some previous studies, plus the apparent contradictory nature of data collected so far, a return to theoretical bases was necessary to focus upon the essential issues which might suggest variables for inclusion in subsequent work which had previously been overlooked.

Operant theory is central to the study of the direct/implicit reward paradigm, and several hypothetical inferences are drawn for likely outcomes of the planned study. As an approach which considers the effects of internal (cognitive) factors as well as more obvious external (i.e., reward stimuli) influences on behaviour, Social Learning theory offers an alternative view to that derived from a purely operant standpoint.

As additional sources of explanation for implicit reward effects, both Equity theory and Attribution theory consider the methods by which subjects deal with the stresses incurred in situations where rewards are administered unfairly. Finally, Piaget (1932) has suggested that there will be very clear-cut age differences in children's reactions to injustice. Theoretical statements are drawn from these viewpoints which are used as the basis for forming postulates and generating testable hypotheses in Chapter 4.

3.2 Operant theory of human behaviour

3.21 Introduction

Following Skinner's (1938) distinction between respondent and operant behaviour, the present study is concerned with that type of behaviour which

may vary under differing reward conditions, i.e.,operant behaviour.

In his experimental situation, Skinner demonstrated that, if the response of lever-pressing is followed by the reward of food, then the probability of the lever-pressing response recurring is increased (Skinner, 1938). This increase in probability has been termed "reinforcement" and defined by Skinner (1938, p. 21) as follows: " if the occurrence of an operant is followed by presentation of a reinforcing stimulus, the strength *(i.e. the probability of the response recurring)* is increased". The strength of such a bond between response and reward may be measured by instituting an extinction process. This process has been defined (Skinner, 1938, p. 21): "if the occurrence of an operant already strengthened through conditioning is not followed by the reinforcing stimulus, the strength *(i.e. the probability of the response recurring)* is decreased".

Reinforcement has been defined above (pp. 5, 6) as implying behaviour-change. Stimuli which are assumed (by the presenter) to be reinforcing, yet which do not show reinforcing effects when applied cannot be termed "reinforcers", but must be seen as rewards only (see pp. 6, 7 above). This distinction is a vital one, stemming from Skinner's (1938) basic work and reiterated by Bandura's (1969, p. 222) statement that "reinforcing events are defined in terms of their effects -- as stimuli that increase the probability of the preceding responses". In addition Premack (1965, p. 129) has suggested that assumptions made about the effectiveness of rewards as reinforcers are often based on "commonsense" and are, in fact, invalid assumptions.

3.22 Applying operant theory

Bandura (1969, pp. 225-234) has suggested three vital components in the effective application of operant procedures. First, the reinforcer used must be powerful enough to maintain responsiveness over long periods

of time; second, there must be contingency of the reinforcing events and the desired reponse; third, a reliable method of eliciting the desired response must be present if the response is not occurring already.

Considering the power of rewards to maintain responsiveness over time, Staats (1965) demonstrated that subjects would engage in very complex and lengthy learning tasks (almost regardless of difficulty) if the procedure involved an effective incentive-system. "Rewards" must appear as sufficiently rewarding to the subject if they are to lead to a repetition of the task-response (i.e., act as a reinforcer). For example, food has often been used as a reinforcer, but must be considered in the light of the level of hunger present in the subject. Satiation may render such a reinforcer merely a "reward" until the subject is hungry once again. Parental attention has been demonstrated as reinforcing for children (Hawkins, Peterson, Schweid & Bijou, 1966; Wahler, Winkel, Peterson & Morrison, 1965; Zeilberger, Sampen & Sloane, 1968), but also has been shown to punish (Herbert, Pinkston, Hayden, Sajwaj, Pinkston, Cordua & Jackson, 1973). Timeout has also been used to punish (Birnbrauer, Wolf, Kidder & Tague, 1965; Burchard & Barrera, 1972; Clark,Rowbury, Baer & Baer, 1973), and to reinforce behaviours (Solnick, Rincover & Peterson, 1977; Steeves, Martin & Pear, 1970). The point to be made here is that such (seemingly) obvious rewards as food, attention and social interaction can, under certain circumstances lose their reinforcing effect.

The relative effectiveness of contingent over noncontingent rewards as reinforcers has been noted by Bandura (1969). Contingent rewards have been established as more effective in changing behaviour in a wide variety of settings (e.g., Beissel, 1972; Glynn, 1970; Perry & Garrow, 1975; Tyler & Brown, 1968; see Sharpley & Sharpley, in press, for a review of this effect in classroom situations).

Prior to either the selection of powerful incentives or contingency between response and reward, the desired behaviour may be elicited (if not already present) by "shaping" of the subject's behaviour towards the desired response pattern (e.g. Isaacs, Thomas & Goldiamond, 1960; Kazdin, 1975; King, Armitage & Tilton, 1960; Reynolds, 1968; Sloane & Macauley, 1968). As an alternative to shaping, Bandura (1965b) and Bandura and Walters (1963) have emphasized the importance of graduated modelling. Under this procedure, a subject's responses are matched with those of a model (Bailey, Timbers, Phillips & Wolf, 1971; Rogers-Warren & Baer, 1976). Bandura (1969, p. 118) cites such research as demonstrating "that virtually all learning phenomena resulting from direct experiences can occur on a vicarious basis through observation of other persons' behavior and its consequences for them". Bandura (1965a) refers to a vicarious event as providing "(1) information concerning probable reinforcement contingencies (2) knowledge about the controlling environmental stimuli, and (3) displays of incentives possessing activating properties" (p. 31).

As mentioned above (p. 7) the incidence of vicarious reward situations in normal classrooms may be outweighed by those in which rewards are administered implicitly. The contribution of operant theory to the implicit reward paradigm is discussed below.

3.23 Operant conditioning and implicit rewards

From the theoretical position outlined above (Skinner, 1938; Bandura, 1969), it appears that under the basic operant paradigm, i.e.

$Rs_x \rightarrow Rw \rightarrow Rs_x$,

the receipt of a *reinforcing* reward will lead to repetition of the rewarded response by the subject. Skinner (1938, pp. 52-55) refers to the analysis of this simple paradigm into sequential parts which form <u>chains</u>. For example, he suggests that when the simple paradigm (above) is applied to the lever-pressing-food situation, the actual chain of behaviour may be written as follows:

sS^D:visual lever.R:lifting $\longrightarrow$ sS^D:tactual lever.R:pressing $\longrightarrow$
sS^D:tray.S^D:sound of magazine.R:approach to tray $\longrightarrow$
S:food.R:seizing,

where the second arrow is understood to connect the response with S^D:sound only. Dropping out the names of the terms, numbering the parts, and omitting the discriminative stimulation supplied by the tray in the absence of the sound of the magazine, we have:

$$sS^{D\ IV}.R^{IV} \longrightarrow sS^{D\ III}.R^{III} \longrightarrow sS^{D\ II}.R^{II} \longrightarrow S^{I}.R^{I}$$

which represents the final structure of the behavior.

(Skinner , 1938, p. 54)

S	=	a stimulus
R	=	a response
sS^D	+	a discriminative stimulus

It follows that the breaking of any point of this chain will lead to a non-reinforcement situation.

When this concept is applied to the implicit reward situation being discussed here, <u>two</u> reward conditions are being considered, and two response-chains are emitted. The conditions and their respective response-chains may be represented schematically as follows: (see over page)

a) direct reward conditions

i) reward conditions:

$Rs \longrightarrow R_w$ (contingent)

or

increase in no. of letters correct $\longrightarrow$ teacher praise) and house points) = contingent rewards

ii) response chain

sS^D:daily rewards for correct letters.R:increase in expectation/attention $\longrightarrow$

sS^D:stimulus sentences.R:handwriting performance improvement

b) implicit reward conditions (actually extinction for peers)

iii) reward conditions:

$Rs \not\longrightarrow R_w$ (contingent)

or

increase in no. of letters correct $\not\longrightarrow$ teacher praise) and house points) = extinction

iv) response chain:

sS^D:daily non-reward.R:decrease in expectation/attention $\longrightarrow$ sS^D:stimulus sentences R:handwriting performance decrement

That is, condition b (implicit reward conditions) is actually an extinction process for the previously applied condition a (direct reward condition), resulting in a decrease in the number of letters written correctly under implicit reward conditions, even though there is an increase in the number of letters written correctly under direct reward conditions. One of the three necessary conditions for effective operant procedures cited above (Bandura, 1969) has been violated: contingency of reward with response. This may be seen by reference to Table 2 wherein each group is submitted to implicit reward conditions *after* experiencing direct reward conditions.

Table 2

Typical implicit reward conditions

Gp. 1	:	A.....B_3 B_3 B_4 B_3 B_3 B_3 A
Gp. 2	:	A.....B_3 B_3 B_3 B_4 B_3 B_3 A
A	=	Baseline
B_3	=	Direct reward conditions
B_4	=	Implicit reward conditions

(from Sharpley, 1978, p. 52)

Operant theory therefore *appears* to deal with expected outcomes from an implicit reward condition. However, data obtained from the previous study do not coincide with this explanation. From Figure 2 (p. 26) it is noted that not only did the groups experiencing implicit reward conditions show a marked decline in performance, but so also did the groups experiencing direct reward conditions at that time.

There appears to be little doubt of the efficacy of direct reward conditions *per se* as demonstrated when applied evenly to all groups (see Figure 2, weeks 12, 13, 19, 20; 22, 23, 26, 27). What is not explained by the preceding operant theory account is the failure of direct reward conditions to effectively reinforce correct handwriting responses by target subjects during weeks 17, 18; 24, 25. The only intervening variable is the presence of implicit reward conditions *within the same classroom.* That is, the reinforcer-power of the rewards used (teacher praise and house points) was not evident when applied directly in the presence of an implicit application of the same rewards.

Thus a cognitive evaluation of the reward conditions *applied to peers* is implied by results, but not by operant theory. Hypothetical outcomes from implicit reward conditions described above may be generated from operant theory in the following form:

1. Direct reward conditions will have reinforcing effects.

2. Implicit reward conditions will have extinction effects when preceded by direct reward conditions. There are no extra implications held above for direct reward conditions, which, presumably, should be reinforcing at all times.

These hypotheses may be shown schematically:

1. Direct rewards alone

$sS^{D2} \ .R^2 \longrightarrow S^1 \ .R^1$

or

sS^{D2}: daily rewards.R^2:motivation, attention $\longrightarrow$ S^1:stimulus sentences.R^1: stimulus sentences.

2. Implicit rewards alone

$sS^{D2} \ .R^2 \longrightarrow S^1 \ .R^1$

or

sS^{D2} : no daily rewards.R^2:withdrawal of motivation, attention $\longrightarrow$ S^1:stimulus sentences.R^1:low performance

3. Direct rewards in conjunction with implicit rewards

As in 1. There is no operant theory basis for expecting any change in direct reward effects when implicit rewards are also present for peer subjects.

3.3 Social Learning theory

3.31 Introduction

In discussing the determinants of behaviour, Bandura (1977a, 1977b, 1978) Bowers (1973), and Rosenthal and Zimmerman (1978) have suggested that "behavior results from the interaction of persons and situations, rather than from either factor alone ". (Bandura, 1977a, p. 9). This may be represented as [B $\overset{P}{\leftrightarrow}$ E] where B signifies behaviour, P the person and E the environment. As such, this approach recognizes the impact which cognitive functions have upon behaviour, and is in contrast to some other views of behaviour which stem from Skinner's conceptualization of operant conditioning (Skinner, 1938).

Baum (1973) has proposed that behaviour may be regulated by integrated feedback. This is in contrast to the more-established rule of operant theory that behaviour is controlled by its immediate consequences, and suggests that consequences may affect action by way of "the integrating influence of thought". (Bandura, 1977a, p. 11). The suggestion that behaviour, cognitions and environmental influences are interdependent thus breaks away from the response-consequence bond of operant theory. Response consequences have more functions than that of reinforcing or punishing the preceding actions. First, consequences may have an informational function by providing persons with a guide to future actions; second, consequences may have a motivating function which enables persons to look forward to future pleasant consequences; and third, consequences can possess reinforcing properties. However, research has shown that rewarding consequences were ineffective in changing behaviour (i.e. were not *reinforcing*) when subjects were not aware of the contingency between response and reward (Dulany, 1968; Spielberger & De Nike, 1966), thus implying the presence of a cognitive process within the response-consequence bond.

3.32 Modelling

Of particular relevance to this theoretical position is the phenomenon of modelling or vicarious learning. Bandura (1977a) has suggested that there are four major processes operating within the observational learning paradigm:

1. Attentional processes, by which various modelling stimuli are attractive/unattractive and which coincide with certain characteristics within the observer (e.g., arousal level, perceptual set, past history) which may lead to that particular observer being interested in the observed behaviour;

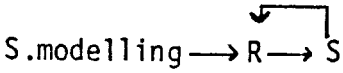
2. Retention processes, by which the previously-modelled behaviour is retained within the memory systems of the observer;

3. Motor reproduction processes (e.g., physical capability, feedback, opportunity for checking responses made), which determine whether the observer will be capable of performing the modelled action; and

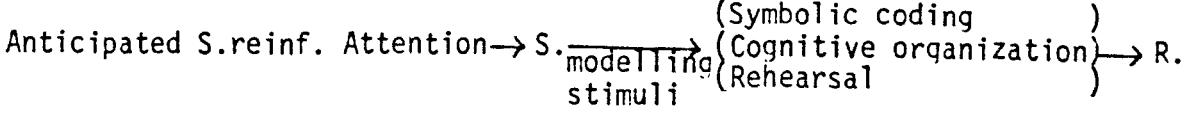
4. Motivational processes (reinforcement -- vicarious or direct), which are largely dictated by the evaluation of possible rewards by the observer/actor.

Reinforcement plays a major role in determining whether or not a certain modelled response will recur within an operant paradigm. Within a social learning framework reinforcement is considered to be a facilitative rather than a necessary condition for vicarious learning. This may be represented schematically.

1. Operant theory



2. Social Learning theory



3.33 Antecedent and consequent determinants of behaviour

When a person decides to perform an action, the decision is usually (if not always) partly based upon previous experience. That is, there have been certain past events which will assist a person to determine whether to perform an action or not. People thus "discern the relationship between situations, actions, and outcomes" and then "can regulate their behavior on the basis of such predictive events ". (Bandura, 1977a, p. 58).

Some examples of these antecedent determinants are anxiety-level; previous experience of aggression-elicitors (which may lead to later aggressive responses); emotional-arousal from verbal interaction; vicarious-expectancy effects (e.g.,"he was rewarded for doing that, then I'll do it"); and self-arousal by cognitive processes.

When the various antecedents have been processed, the person may decide to perform the specific action under consideration. As such, this decision will, in part, be formed on the basis of efficacy expectations within the person. After the performance of the action, the person will compare the outcome with the expectation and thence evaluate the action. The relative satisfaction experienced will provide input for future decisions. Thus, a person may, through cognitive processes regulate future responses.

Social learning theory suggests that, while consequences to behaviour are important in determining future repetitions of that behaviour, this occurs by way of the antecedent nature of the consequences. That is, instead of reacting to each consequence as a separate stimulus, the person will sum all consequences and then cognitively evaluate the effects of these in future response-consequence bondings. "The likelihood of particular actions is increased by *anticipated* reward and reduced by *anticipated* punishment." (Bandura, 1977a, p. 96)

Therefore, while social learning theory remains primarily in agreement with operant theory regarding the basic descriptions of consequential determinants of behaviour, a significant difference lies in the mechanism by which consequences influence future behaviour. In contrast to the simple Response ⟶ Reward ⟶ Response bond, social learning theory suggests a Response ⟶ Reward ⟶ Cognitive evaluation ⟶ Response bond in which previous consequences become antecedent determinants of future behaviour by the cognitive evaluations performed by the person. Cognitive control of behaviour thus is a major theoretical difference between operant theory and social learning theory.

3.34 Cognitive control of behaviour

Although much of human behaviour is motivated by immediate external determinants (Skinner, 1938) human behaviour does occur which is begun and continued when such immediate external stimuli are absent. In these cases, a motivational process is in action through cognitive means. The student who strives for high grades is an example of such behaviour: there is no immediate consequence to hard work at study (in fact, in many instances, this occurs only after some months or years) and it may be assumed that an "innate desire for learning" does not operate all the time (especially when other more attractive activities beckon). In spite of this absence of either an inner level of anxiety or an exterior (and immediate) pleasant consequence, the student continues to be highly motivated towards study.

Conversely, refraining from certain behaviour which may possess immediate pleasurable consequences for either altruistic or "more noble" reasons represents a cognitive control over behaviour which a purely operant paradigm suggests *ought* to occur.

3.35 Implicit rewards and social learning theory

It has been suggested that there is an interaction between person, behaviour, and environment. This mutual process has been termed

"Reciprocal Determinism" (Bandura, 1977a, 1978), and is expressed in the schema on page 39). Examples of interaction between person, behaviour and environment have been shown by Bandura, Lipsher and Miller (1960), Raush (1965) and Raush, Barry, Hertel and Swain (1974). When considering the implicit reward paradigm, it may be suggested that the reciprocal interaction between persons, performance and rewards will lead to subjects making cognitive evaluations of the implicit situation. There is no specific indication from social learning theory regarding the implicit reward situation, but the implications are as follows:

1. for the subject receiving direct rewards, an evaluation of the aversive consequences inherent in receiving rewards when others do not may lead to a withdrawal from the activity.
2. for the subject receiving implicit rewards, task withdrawal may also indicate a method of "balancing" the inputs from environment and behaviour.

Both reactions may be seen as examples of self-regulatory behaviour: the withdrawal from response is a reinforcer of that withdrawal, i.e., a self-reward situation.

In summary, a response-decrement by target subjects from direct to implicit reward conditions represents the results of a cognitive evaluation of reward conditions and thus is consistent with the social learning perspective. While there is little disagreement between the two theories regarding subjects who receive implicit reward conditions, the hypothesized response of target subjects (who continued to receive direct contingent rewards) suggested by operant theory is in direct opposition to that suggested by social learning theory.

3.4 Equity theory

3.41 Introduction

Equity theory was first described by Adams (1965) and later refined by Walster, Berscheid, and Walster (1976) as a means of synthesizing various theoretical approaches to explaining social interaction.

> Equity theory describes how individuals enmeshed in inequitable relationships respond. To predict how an individual will respond, one merely has to ascertain whether the scrutineer perceives participants to be in a relationship and how he calculates the participants' relative outcomes.
>
> (Walster, et al., 1976, p. 36)

Adams (1965, p. 280) saw Inequity to exist for a Person

> whenever he perceives that the ratio of his outcomes to inputs and the ratio of Other's outcomes to Other's inputs are unequal...and may happen ... when both (Person and Other) are in an exchange relationship with a third party and Person compares himself to Other ...

That is, Person will

> feel inequity exists noy only when his effort is high and his pay low, while Other's effort and pay are high, but also when his effort is low and his pay high, while Other's effort and pay are low.
>
> (p. 281)

The two situations of:

(1) Person performing good work but receiving no reward and Other performing good work and receiving reward, and

(2) Person performing poor work but receiving reward and Other performing poor work and not receiving reward, may be shown schematically as follows:

(1) $\frac{Op}{Ip} < \frac{Oa}{Ia}$

(2) $\frac{Op}{Ip} > \frac{Oa}{Ia}$

(see key overleaf)

Where O = Outcomes from the relationship

I = Inputs to the relationship

p = Person

a = Other

Equity may be said to exist when:

$$\frac{Op}{Ip} = \frac{Oa}{Ia}$$

(from Adams, 1965, pp. 280, 281)

Outcomes have been defined by Walster, Berscheid and Walster (1976) as "the positive and negative consequences that a scrutineer perceives a participant has incurred as a consequence of his relationship with another " and Inputs as "the participant's contributions to the exchange, which are seen (by a scrutineer) as entitling him to rewards or costs (outcomes)" (p. 3).

3.42 Basic propositions

Walster, Berscheid and Walster mention that equity theory rests on the assumption that man is "selfish" (1976, p. 2) and state four propositions based on this assumption:

> Proposition I: Individuals will try to maximize their outcomes.

However, if everyone tried to maximize their outcomes regardless of the effects this had upon others, there would be constant rivalry between persons. Therefore, a compromise can avoid the warfare implicit in Proposition I. Such a compromise is engendered in Proposition II A.

> Proposition II A: Groups can maximise collective rewards by evolving accepted systems for 'equitably' apportioning rewards and costs among members. Thus, members will evolve such systems of equity and will attempt to induce members to accept and adhere to these systems.

In order to induce others to behave equitably, members must make it more profitable for others to do so rather than merely follow Proposition I. Proposition II B suggests this.

> Proposition II B: Groups will generally reward members who treat others equitably and generally punish members who treat others inequitably.

Although the definition of what is equitable varies culturally, Walster et al. (1976) base their notion of equity upon the scrutiny (by Participants A, B, or an observer) of the *relative equality* of outcomes from the relationships. This scrutiny is performed in reference to the formula devised by Adams (1965) as presented above.

Because Proposition I antecedes Propositions II A and II B, inviduals will, at times, test the strength of Proposition II B (i.e., are groups still rewarding equity and punishing inequity?) by behaving inequitably. When this occurs, there will be a reaction from the individual which is expressed in Proposition III.

> Proposition III: When individuals find themselves participating in inequitable relationships, they become distressed. The more inequitable the relationship, the more distress individuals feel.

Experiments examining the effects of being present in an inequitable relationship verify Proposition III. Jacques (1961), Leventhal, Allen and Kemelgor (1969), Thibaut (1950) and Walster, Berscheid and Walster (1976) showed that those who received less than they thought they deserved became distressed, usually angry. Conversely, Adams (1963), Adams and Rosenbaum (1962), Jacques (1961), and Leventhal et al. (1969) demonstrated that receiving higher than deserved outcomes resulted in subjects experiencing guilt feelings. As the degree of inequity increases, so does the degree of distress experienced (Leventhal and Bergman, 1969; Leventhal et al., 1969).

The resultant action which individuals take when experiencing inequity is expressed in Proposition IV.

> Proposition IV: Individuals who discover they are in an inequitable relationship attempt to eliminate their distress by restoring equity. The greater the inequity that exists, the more distress they feel, and the harder they try to restore equity.

Walster et al. (1976) suggest that an individual can restore equity either to the actual relationship, or by restoring psychological equity. Two methods of restoring equity in the actual relationship are suggested by Adams (1965):

(a) Persons alter their Inputs:

If the inequity is advantageous to them, Persons may increase their inputs. Conversely, if the inequity is disadvantageous to them, they may reduce their inputs (Adams & Jacobsen, 1964; Arrowood, 1962; Clark, 1958).

(b) Persons alter their Outcomes:

If inequity is disadvantageous to them, Persons may increase their outcomes. Conversely, if inequity is advantageous to them, they may reduce their outcomes (Homans, 1953).

Psychological equity may be restored by the following methods:

(a) Persons distorting their Inputs and Outcomes cognitively:

Persons may either imagine that they are doing (a) or (b) above, or alter the importance or relevance of inputs/outcomes (Leventhal, Reilly & Lehrer, 1963; Weick, 1964).

(b) Persons leaving the field:

Persons may sever social relationships (e.g., absenteeism, opting out of the game). Patchen (in Adams & Freedman, 1976) found evidence of this.

(c) Persons acting on Others;

Persons may try to distort or alter Others' inputs/outcomes, or try to force Others to leave the field.

(d) Persons change the object of their comparisons:

Persons may cease comparing themselves with certain Others if such comparison is inequitable, and instead compare themselves with another group of Others who give a more equitable comparison.

3.43 Reactions to inequity: implicit rewards

According to Equity theory, the presence of distress occasioned by inequity in a social relationship will lead to feelings of guilt (by the party advantaged) or anger (by the party disadvantaged). While there is some evidence to show that anger is forthcoming (Homans, 1953), there is no evidence from the literature to support the theorized presence of guilt. The present study is primarily concerned with the reactions of subjects who may be considered to materially benefit from the inequity (i.e., target subjects). As such, this study examines an area not specifically researched by equity theorists. Specific psychological measures of guilt were not within the limits of this study, but the presence of guilt may be inferred from target subjects' reduction of inputs to the task which is rewarded. Adams and Freedman (1976) suggest that when materially advantageous inequity results from one's unintentional acts (e.g., rewards administered by adults) there is a feeling of guilt and a consequential desire to compensate. The presence of peers who observe the target subjects receiving rewards while they (the peers) are not, may be suggested as a guilt-inducing stimulus for the targets. It follows that if only one peer observes a target in this condition the resulting guilt will be less than if that target is observed by a group of peers. The administration of implicit rewards in pairs vs groups is suggested as a test of the relevance of this aspect of equity theory to implicit rewards.

3.5 Attribution theory

3.51 Introduction

Shaver (1975) has described the attribution process as one in which persons try to understand (and thence predict) the behaviour of others by *attributing* actions to underlying dispositions. That is, when an "actor" (as Shaver refers to one who performs an act) does

something which is perceived by a person, that perceiving person may try to find a meaning for the actor's behaviour by attributing certain personal dispositions to the actor as explanations of the actor's behaviour. This attribution-process functions as a means to explain *causality* in the reality of the observer. By explaining the causal processes in this way, the world becomes more predictable (and therefore less threatening) for the perceiver. Attributions of causality may take the form of personal attributions or environmental attributions. In the latter a perceiver attributes actions or events to the *situation*, e.g., Fate, God's will, "the way things are", etc..

The attribution-process may be viewed within the more general study of person-perception. Allport (1955, p. 23) described this as " a phenomenological experience of the object, that is to say, the way some object or situation appears to the subject". The perceptions we have of persons and actions will be influenced by mediating information about them and us -- an interchange between existing cognitive/perceptual information and new information. More precisely, as well as there being perceptual input from objects, persons and environment, there is also cognitive input from the perceiver. Motivation has been shown to affect the perceiver's judgments -- the stimulus will mean different things to different perceivers (Kelly, 1955, 1963) -- with an interaction between motivation and perception underlying the attribution process.

3.52 Stages of the attribution process

Shaver (1975) suggests that there are three stages in the attribution of an action to a personal disposition of an actor:

1. observation of the action;
2. judgment of intention;
3. making a dispositional attribution

These three stages lead to an explanation of behaviour and a following

prediction of future behaviour. Shaver (p. 32) has described this process in flowchart form (see Figure 3).

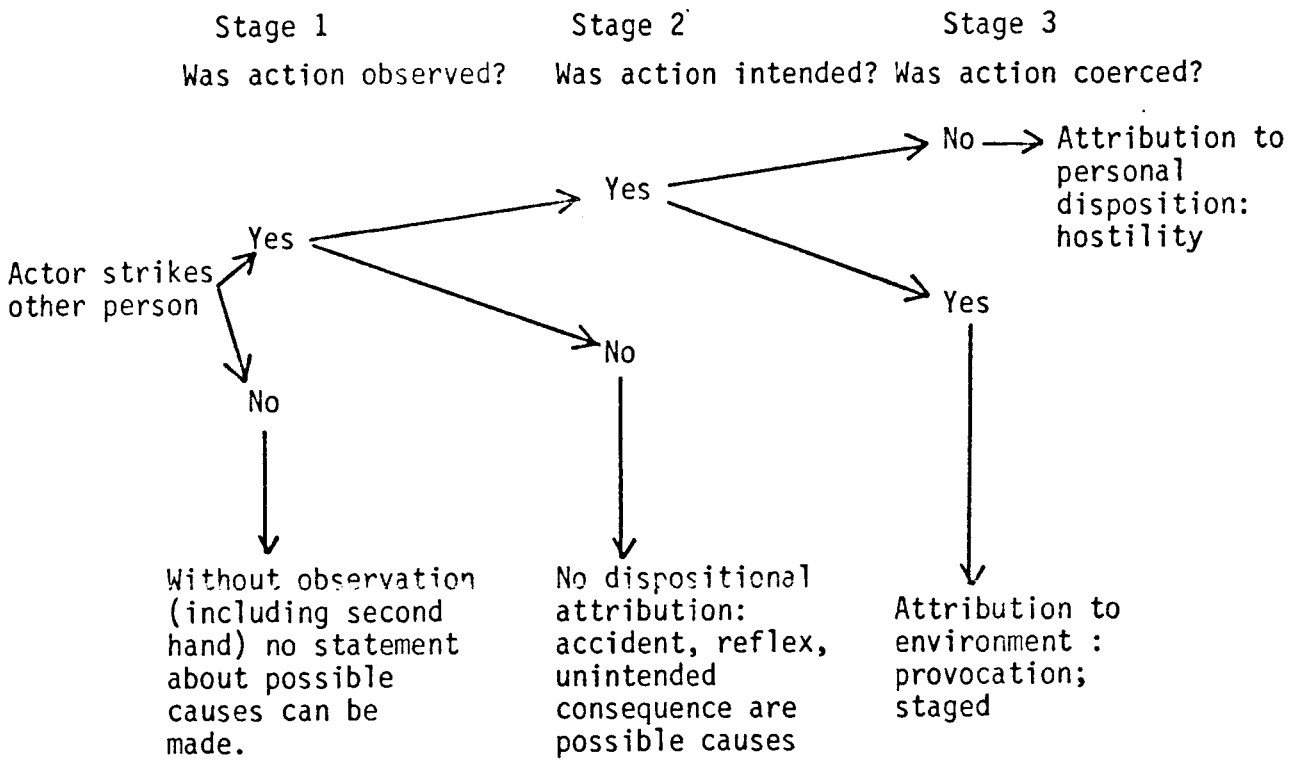


Figure 3: The attribution process (from Shaver, 1975, p. 32)

Using the example of the striking of a person by another person (the actor), Shaver suggests that observation of the action must be present, intent must also be inferred and the action must be done of the actor's free will. When all these conditions are met, Shaver suggests that the perceiver will attribute the personal disposition of hostility to the actor.

3.53 Implications from attribution theory for implicit reward effects

When the variation in reward-structures occurs during change from direct to implicit conditions, Attribution theory suggests that both the subject receiving direct rewards (the actor) and the subject receiving implicit rewards (the perceiver) will make attributions to situational and personal sources. This effort to understand and predict the future may be along the lines of attributing causation and responsibility to self, other, or situation (perhaps the experimenter/teacher). While the present study is not intended as an arena for testing several of the major tenets of attribution theory, the method by which subjects deal with the unfair reward conditions inherent in implicit rewards may include attributions of causality along one or more of the lines suggested in Shaver's figure (Shaver, 1975, p. 32) presented above.

3.6 Developmental considerations

3.61 Level of cognitive-moral development

None of the previous studies reviewed (Section 2.3) examined the effects of age upon subjects' reactions to implicit rewards. It has been suggested by Piaget (1932) that the perceiver's stage of moral development will influence his/her decision regarding responsibility. Piaget carried out research which clearly defined three stages of moral growth in regard to attitudes or conceptions of justice. Upon being asked to comment upon a moral dilemma (Piaget, 1932, p. 267) children's answers fell into three categories dependent upon whether they referred to a system of justice based on "Immanent justice" (i.e., misdeeds will be punished in the natural course of events merely because they are misdeeds), "Distributive justice" (i.e., an egalitarian system wherein each receives what is deserved), and "Relativistic egalitarianism" (i.e., equality is tempered with equity). Of 167 children questioned,

responses fell into the following age-groupings:

	PUNISHMENT	EQUALITY	EQUITY
Age 6 - 9	48%	35%	17%
Age 10 - 12	3%	55%	42%
Age 13 - 14	0%	5%	95%

from Piaget (1932, p. 268)

Piaget concludes that there are:

> three great periods in the development of the sense of justice in the child. One period, lasting up to the age of 7 - 8, during which justice is subordinated to adult authority; a period contained approximately between 8 - 11, and which is that of progressive egalitarianism; and finally a period which sets in towards 11 - 12, and during which purely egalitarian justice is tempered by considerations of equity.
>
> (p. 314)

Considering these three in detail, Piaget goes on to describe them.

> The first is characterized by the non-differentiation of the notions of just and unjust from those of duty and disobedience: whatever conforms to the dictates of the adult authority is just. In the domain of justice between children, the need for equality is already felt, but it is yielded to only where it cannot possibly come into conflict with authority.
>
> The second period does not appear on the plane of reflection and moral judgment until about the age of 7 or 8 ... This period may be defined by the progressive development of autonomy and the priority of equality over authority. In the domain of retributive justice, the idea of expiatory punishment is no longer accepted with the same docility as before, and the only punishments accepted as really legitimate are those based upon reciprocity.
>
> In the matters of distributive justice, equality rules supreme. In conflicts between punishment and equality, equality outweighs every other consideration.

> Finally, in the relations between children egalitarianism obtains progressively with increasing age.
>
> (p. 315)

> Towards 11 - 12 we see a new attitude emerge, which may be said to be characterized by the feeling of equality, and which is nothing but a development of egalitarianism in the direction of relativity. Instead of looking for equality in identity, the child no longer thinks of the equal rights of individuals except in relation to the particular situation of each. In the domain of retributive justice this comes to the same thing as not applying the same punishment to all, but taking into account the attentuating circumstances of some. In the domain of distributive justice it means no longer thinking of a law as identical for all but taking account of the personal circumstances of each (favouring the young ones, etc.).
>
> (p. 316)

It may be that there will be differing reactions to the unfairness present under implicit reward conditions according to the level of cognitive-moral development of subjects. These differences will be measured in the planned study to follow.

3.7 Integration of theoretical perspectives

From the preceding theoretical sections a number of hypothetical predictions regarding the outcome of implicit reward conditions have arisen. These will be summarized and presented in postulate form. Directional hypotheses will be generated in the next chapter (Rationale) following a description of the choice of dependent variables.

3.71 Operant theory

Operant learning theory suggestions of possible outcomes from administering implicit rewards take the following form:

1. Direct rewards will possess reinforcing properties.
2. Implicit rewards will possess extinguishing properties when administered <u>after</u> direct rewards.
3. The presence of implicit reward conditions for peers will have no extinguishing effect upon the performance of targets who are receiving direct rewards.

3.72 Social learning theory

Under the mutual interactionism of "Reciprocal Determinism", cognitive evaluations will be made of the implicit situation by those in it, such evaluations leading to self-regulatory behaviour.

1. Target subjects will change their responses to the reception of direct rewards while peer subjects are receiving implicit rewards.

3.73 Equity theory

The focus here is upon the reactions of target subjects who may be experiencing guilt as a result of materially benefitting from the inequity of implicit reward conditions. The presence of peers in pairs or groups will be linked to lower or higher levels of guilt and consequential task-input withdrawal.

1. The presence of a group of peers will adversely affect the responses of subjects receiving direct rewards.

3.74 Attribution theory

The attribution of causality as a method by which subjects will deal with the unfair reward conditions is not intended as a major focus of the present study. Instead, the contribution of this theoretical perspective is to extrapolate equity theory suggestions of how subjects will deal with unfairness. The formulation of hypothetical predictions and concomitant postulates and hypotheses was therefore not performed. This theoretical perspective was, however, retained for purposes of discussion of results in final chapters. (A measure [post-task questionnaire] was administered during the first main study to detect the presence of attributions. This was purely exploratory in nature.)

3.75 Level of cognitive-moral development

Piaget's work has suggested that there will be differences between age groups in their reactions to implicit reward conditions along the following lines:

1. The reactions to implicit reward conditions by those subjects receiving direct rewards will vary according to age. Younger children (CA 5-6) will not show a sense of injustice in their reactions; older children (CA 8-9) will show a sense of equality between peers; the oldest children (CA 11-12) will show reactions based on personal and group equity.

3.8 Summary

The consideration of five theoretical perspectives has resulted in the statement of four sets of theoretical postulates. Those which arise from Operant theory and Social learning theory are mutually exclusive and directional hypotheses will be generated from the former as a means of testing between the two. Suggestions from both Equity and Piagetian theories have given rise to independent postulates from which hypotheses will be generated for testing in the following chapter. By this generation of testable hypotheses and the subsequent empirical confirmation or rejection of them, an explanation of the data obtained from the planned study investigating implicit rewards may follow.

CHAPTER 4

RATIONALE - MAIN STUDY 1

CHAPTER 4

RATIONALE - MAIN STUDY 1

4.1 Introduction

The presence of extinctive effects when implicit rewards were administered in a typical classroom has been noted (Sharpley, 1978). In an investigation of the causal processes involved, a prime question to be considered is the exclusive nature of the effects. That is, are extinctive effects noted under implicit reward conditions only within the two (typical) classrooms studied or are these extinctive effects likely to recur in other situations? This question resolves itself into whether extinctive effects are "caused" by the "social" and "teacher" variables present within these typical classrooms, or whether they are "caused" by the nature of the implicit reward conditions themselves and/or the order in which they are presented. To answer this first question it was decided to replicate the previous research under "laboratory" conditions as a means of controlling the variables extraneous to the actual reward administration as suggested at the end of Chapter Two (i.e., social relationship between subjects' and the interaction between subjects and teacher-experimenter). If extinctive effects were noted under such controlled conditions, then further investigation of relevant variables was planned. If no extinctive effects were noted under laboratory conditions, then a replication within a typical classroom would follow. This guideline is presented in Figure 4, and shows the overall decision processes involved in the selection of variables for study within this entire investigation.

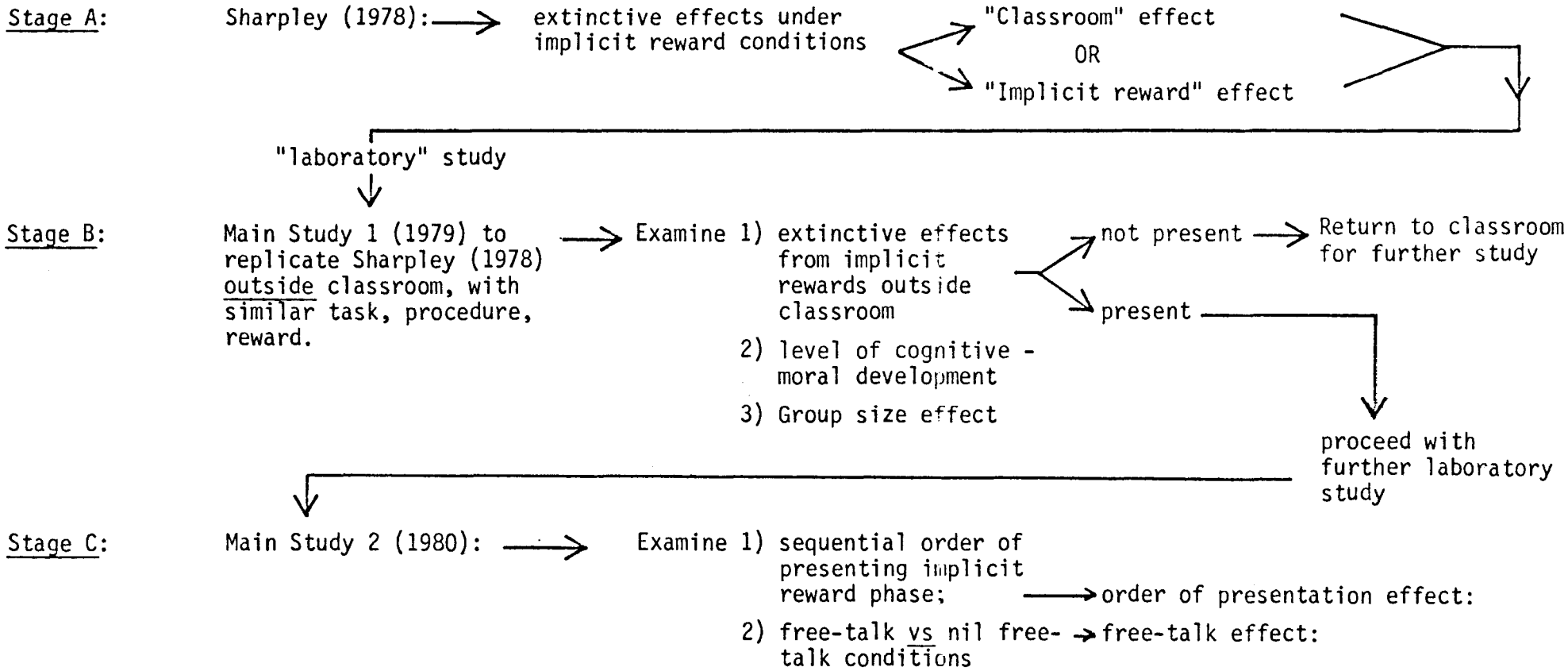


Figure 4: Plan of investigation

4.2 The laboratory study

In designing a controlled study under laboratory conditions, a number of variables were considered. In order to enable an accurate replication of the previous (classroom) study, the task and reward-administration conditions should be as similar as possible to those used previously. For this reason, the present study was designed to follow closely the methods and procedures of Sharpley (1978).

4.3 Dependent variables

4.31 Task: fine motor-skill activity -- printing

The choice of the academic-skills task of handwriting as the main dependent variable in the previous study was based on:

(1) the upsurge of interest in basic skills of literacy;

(2) the sensitivity of handwriting to the transient motivational state of the subject. Handwriting has been used to measure psychological states of emotional upset (Birge, 1954; Eysenck, 1948; Flunckiger, Tripp and Weinbeck, 1961; Wolfson, 1951), and typically reflects changes in subjects' reactions to altered incentive conditions;

(3) the relevance to teachers of operant procedures for typical classroom academic-skills tasks;

(4) Hall's (1970) suggestion that direct measurement of permanent products (i.e., data which may be re-assessed at any time) has the advantages of precision and permanency over many other forms of data. Handwriting performed upon previously prepared and standardized slips of paper is a permanent product which lends itself to later cross-checking;

(5) the high level of reliability available as regards scoring criteria. It is possible to set a definite standard for handwriting performance and score each performance precisely.

It was decided to continue to use such a motivationally-sensitive task which also provided permanent product data plus a high level of

reliability in scoring. To achieve this end, a series of four preliminary studies was carried out with various tasks, scoring procedures, rewards and administrations. These four studies are reported below. The outcomes from them in terms of finding a task-activity sensitive to emotional state, similar to the sentence-writing of the previous study, possessing a range of possible scores, yet quick to complete and score, resulted in the task of printing of the 26 letters of the alphabet in lower-case print. Details of administration are given in Chapter 5.

4.32 Subject-evaluation of reward conditions

To collect data "in vivo" during intervention is obviously relevant. However, it is also relevant to take a measure of the subjects' overall reactions to the experiment. Post-questionnaires have been used to collect such data (e.g., Foreman, 1974; Sharpley, 1978), and post-intervention debriefing was held with each subject at the end of selected interventions. Although no directional hypotheses were drawn from Attribution theory for this study, these questionnaires were used as a general measure of subjects' attributions of causality regarding the unfairness of the implicit reward phase. As well as questionnaires at the end of certain interventions, a record of comments and complaints was taken during the implicit phase and the direct phase following it.

4.4 Independent variables

4.41 Direct/implicit rewards

Direct rewards are defined as contingent rewards received by a subject. Implicit rewards are the observation of another subject's receiving direct contingent rewards but the observer (who is also performing the reward task) not receiving direct contingent rewards.

4.42 Group size

It may be that it is the presence of peers who can observe the subjects' reactions to implicit reward conditions which leads the

subject receiving direct rewards to withdraw from the task-activity. This point is supported by Equity theory (see pp. 47,48) and as such led to the inclusion of group size as an independent variable defined in terms of pairs (i.e., 1:1) and groups (i.e., 4:4). A pair is the smallest grouping possible of target and peer, and eight subjects (i.e., four targets and four peers) constituted the maximum number of children able to be accommodated within the experimental setting (a small room in the school where all subjects were pupils). While this latter definition is therefore somewhat arbitrary (Equity theory does not suggest any size of group) it was adopted for the purposes of this study as representing a marked increase over a pair.

4.43 Level of cognitive-moral development

As mentioned above (pp. 51-53), the work of Piaget has suggested three differing reactions to the implicit reward conditions when applied to certain age groups of children. The children chosen were therefore restricted to those age groups specified by Piaget, i.e., 5-6, 8-9, and 11-12 years.

4.5 Population

The subject population was chosen from the pool of all primary age children in a typical school in a large country town in New South Wales, Australia. No children from special classes or schools were used and all subjects were volunteers. No further criteria apart from those mentioned above were used in selecting subjects. The present sample therefore was from the same population of "typical" school children as used in Sharpley (1978).

4.6 Design

As mentioned above in the Review of Literature (p. 18) several previous studies of implicit rewards utilized experimental designs which were open to some sources of invalidity. Keppel (1973) and Winer (1971) have suggested that the sometimes spuriously high levels of variability encountered in experimental work in the behavioural sciences

may be avoided by separating the effects of differences between subjects which exist prior to the experiment, by use of repeated-measurement procedures. With repeated measurements of each subject's responses over multiple interventions, all subjects serve as their own controls because measurements are based upon the deviations from the mean of each subject's responses. Thus the performance of each subject is measured in such a way that "variability due to differences in the average responsiveness of the subjects is eliminated from the experimental error" (Winer, 1971, p. 261). The results obtained from such design are therefore more reliable than those obtained from single-intervention procedures (Baer, Wolf & Risley, 1968; Hanley, 1970; Namboodiri, 1972). Following Campbell and Stanley (1966) and Cook and Campbell (1979) a multiple time-series design was formulated and is shown in Figure 5. This design avoids most sources of invalidity (Campbell & Stanley, 1966, p. 56) but remains open to invalidity due to interaction of testing and subjects, and interaction of selection and subjects. Invalidity due to interaction of testing and subjects (i.e., due to "practice" effects from pretesting the subjects chosen) was overcome by repeated measurements of the task-activity plus exclusion of any children who showed any atypical learning or behavioural characteristics which would have distinguished them from Sharpley's (1978) sample. To avoid interaction of selection and subjects, children were randomly chosen from a typical school. The choice of typical children from normal classes overcomes these two possible sources of invalidity.

The use of repeated measurements of the chosen task-activity, contributes strongly to the validity of the study by reducing the effects due to history, maturation, testing and selection. Randomization of subjects adds to the generalizability of results by overcoming invalidity due to selection and statistical regression. The implementation of other

	WEEKS			
	1	2	3	4
target subjects	A	B	B	B
peer subjects	A	B	B_1	B

Key

A = Baseline

B = Direct contingent rewards

B_1 = Implicit contingent rewards

Figure 5 : Experimental design, Main Study 1

phases before and after the implicit intervention phase helps to overcome invalidity due to history, maturation and testing. There were no drop-outs from any subject-group, thus avoiding possible invalidity due to mortality, and the method of measurement remained constant throughout.

4.7 Research questions

4.71 Direct vs implicit rewards

As mentioned in the Introduction to this chapter (section 4.1) the fundamental question being asked in this section of the present research is whether or not a situation involving implicit rewards will have aversive effects in a controlled (non-classroom) laboratory situation. However, prior to consideration of this question is the enquiry as to the existence of any aversive effects under any experimental conditions. From the earlier sections on Operant theory and Social Learning theory, the mutually exclusive positions of these two theoretical accounts of implicit reward conditions led to the statement of several theoretical postulates. From these are generated directional hypotheses for testing.

Postulate 1a: Direct contingent rewards to both groups will possess reinforcing properties.

Hypothesis 1: There will be a significant increase in the number of letters printed correctly by all subject groups from baseline (A) to direct contingent reward conditions (B).

Postulate 1b: Implicit rewards will possess extinguishing properties when administered after direct rewards.

Hypothesis 2: There will be a significant decrease in the number of letters printed correctly during B_1 by those subject groups receiving implicit rewards.

Postulate 1c: The presence of implicit reward conditions for peers will have no extinguishing effects upon the performance of targets who are receiving direct rewards.

Hypothesis 3: There will be no significant decrease in the number of letters printed correctly during B_1 by those subjects receiving direct contingent rewards.

4.72 Group size

As suggested above (p. 61) the presence of peers may influence a child's reaction to implicit reward conditions. That is, if a child can observe peers receiving implicit rewards while he/she is receiving direct rewards, that child may feel obliged to withdraw from the task-activity.

Postulate 2: The presence of a group of peers (in contrast to a single peer) receiving implicit rewards will adversely affect the responses of subjects receiving direct rewards.[1]

Hypothesis 4: There will be a significant change in the number of letters printed correctly from B to B_1 by those subjects receiving direct contingent rewards in groups of eight versus those in pairs. This change will be in the direction of those subjects in large groups decreasing their level of correct responses compared to pairs.

4.73 Level of cognitive-moral development

Piaget's three stages of justice suggest a difference in subject reaction to inequitable reward conditions between children of different age-groups. This difference in reaction may be noted in terms of the major dependent variable (handwriting) or the secondary dependent variable (subject-evaluation of the reward conditions). The suggested difference in reaction is summarized in Postulate 3.

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1 If Hypotheis 3 were to be accepted, this Postulate and its Hypothesis would not be required to be tested.

Postulate 3: The reactions to implicit reward conditions by those subjects receiving direct rewards will vary according to age. Younger children (C.A. 5-6) will not show a sense of injustice in their reactions; older children (C.A. 8-9) will show a sense of equality between peers; the oldest children (C.A. 11-12) will show reactions based on personal and group equity.

These differences in reaction were tested on the first dependent variable of handwriting by Hypothesis 5, and investigated on the second dependent variable by informal analysis of questionnaire responses. Because of the complex and mutually exclusive motives of the various age-level reactions as suggested, this hypothesis was generated in null form.

Hypothesis 5: There will be no significant difference according to age group in the number of letters printed correctly from B to B_1 by those subjects receiving direct contingent rewards.

CHAPTER 5

MAIN STUDY 1

CHAPTER 5

MAIN STUDY I

5.1 Introduction

The execution of this study was resolved into a series of empirical measurements in that, prior to hypothesis-testing, decisions relating to validity and reliability of reward, task and procedure were made on the basis of data obtained from preliminary studies in which these aspects of the planned study were trialled and assessed. The complete details of these preliminary studies are presented in Appendix A, but a summary of these is presented below to clarify the processes involved in development and choice of reward, task and procedure.

5.2 Summary of preliminary studies

5.21 Task

One of the major concerns was to devise a task which was suitable for all age groups (i.e., CA = 5-6, 8-9, 11-12), yet remained sensitive to changes in motivational state of the child. Two line-tracing tasks were trialled, but were finally replaced by the printing of standard letters of the alphabet because of the lack of sensitivity to within-subject variance shown by the line-tracing tasks. The copying of a stimulus sheet of the 26 letters of the alphabet allowed for individual subject variations in response as well as providing data with a wide range of possible scores (i.e., from 0/26 to 26/26) for statistical analysis.

5.22 Reward

The use of verbal praise, knowledge of results, plus the tangible rewards of a "Smiley" or "Grumpy" face stamp and a "Smartie"[4] were found to be reinforcing for correct responses for the children used in the preliminary studies.

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[4] A "Smartie" is a small coloured chocolate bean which is common in Australia (similar to an M & M).

5.23 Procedure

The procedure used was essentially the same in all preliminary studies, and was adopted for Main Study 1. The previous definitions of direct and implicit rewards were adhered to, with the design being as in Figure 5 (p.63).

5.3 Main Study 1: Method

5.31 Subjects and setting

The subjects were 48 children (31 boys, 17 girls) from a typical school in a large country town. There were 16 children from each of grades one, three and six, the grade one children being 15 boys and one girl, all of ages five or six; the grade three children being equally divided as to boys and girls (C.A. 8 or 9); and the grade six children being seven boys and nine girls (C.A. 11 or 12). The disproportionate number of boys in grade one reflected the nature of the school population. There were no outstanding academic or behavioural problems reported for any of the subjects, and all subjects were volunteers. The study was carried out during free time before school (9-9.30 a.m.) and during the lunch hour (1-1.30 p.m.) in two rooms which were usually used for small-group teaching. All teachers were unaware of the actual nature of the study but were told that the children would be practising their handwriting. Every teacher expressed approval of this exercise. (The Principal of the school was informed as to the nature of reward conditions to be used in the study. After completion of the study, a staff seminar was held in which full details of procedure and results were given to teachers. All expressed interest and approval of the study and were pleased at the noted improvement in the handwriting of those children who were subjects. Parents were also similary notified of the study and its results. No complaints were received from any source.) The subjects were randomly divided into groups or pairs and into targets or peers.

5.32 Experimenters

Both of the experimenters were postgraduate students in special education, aged 21 and 28, who were trained in the procedure to be used.

5.33 Data-collection procedures

As mentioned above, handwriting was the task chosen as the main dependent variable, performed upon prepared slips of paper appropriate to each grade. All subjects were required to write their names and the session number upon their sheet of paper prior to beginning the task. Depending upon the particular intervention strategy, all children received both papers from the previous session and the appropriate intervention response before completing the task for that session.

The letters of the alphabet were arranged in random order on a separate stimulus sheet for each trial of each particular intervention period. There were eight trials during each intervention, thus eight different stimulus sheets were prepared. The letters were initially printed by an experienced primary teacher who copied them from the official Course of Study (N.S.W. Department of Education) as used in the school (see Appendix B). The stimulus was presented on an overhead-projection screen 2.5m from the children (see Figure 6).

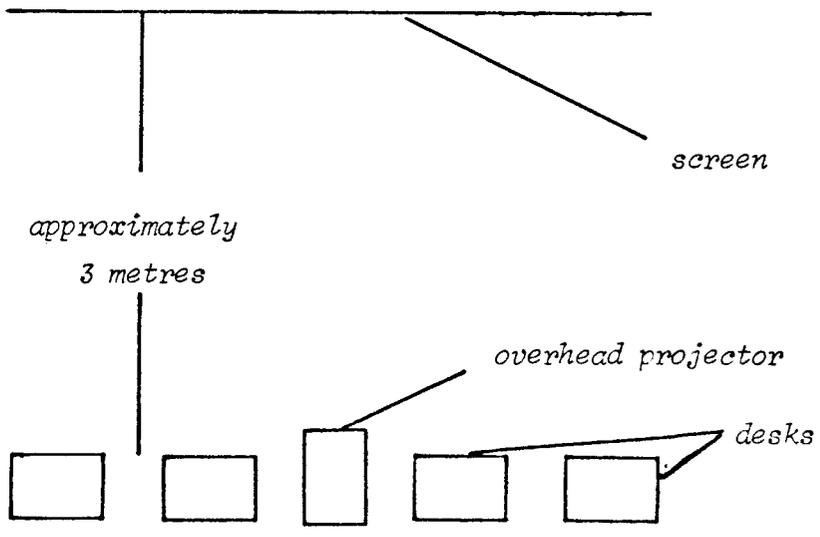


Figure 6: Stimulus presentation conditions

5.34 Dependent variable measures

5.341 Handwriting

The scoring of handwriting has sometimes been associated with subjective responses on the part of the scorer (Anderson, 1965; Feldt, 1962), but recent methods have produced high levels of reliability (Helwig, Johns, Norman & Cooper, 1976). Using one of these methods, transparent overlays were constructed to measure three ranges of deviations in children's responses to the model letter: from 0-1 mm, 0-2 mm, and 0-3 mm. The following criteria were used to define correct manuscript letter strokes.

1. The total stroke must be within the confines of the line of the overlay.
2. The lower section of each relevant letter must touch the parallel lines drawn on the writing sheet.
3. The upper section of each relevant letter must touch the slash mark for that stroke.
4. All circles in the letters a, b, d, g, o, p, q, and the top of the letter e must be closed curves.
5. All strokes must intersect each successive stroke at the correct point.
6. The letter must be complete with all strokes and dots present.
7. The horizontal stroke in the t and f must intersect the other stroke at the upper parallel line on the writing sheet.

The 0-1 mm overlays were used to score the grade six writing; the 0-2 mm overlays for the grade three, and the 0-3 mm overlays for the grade one writing. This procedure allows for variations according to expected proficiency level resulting from age while using a standard task over all subjects. Copies of these overlays appear in Appendix C.

5.342 Attitudinal responses

The measures used in this part of the study were taken from the literature on Attribution theory wherein attempts have been made to tap

subject-responses to reward situations similar to that used in the present study (DiVitto & McArthur, 1978; Nichols, 1979).

Two measures of changes in subjects' attitudes towards the task and the experimental conditions were taken. First, a questionnaire which asked subjects to respond to the following questions was administered at selected points during the study.

Q1. Did you like doing this?

Q2. Would you like to do it again?

Q3. Do you think it was fair?

Subjects' responses to these questions were confined to "a lot", "a bit", "not much". Questions 4, 5 and 6 were asked only if Q3. had a response indicating awareness of unfairness (i.e., "a bit" or "not much").

Q4. In what way was it unfair?

Q5. Would you like to change it so it would be fair?

Yes/No - How?

Q6. Who do you think made it unfair?

Total responses for groups were calculated. The content of this questionnaire was developed after trialling of a similar questionnaire in preliminary study 3. A copy of this questionnaire appears in Appendix D.

The second measure of attitudinal change taken was in the form of an anecdotal record of subjects' comments and complaints. Where possible, note was made of the actual wording of the comments and/or complaints. Totals were calculated across groups. A complaint was defined as any verbalization which was of a derogatory nature concerning the task, the experimenter, the scores, or the reward structure. Verbalization of a non-derogatory nature was recorded as a comment. These records were kept only during the actual time of intervention.

5.35 Reliability

The correction of each session's responses was carried out immediately after the session by an independent evaluator. This person was an experienced teacher who had been taught the scoring method until a criterion of 100 per cent agreement was reached between her responses and those of the experimenter. This evaluator was naive as to the actual nature of the study and unaware of the different intervention-phases.

An additional cross-check was made using another similarly experienced and trained evaluator to re-score one session per intervention-phase. The session was chosen on a random-choice basis and there was no feedback to the first evaluator as to the correlation between scores. A post-study check was carried out at the end of the study when the first evaluator re-scored one session per intervention-phase. Inter-rater and post-check reliability data were calculated and appear in the Results section.

5.36 Procedure

5.361 Rewards

The rewards chosen were:

1) Feedback of results in the form of a tick above each letter correct, plus a total of the number of letters correct/26;
2) an indication of improvement over the previous session's performance. This took the form of a plus, minus or equals sign together with a "Smiley" face for improvement or perfect score (i.e., 26/26), or a "Grumpy" face for equal or no improvement;
3) verbal praise from the experimenters in the form,"That's an improvement/another perfect score. Very good work";
4) A Smartie for improvement or perfect score.

In order to validate the use of this reward as a reinforcer, a single-intervention time-series analysis was carried out upon each subject-group's data at the end of the first week of use of this reward. Comparison was made between baseline and intervention (i.e., use of the reward) and results are presented in Tables 3 and 4. (The use of time-series analysis procedures for these and other data is discussed below in section 5.37). These data support the use of the chosen reward as a reinforcer by demonstrating the power-as-a-reinforcer which this reward had upon the task performed ($p < .05$), and constituted a test of Hypothesis 1.

5.362 Experimental conditions

All children were exposed to the same conditions unless specified because of the nature of the reward-phase. Figure 5 shows the design of the study (reproduced on p. 77).

A-Baseline

Handwriting was recorded for each subject over the eight sessions of this phase, with the experimenters' only comment being "Thank you" as the individual pieces of writing paper were collected. Any questions were politely answered in a non-committal fashion by the experimenter.

B-Intervention 1 (Direct rewards to all subjects)

During this phase all children received their previous session's writing sheet back with the appropriate experimenter response as detailed above. After perusal of these sheets for about 30 seconds, children were given a blank sheet and asked to copy the day's exercise onto it. Both sheets were collected at the end of the session.

B_1 Intervention 2 (Implicit rewards to half of subjects)

During this phase, only half of each group or pair received their previous session's sheet back. When questioned as to this, the experimenter replied that "The person who corrects them only gave me these ones back." That is, half of the group or pair were experiencing the same reward conditions as during the previous week, and the other half of the group or pair were experiencing implicit reward conditions.

Table 3

Changes in group means for number of letters correct over sessions for baseline (A) and direct contingent reward (B) conditions

* Groups	Baseline sessions								Direct Contingent reward sessions							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
14t	.00	.25	.00	.00	.00	.25	.00	.00	1.50	3.00	4.50	4.00	5.00	4.50	6.50	4.00
14p	1.00	1.25	.00	.00	.00	.75	1.50	1.75	1.75	2.75	5.33	7.00	4.00	5.50	6.33	6.37
12t	.00	.50	.00	.00	.00	.00	.00	.50	4.75	5.75	6.75	6.75	8.75	6.25	9.50	8.75
12p	.00	.25	.50	.00	.00	.25	.25	.25	3.75	4.00	4.00	5.50	8.75	5.50	7.00	7.00
34t	4.00	5.33	5.00	5.75	2.50	3.66	2.00	2.75	6.50	6.75	8.50	9.25	12.00	8.00	13.00	9.25
34p	4.75	4.25	4.66	2.50	3.00	2.00	3.25	4.00	5.75	7.00	8.00	10.00	9.00	9.75	11.25	11.00
32t	4.00	4.66	2.66	3.00	2.25	4.40	4.00	2.66	4.75	5.75	7.00	8.50	8.00	9.00	6.33	10.50
32p	8.20	4.80	4.40	4.40	3.00	3.20	4.66	6.40	7.33	7.66	9.00	11.00	7.75	11.00	12.00	12.25
64t	5.50	6.25	3.25	4.50	4.25	2.50	2.33	3.25	6.50	8.66	8.75	9.50	11.75	11.00	12.50	13.66
64p	4.50	3.00	2.33	2.50	4.75	1.66	2.25	3.00	7.00	7.25	10.00	9.66	9.00	10.66	14.00	11.25
62t	5.00	4.75	3.25	3.75	1.50	3.00	4.75	4.00	5.75	9.25	6.75	7.75	3.25	7.50	11.66	10.00
62p	6.50	5.25	5.75	6.75	4.25	8.00	5.25	6.00	7.50	14.00	10.50	13.00	14.50	17.30	17.00	14.50

* Designates class: e.g., 14t = class one, groups of four, t = target or p = peer subjects.

Table 4

Time-series analysis of changes in response-levels from Baseline to direct contingent reward conditions

*Class	t for change in level	t for change in slope
14 t	4.74	5.16
14 p	3.69	5.37
12 t	7.26	4.51
12 p	3.68	9.03
34 t	5.36	10.85
34 p	7.77	13.66
32 t	3.56	6.74
32 p	3.79	5.60
64 t	8.85	14.62
64 p	4.41	5.37
62 t	4.16	5.09
62 p	4.88	14.18

All obtained t values for level were significant at the $p < .05$ level

*Designates class: e.g. 14 t = class one, groups of four, t = target or p = peer subjects.

	WEEKS			
	1	2	3	4
target subjects	A	B	B	B
peer subjects	A	B	B_1	B

Key

A = Baseline

B = Direct contingent rewards

B_1 = Implicit contingent rewards

Figure 5 : Experimental design, Main Study 1

B Intervention 3 (Direct rewards to all subjects)

5.37 Statistics

Statistical analysis of the data obtained from this study was performed by two methods: the TMS time-series package written by Bower, Padia and Glass (1974), and Finn's Multivariance (Series VI) programme (Finn, 1977). The use of time-series analysis with data obtained over repeated observations has been suggested by various authors as a method of overcoming any spurious effects due to serial dependency in such data (e.g., Glass, Willson & Gottman, 1975; Jones, Vaught & Weinrott, 1977; Sharpley & Rogers, 1981) and because the evaluation of changes in response-levels by visual (i.e., graphed, mean scores) representation can often be grossly misleading (Jones, Weinrott & Vaught, 1978; Sharpley, in press). Such effects are taken into consideration by the calculation of correlation coefficients between data points so that an appropriate model of the data can be determined prior to testing for intervention effects. Without such prior evaluation of the autocorrelation effects of either previous data points or previous random shocks in the data, testing for intervention effects assumes independent data -- an assumption which may be unjustified. In a commentary upon this McCain and McCleary (1979) quote an example where the correlation between data points reached .7. They go on to point out that testing this data for significance by traditional *t* test could result in a *t* statistic which had been inflated by 265 per cent. Because both the standard *t* and *F* statistics assume that data are independent, the use of *t* tests or analysis of variance statistics to test for intervention effects with data which are(by their nature as operant responses) correlated can lead to unjustified conclusions being drawn.

A method which can deal with sequential dependence between observations is required. For this purpose, the ARIMA (Auto Regressive Integrated Moving Averages) model presented by Box and Jenkins (1970) for the description of time-series data has been adopted, and tests for intervention

devised (Glass, Willson & Gottman, 1975). To correctly identify the model which best fits the data, three measures are obtained: the degree of differencing (d) necessary to produce a stationary model of the data (i.e., one in which the data series remains in equilibrium around a constant mean level); the order of the autoregressive component (p) of the model (i.e., how much a certain data point can be predicted from previous observations); and the value of the moving-average component (q) (i.e., the extent to which a certain data point can be predicted by previous random shocks in the data). The TMS package contains a subprogram CORREL which processes data and determines the level of autocorrelation present. Data may then be analyzed by a further subprogram TSX, to test for treatment effects. Time-series analysis provides two main statistics. The first is a measure of change in overall level of the data from intervention one to intervention two. The second is a measure of changes in slope (i.e., trend or gradient) of the data, so that specific intervention effects can be detected. If only level changes were examined (as in traditional methods, e.g., t test, ANOVA) then changes in performance which had actually begun prior to intervention could not be detected (see McCain & McCleary, 1979; Sharpley & Rogers, 1981, for a fuller account of this). Additionally, where only a few data points can be collected within interventions because of logistic restrictions, slope effects can indicate performance changes which had not yet registered as changes in overall level. This procedure was followed for the present study in testing Hypotheses 1, 2 and 3.

In order to test for differences between groups (i.e., groups vs pairs, and age-level comparisons), the Multivariance package was used with these variables as factors in a repeated measures analysis of variance. Intervention phases B and B_1 were contrasted, with data from B being covaried out of the analysis of the data. Thus the effects of group-size and age-level as factors within any change in response-levels during the implicit

reward phase were examined. Although the TMS package tests for effects within groups over time, it does not measure for effects between all the individuals in one group vs all the individuals in another group at a specified point in time. In addition, the Multivariance package enables the researcher to obtain step-down F values for specific data points within intervention phases so that between-group comparisons may be made on single trials as well as over entire phases. The use of covariance procedures to eliminate differences due to subject ability prior to intervention contributes to the overall power of this procedure.

5.4 Main Study I : Results

5.41 Reliability

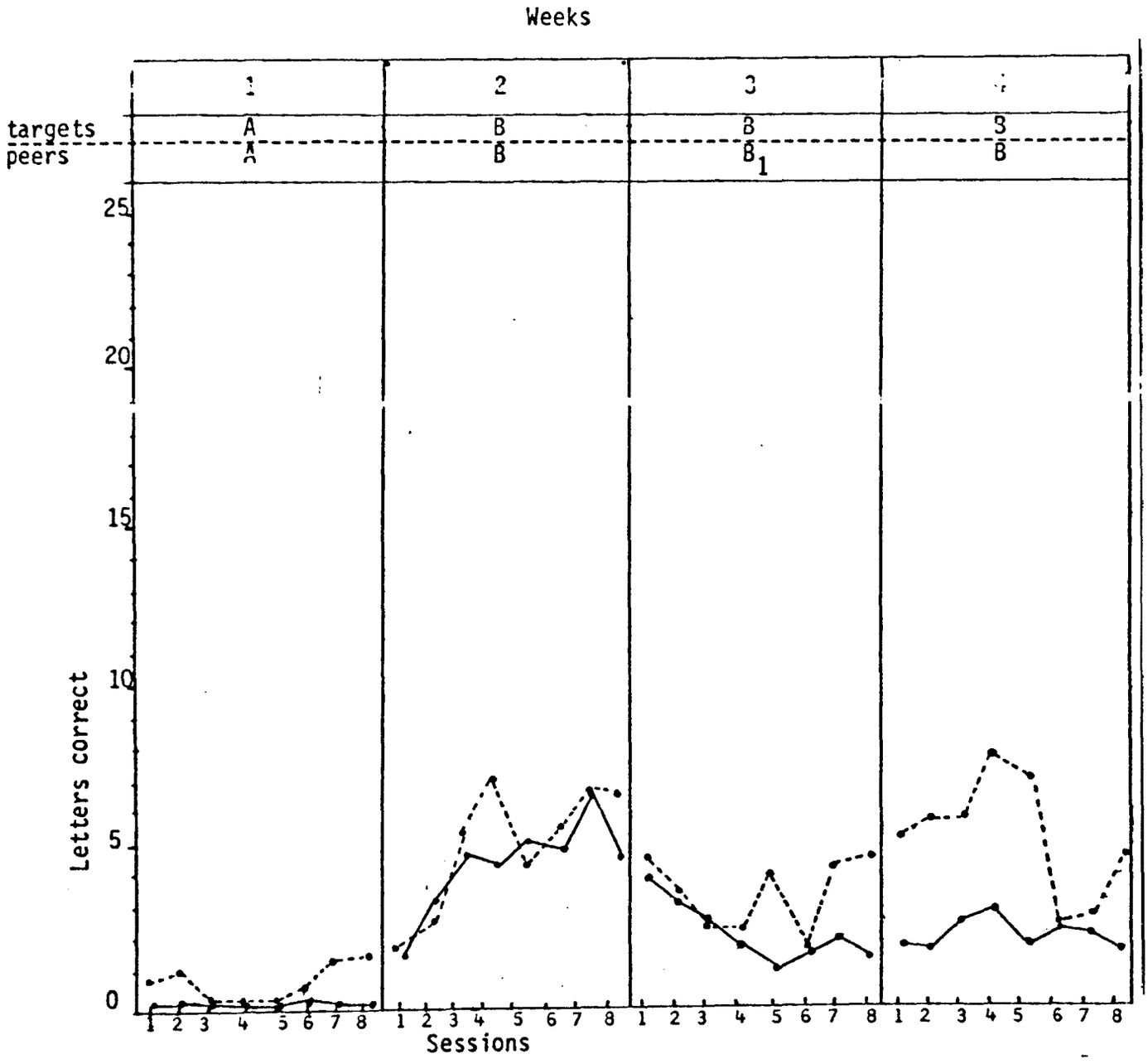
Interscorer checks were conducted on sessions 1/7 (week/session), 2/5, 3/3 and 4/4 and results showed a high level of agreement between scorers (r = from .908 to .997). Post-checks were conducted on sessions 1/6, 2/4, 3/2 and 4/2, with results ranging from r = .945 to .981. Reliability was thus higher than the various standards suggested (.60 by Gelfland and Hartmann (1975); .80 by Hartmann (1977); .90 by Kelly (1977)), and the scoring procedure is generalizable across conditions and consistently dependable over the total span of the study.

5.42 Data from the study

Graphed representations of session-by-session group means are shown in Figures 7 (a) to (e) and appear to indicate marked effects due to interventions. However, as mentioned above visual presentation of data such as that obtained in this study may lead to erroneous conclusions if examined apart from more rigorous statistical analysis, and time-series analysis of each group's sessional responses was carried out. These data should be considered in reference to the relevant graphed presentation.

Year one: a) groups (Figure 7 (a)

Both target and peer subjects' responses in the "groups" condition were low during baseline sessions, with little movement above zero letters correct . During the implementation of phase B however, there was a



Key: (i) Intervention conditions

A = Baseline
B = Direct contingent rewards
B_1 = Implicit contingent rewards

Key: (ii) Data

——●—— = target subjects
●- - -● = peer subjects

Figure 7(a): Mean letters correct, year one, groups, for all phases

significant increase in both the level and slope for target and peer subjects ($p < .05$: these results are presented in Table 4, p. 76). The reward acted as a reinforcer for correct handwriting responses during this phase. When the data from phase B_1 are examined it appears from Figure 7 (a) that there were decreases in responses for both targets and peers. Statistical analyses verify this for targets (t level = -5.85, df = 12, $p < .05$; t slope = -10.55, df = 12, $p < .05$) and for peers (t level = -5.50, df = 12, $p < .05$; t slope = -5.60, df = 12, $p < .05$). These decreases in correct responses were significant for those subjects who were still receiving direct contingent rewards (i.e., targets) as well as for those who were on an extinction phase (i.e., peers). During the final phase, both targets and peers increased the level of correct responses (targets: $t = 2.79$, df = 12, $p < .05$; peers: $t = 2.13$, df = 12, $p < .05$). Targets increased the slope of their ongoing responses ($t = 2.75$, df = 12, $p < .05$), but peers showed a nonsignificant downward movement ($t = -1.07$, df = 12, n.s.). Both sets of responses show similarities which are statistically significant.

Year one: b) Pairs (Figure 7 (b))

Once again there was little change during the baseline phase for either targets or peers. During direct reward conditions (B) significant rises from baseline were noted for both targets and peers : targets (t level = 7.26, df = 12, $p < .05$; t slope = 4.51, df = 12, $p < .05$), peers (t level = 3.68, df = 12, $p < .05$; t slope = 9.03, df = 12, $p < .05$). These results are reflected in Figure 7 (b). Unlike the year-one subjects in groups, subjects in pairs did not reach significance in level of decreases on responses during phase B_1. A clear downward movement is evident in level which is verified by the accompanying significant decrease in slope for both groups: targets (t level = -.64, df = 12, n.s.; t slope = -5.93, df = 12, $p < .05$), peers (t level = -2.0, df = 12, n.s.; t slope = -7.96, df = 12, $p < .05$). These results indicate that the level

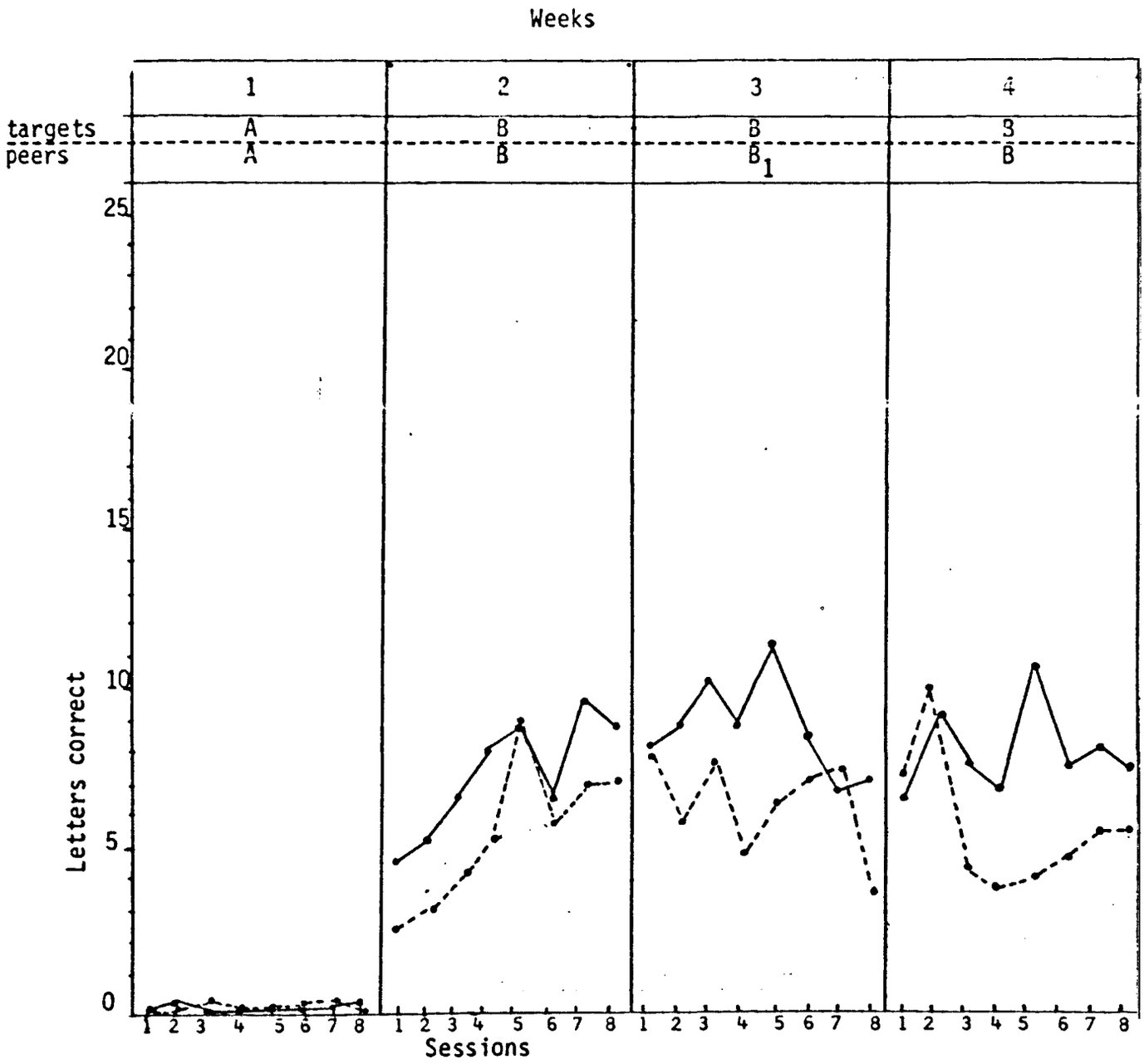


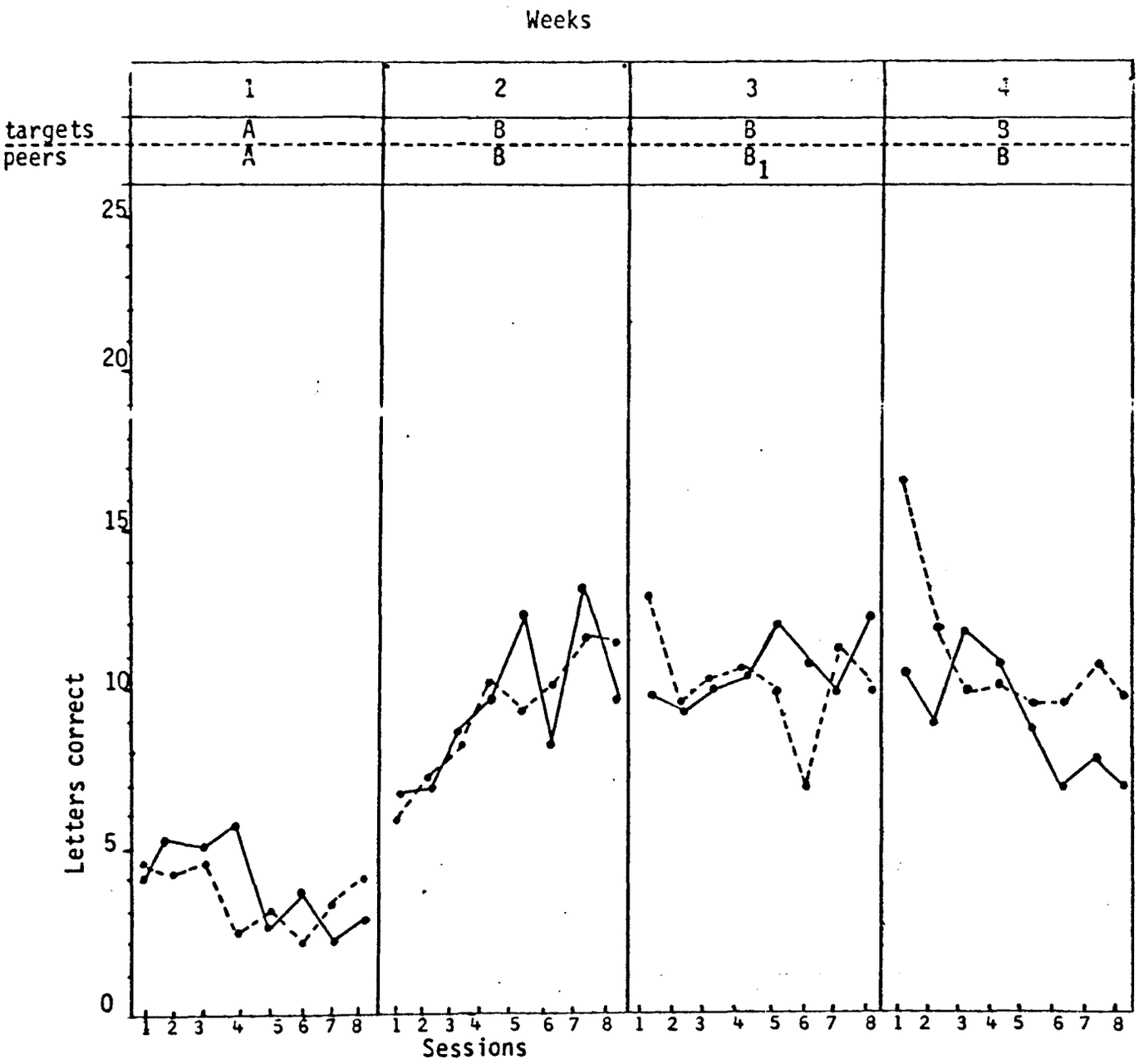
Figure 7(b): Mean letters correct, year one,pairs, for all phases

of correct responses was falling for both groups during this phase, although the decrease had not reached significance.

The final phase (B) showed different results for the two groups. While targets showed a slight nonsignificant decrease in level (t = -.09, df = 12, n.s.) plus a similar increase in slope (t = 1.26, df = 12, n.s.), peers showed the opposite (t level = 1.22, df = 12, n.s.; t slope = -.33, df = 12, n.s.). These data indicate no clear-cut significant change upwards or downwards for either group during this final return to direct reward conditions.

Year three: a) groups (Figure 7 (c))

As in previous groups, significant increases from baseline to direct reward phases were noted in this age group: targets (t level = 5.36, df = 12, $p < .05$; t slope = 10.85, df = 12, $p < .05$), peers (t level = 7.77, df = 12, $p < .05$; t slope = 13.66, df = 12, $p < .05$). The reward chosen was reinforcing correct handwriting responses for these subjects during this phase, but not during the next (implicit) phase --B_1. Targets showed a significant decrease in level (t = -3.87, df = 12, $p < .05$) but slope results were nonsignificant (t = -1.11, df = 12, n.s.), while peers showed a similar nonsignificant result for level (t = -1.77, df = 12, n.s.), and a significant decrease in slope (t = -11.22, df = 12, $p < .05$). Upon the reintroduction of direct rewards for both groups, there were mixed reactions from subjects. While targets showed no significant increases in level (t = -.07, df = 12, n.s.) and a significant decrease slope in (t = -9.06, df = 12, $p < .05$), peers increased their level of correct responses (t = 2.64, df = 12, $p < .05$) but showed a nonsignificant downward movement in slope (t = -1.08, df = 12, n.s.). The peers' results may be biased by data collected during session one of this phase. Although their responses to session one were higher than during the previous session, there was a clear downward movement over the entire five sessions of this final phase.



Key: (i) Intervention conditions

A = Baseline
B = Direct contingent rewards
B_1 = Implicit contingent rewards

Key: (ii) Data

——●—— = target subjects
●- - -● = peer subjects

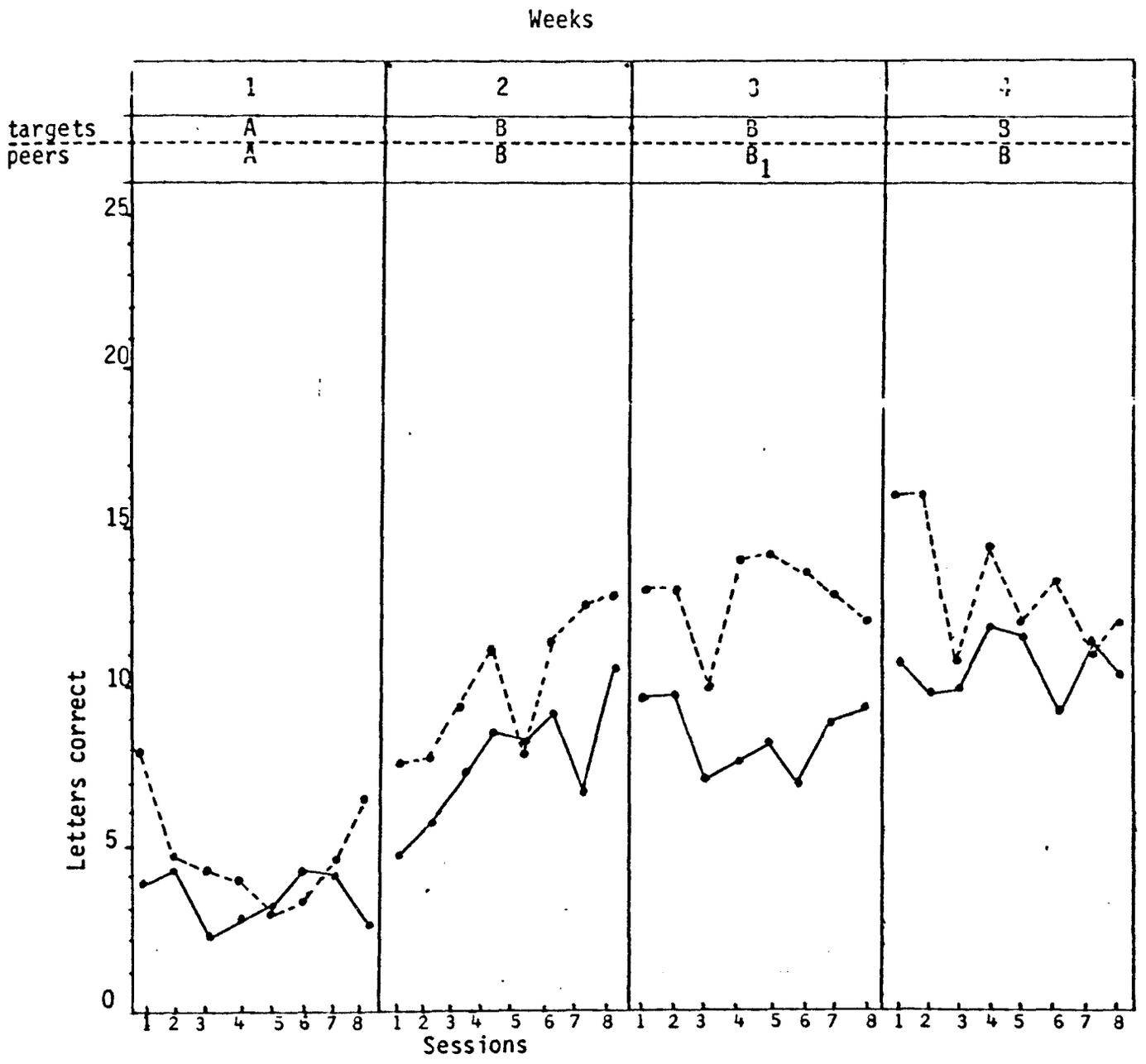
figure 7(c): Mean letters correct, year three, groups, for all phases

Year three: b) pairs (Figure 7 (d))

Once again significant increases in level of correct responses were noted from baseline to direct reward conditions for these subjects (targets: $\underline{t}$ level = 3.56, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = 6.74, df = 12, $\underline{p} < .05$; peers: $\underline{t}$ level = 3.79, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = 5.60, df = 12, $\underline{p} < .05$). While there were no significant changes in level for both groups of subjects during phase B_1, (targets: $\underline{t}$ = -.51, df = 12, n.s.; peers: $\underline{t}$ = -.05, df = 12, n.s.), there were significant decreases in slope for both groups (targets: $\underline{t}$ = - 2.72, df = 12, $\underline{p} < .05$; peers: $\underline{t}$ = -6.32, df = 12, $\underline{p} < .05$) indicative of a change in response direction for both groups during this phase. The implementation of the final direct reward phase showed significant increases in level both for targets ($\underline{t}$ = 2.29, df = 12, $\underline{p} < .05$) and peers ($\underline{t}$ = 2.39, df = 12, $\underline{p} < .05$). This upward movement was not reflected in the slope for either targets ($\underline{t}$ = .28, df = 12, n.s.) or for peers ($\underline{t}$ = -2.68, df = 12, $\underline{p} < .05$).

Year six: a) groups (Figure 7 (e))

Increases from baseline to direct reward phases were significant: targets ($\underline{t}$ level = 8.85, df = 12, $\underline{p} < .05$); $\underline{t}$ slope = 14.62, df = 12, $\underline{p} < .05$), peers ($\underline{t}$ level = 4.41, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = 5.37, df = 12, $\underline{p} < .05$). Decreases during B_1 were also noted for both targets ($\underline{t}$ level = -3.73, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = -10.41, df = 12, $\underline{p} < .05$) and peer subjects ($\underline{t}$ level = -2.78, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = -9.72, df = 12, $\underline{p} < .05$). The data from the final direct reward phase were also similar between targets and peers: targets ($\underline{t}$ level = 1.38, df = 12, n.s.; $\underline{t}$ slope = -.44, df = 12, n.s.), peers ($\underline{t}$ level = 3.65, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = -1.71, df = 12, n.s.), indicating some increases in level but not for slope. (There was some truancy from the final session of this phase, which is discussed below in section 5.45.)



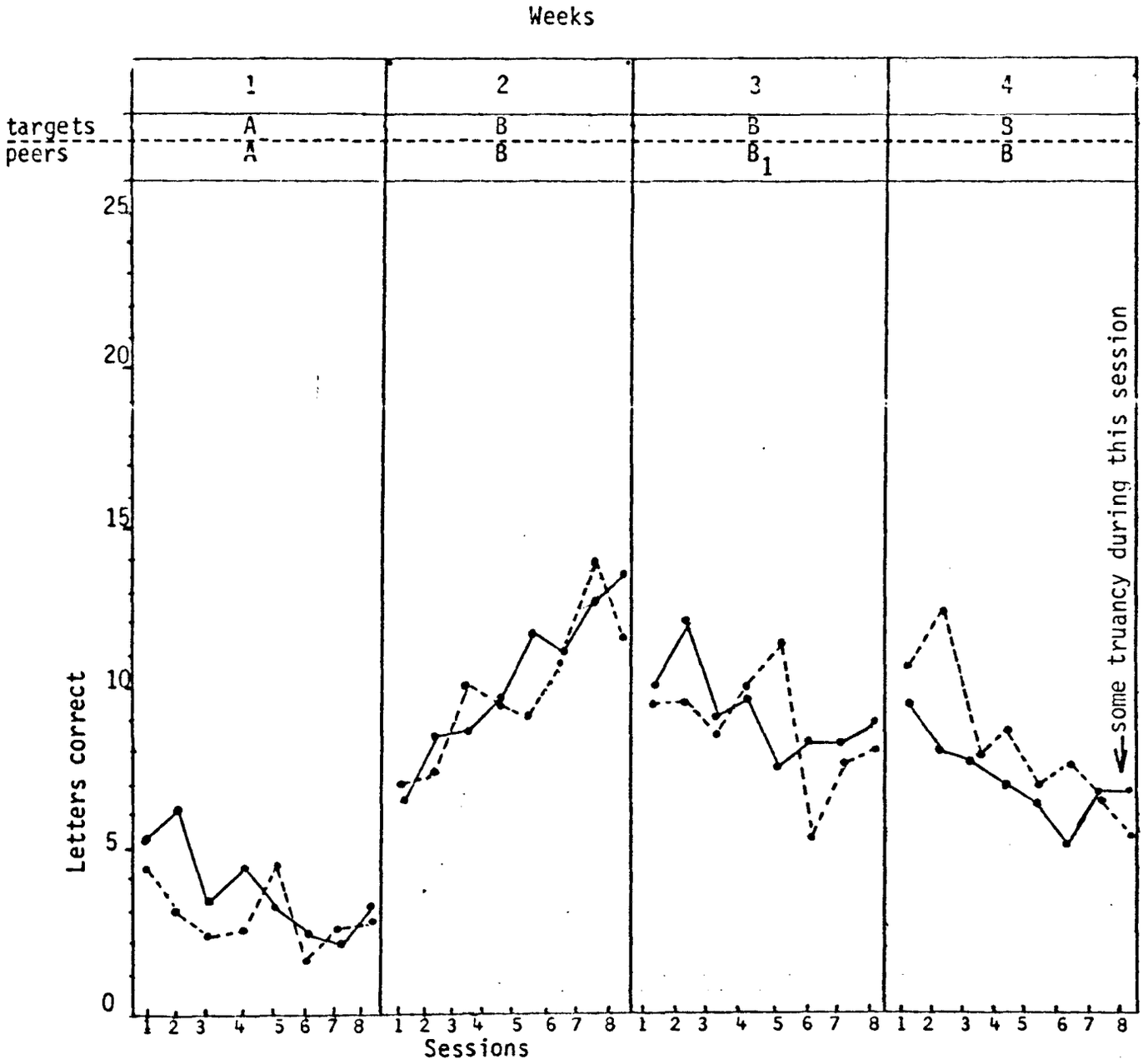
Key: (i) Intervention conditions

A = Baseline
B = Direct contingent rewards
B_1 = Implicit contingent rewards

Key: (ii) Data

——● = target subjects
●- - -● = peer subjects

Figure 7(d): Mean letters correct, year three, pairs, for all phases



Key: (i) Intervention conditions

A = Baseline
B = Direct contingent rewards
B_1 = Implicit contingent rewards

Key: (ii) Data

= target subjects
= peer subjects

Figure 7(e): Mean letters correct, year six, groups, for all phases

Year six: b) pairs (Figure 7 (f))

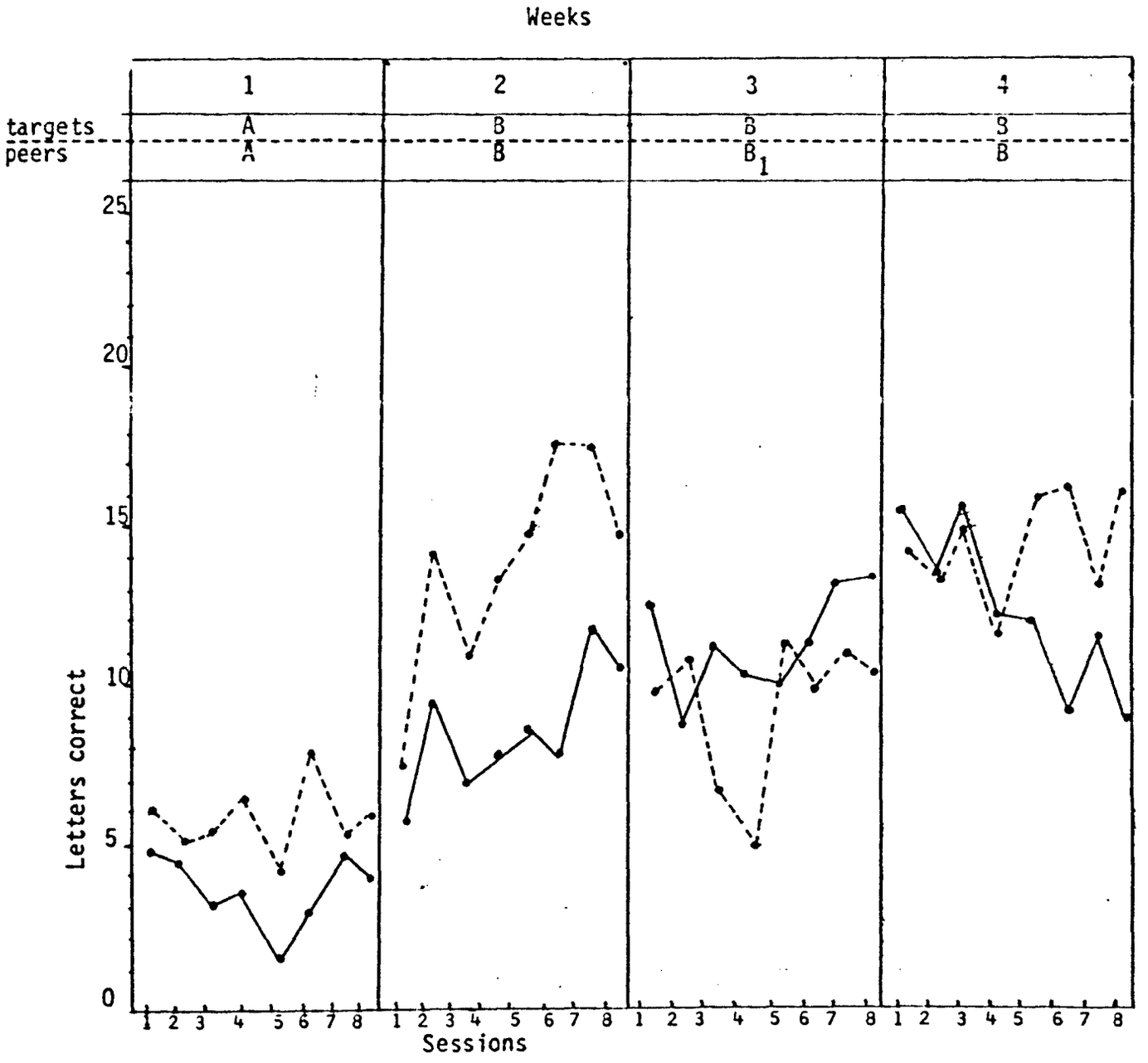
The significant increases in level and slope for both targets ($\underline{t}$ level = 4.16, df = 12, $\underline{p} < .05$; $\underline{t}$ slope = 5.09, df = 12, $\underline{p} < .05$) and peers ($\underline{t}$ level = 4.88, df = 12, $\underline{p} < 05$; $\underline{t}$ slope = 14.18, df = 12, $\underline{p} < .05$) was followed by a nonsignificant downward movement for targets and a significant decrease for peers during B_1. Targets showed nonsignificant decreases in both level ($\underline{t}$ = -1.12, df = 12, n.s.) and slope ($\underline{t}$ = -2.10, df = 12, n.s.). Peers decreased significantly in both level ($\underline{t}$ = -23.08, df = 12, $\underline{p} < .05$) and slope ($\underline{t}$ = -11.56, df =12, $\underline{p} < .05$). Both groups showed a significant increase in level under the final application of direct reward conditions: targets ($\underline{t}$ = 5.62, df = 12, $\underline{p} < .05$) peers ($\underline{t}$ = 2.52, df = 12, $\underline{p} < .05$). These results were accompanied by a downward slope change which was significant for targets ($\underline{t}$ = -10.89, df = 12, $\underline{p} < .05$) but not for peers ($\underline{t}$ = -.33, df = 12, n.s.).

5.43 Summary of results

1. The application of the chosen reward significantly reinforced the correct letter writing responses of all subject groups during phase B (week 2).

2. There were significant decreases in level or slope, or both, of the correct letter writing response for all subject groups during the implicit reward phase (B_1) in spite of the continued application of the hitherto reinforcing reward to target subjects.

3. With only two exceptions (12t and 34t) subject groups increased their levels of correct responses when direct rewards to all groups were reinstituted during the final week (B). The two exceptions were nonsignificant movements only (12t: $\underline{t}$ = - .09, df = 12, n.s.; 34t: $\underline{t}$ = - .07, df = 12, n.s.).



Key: (i) Intervention conditions

A = Baseline
B = Direct contingent rewards
B_1 = Implicit contingent rewards

Key: (ii) Data

——● = target subjects
●- - -● = peer subjects

Figure 7(f): Mean letters correct, year six, pairs, for all phases

5.44 Hypothesis-testing

Hypothesis 1: There will be a significant increase in the number of letters printed correctly by all subject groups from baseline (A) to direct contingent reward conditions (B).

As mentioned above (p. 74) this hypothesis was tested as an integral part of the methodology. Without verification of the reward as a reinforcer of the task-response, any further interventions would be illogical. The reward acted as a reinforcer of the handwriting behaviour of all subject-groups as shown by Tables 3 and 4, and this hypothesis is therefore accepted.

Hypothesis 2: There will be a significant decrease in the number of letters printed correctly during B_1 by those subject groups receiving implicit rewards.

Table 5 shows the changes in sessional mean scores for each separate subject group receiving implicit rewards during B_1. Figure 8 visually presents the overall data from all these groups and suggests a downward movement of responses during B_1. This suggestion is verified by time-series analysis of these data which supported the hypothesis as stated (t level = -4.49, df = 12, $p < .05$; t slope = -8.40, df = 12, $p < .05$). These subjects reacted as might be suggested by operant theory when submitted to a no-reward condition following a reward phase. This constitutes an extinction procedure and data are in accordance with this.

Hypothesis 3: There will be no significant decrease in the number of letters printed correctly during B_1 by those subjects receiving direct contingent rewards.

Table 6 presents the changes in sessional mean scores for each direct reward subject group during B_1. Figure 9 presents the overall data from all these groups visually, and suggests a downward movement in data during B_1. Time-series analysis of these data verifies this visual

Table 5

Changes in group means for number of letters correct over sessions for phases B and B_1; implicit reward subjects only

Group	B sessions								B_1 sessions							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
14p	1.75	2.75	5.33	7.00	4.00	5.50	6.33	6.33	4.66	3.33	2.66	2.33	4.00	1.50.	4.00	4.33
12p	2.66	3.00	4.00	5.33	8.75	5.50	7.00	7.00	8.00	5.75	7.75	4.50	6.25	7.00	7.25	3.50
34p	5.75	7.00	8.00	10.00	9.00	9.75	11.25	11.00	12.75	9.00	10.00	10.25	9.75	6.50	11.00	9.50
32p	7.33	7.66	9.00	11.00	7.75	11.00	12.00	12.25	12.66	12.66	9.66	13.33	13.66	13.00	12.25	11.25
64p	7.00	7.25	10.00	9.66	9.00	10.66	14.00	11.25	9.33	9.50	8.50	10.00	11.25	5.00	7.75	8.00
62p	7.50	14.00	10.50	13.00	14.50	17.30	17.00	14.50	9.66	10.50	6.33	4.66	11.00	9.66	10.75	10.00

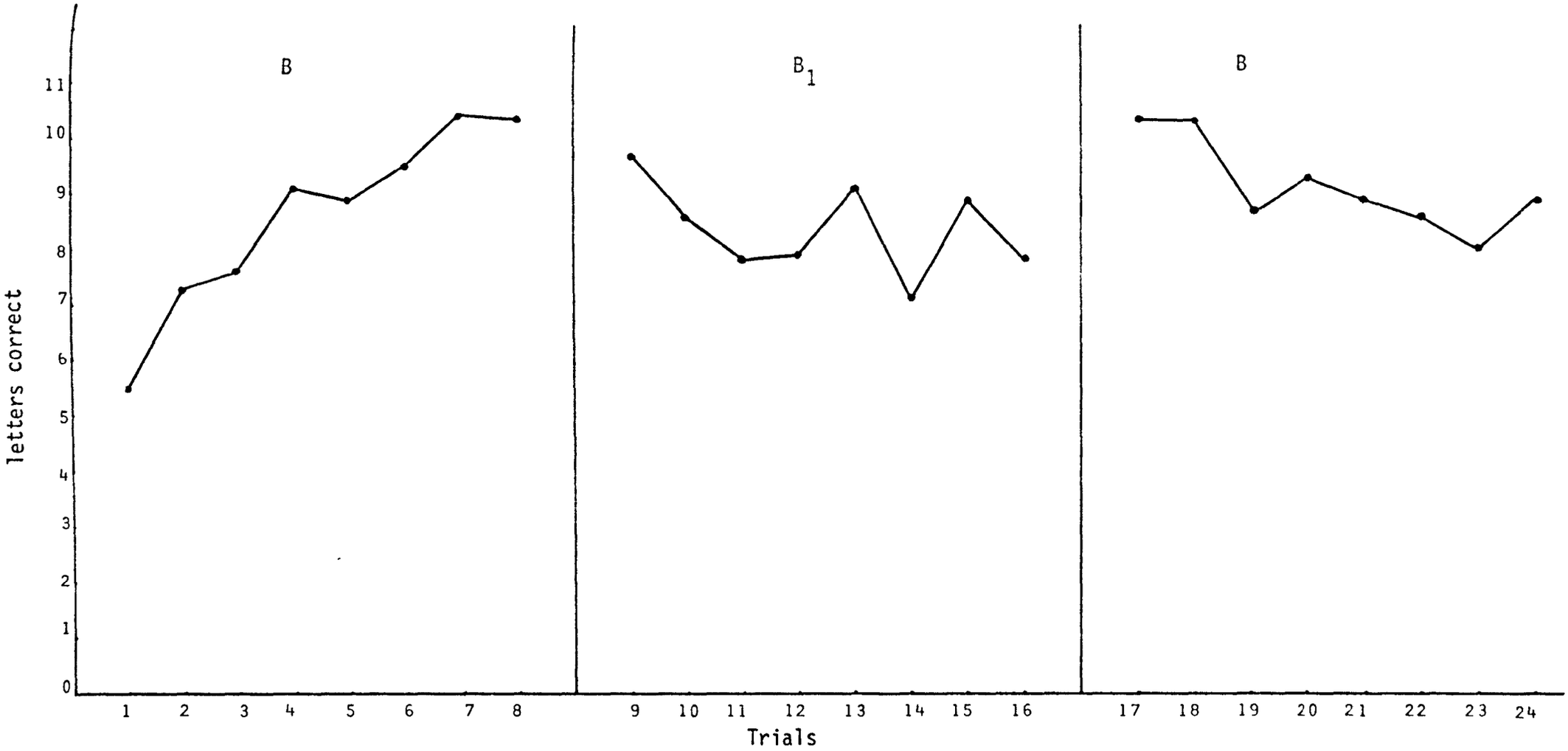


Figure 8 :Sessional mean scores for implicit reward subjects only, during phases B, B_1, B

Table 6

Changes in group means for number of letters correct over sessions for phases B and B_1; direct reward subjects only

Group	B sessions								B_1 sessions							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
14t	1.50	3.00	4.50	4.00	5.00	4.50	6.50	4.00	3.75	3.00	2.50	1.75	1.00	1.25	2.00	1.25
12t	4.75	5.25	6.75	8.00	8.75	6.25	9.50	8.75	8.00	8.75	10.00	8.25	11.25	8.25	6.75	7.00
34t	6.50	6.75	8.75	9.25	12.00	8.00	13.00	9.25	8.30	8.00	9.75	10.00	11.66	10.33	9.50	12.00
32t	4.75	5.75	7.00	8.50	8.00	9.00	6.33	10.50	9.66	9.66	7.00	7.66	8.00	8.00	8.75	9.00
64t	6.50	8.66	8.75	9.50	11.75	11.00	12.50	13.66	10.00	12.00	9.00	9.75	7.50	8.50	8.25	9.00
62t	5.75	9.25	6.75	7.75	8.25	7.50	11.66	10.00	12.33	8.50	11.00	10.00	9.75	11.00	13.00	13.00

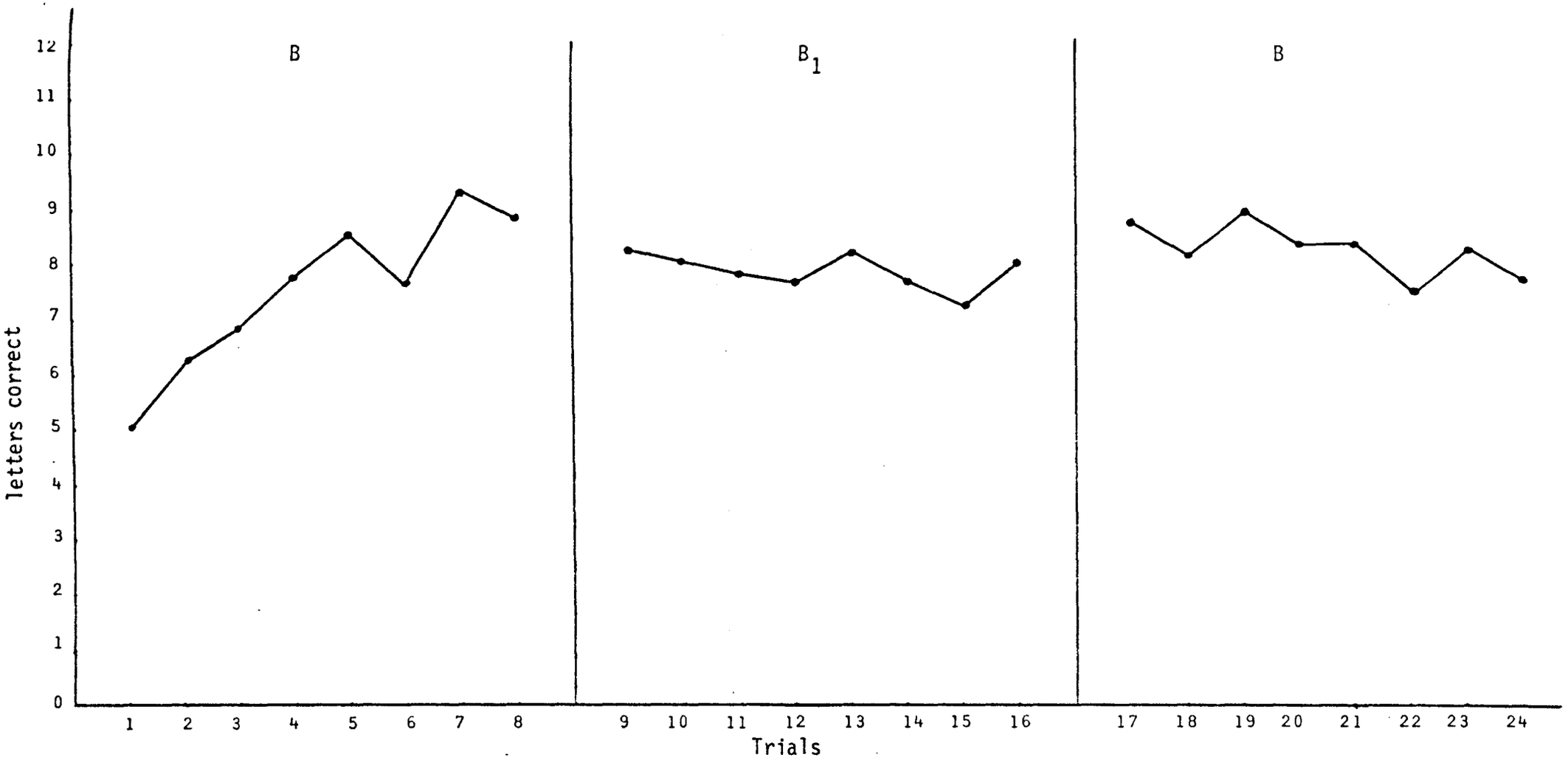


Figure 9 : Sessional mean scores for direct reward subjects only, during phases B, B_1 , B

suggestion (t level = -3.80, df = 12, $p < .05$; t slope = -8.66, df = 12, $p < .05$). This finding is of note since these subjects were experiencing the same direct reward conditions as they had during phase B. These results reject Hypothesis 3 for these subjects.

Hypothesis 4: There will be a significant difference in the number of letters printed correctly from B to B_1 by those subjects receiving direct contingent rewards in groups of eight versus those in pairs. This difference will be in the direction of those subjects in large groups decreasing their level of correct responses compared to pairs.

Table 7 presents the overall data for level of correct responses for those subjects receiving direct rewards in groups of eight and in pairs during phases B and B_1. The multivariate analysis of variance with repeated measures over phase B_1 carried out with data from phase B covaried out revealed an overall significant effect due to size of group (F = 11.55, df = 8,3, $p < .05$). Step-down F values presented in Table 8 show that significant effects were noted between sessions at two points: when sessions one and two had been covaried out of the analysis and when sessions one to five had been covaried out ($F_{(2-3)}$ = 10.60, $p < .05$; $F_{(5-6)}$ = 10.04, $p < .05$). These results indicate that changes occurred in these data between sessions two and three and sessions five and six which were not accounted for by the variance in previous sessions. By reference to the covariate adjusted treatment means (presented graphically in Figure 10) it may be seen that there was a divergence of mean scores from session two to three, and a convergence from session five to six. After session two those subjects receiving direct rewards in pairs increased their level of correct responses while those subjects receiving direct rewards in groups of eight decreased their level of correct responses. A similar change may be noted from session four to five, although this was predicted from

Table 7

Changes in group means for number of letters correct over sessions for phases B and B_1; groups vs pairs, direct reward subjects only

	B sessions								B_1 sessions							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Subjects in Groups of eight	5.17	6.17	7.25	7.58	9.33	8.08	10.66	8.50	7.50	7.66	7.08	7.08	6.67	6.75	6.58	7.[illegible]
Subjects in pairs	4.83	6.08	6.42	7.83	7.67	7.17	8.00	9.17	9.00	8.33	8.75	8.33	9.58	8.67	8.00	8.5[illegible]

Table 8

Analysis of variance with repeated measures for level of correct responses, subjects in groups of eight *vs* subjects in pairs, B - B_1 (sessions 1 to 8 during B covaried out of the analysis)

Variable(=Session in B_1)	Step-down *F*	*p*
1	3.459	.092
2	.540	.481
3	10.602	.012
4	2.657	.147
5	2.342	.177
6	10.041	.025
7	2.588	.183
8	.027	.879

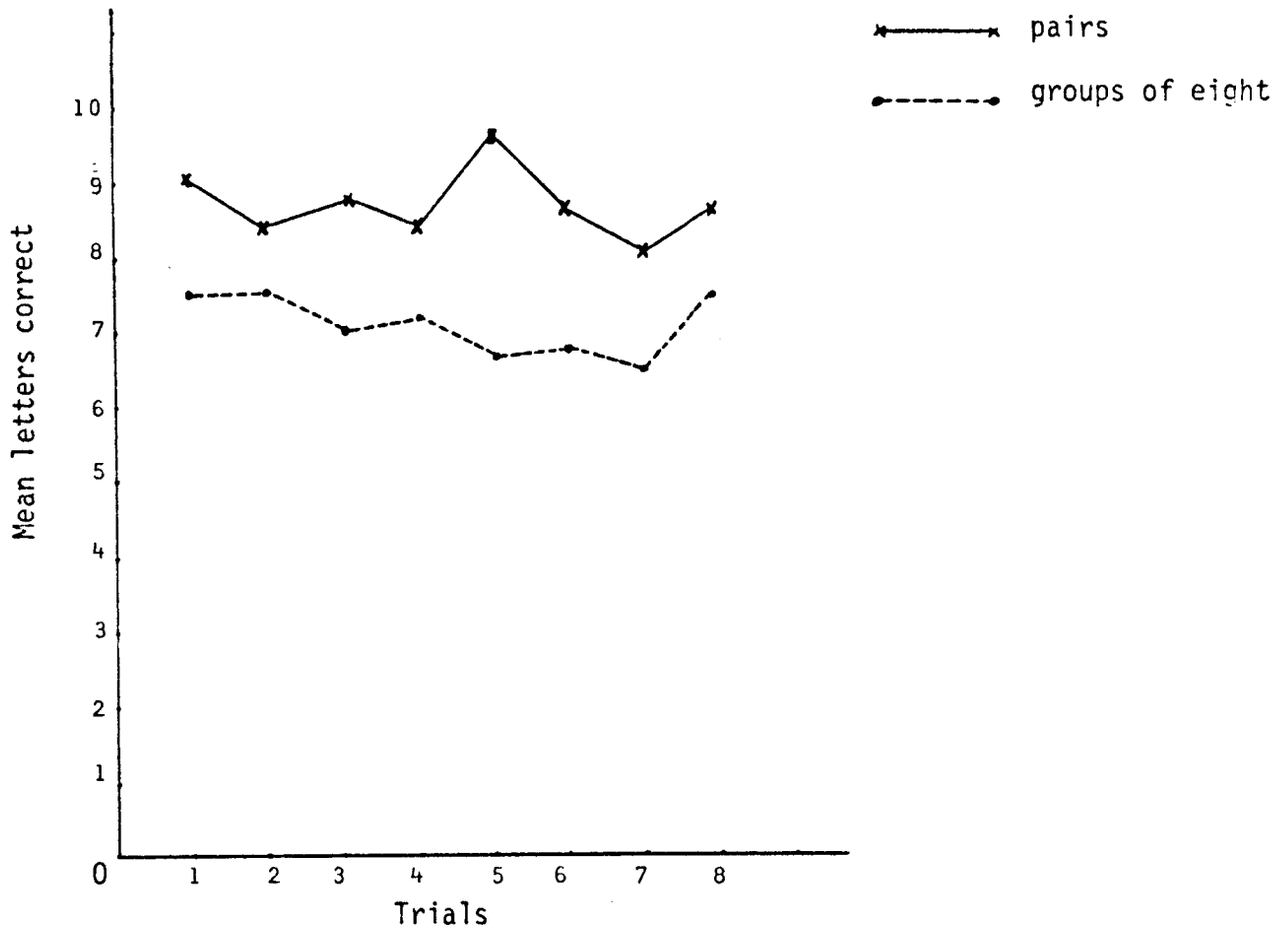


Figure 10: Covaried estimated means for pairs vs groups of eight, direct reward subjects during phase B_1

previous scores and therefore it is not surprising that the F value here did not reach significance. A reversal of this trend occurred following session five and was noted as a significant change in data not accounted for by previous scores. After session five both sets of data follow a more similar trend than in the previous three sessions. These data support Hypothesis 4.

Hypothesis 5: There will be no significant difference according to age-group in the number of letters printed correctly from B to B_1 by those subjects receiving direct contingent rewards.

Analysis of the data relevant to this hypothesis revealed a nonsignificant outcome ($F = 1.42$, df = 8,3, n.s.). There was no significant interaction with this factor of age-level and the previously investigated group-size factor ($F = 1.74$, df = 8,3, n.s.). The difference in reaction on the main dependent variable of handwriting suggested by Piagetian theory was not found. Age level did not affect handwriting responses to implicit reward conditions by target subjects in this study.

5.45 Other data

As well as the formal hypothesis-testing of principal dependent variable data (handwriting), attitudinal responses were examined.

Questionnaire data revealed that there was a marked increase in the number of negative responses during the implicit reward conditions compared to the previous direct reward conditions. While rewards were distributed to all children (i.e.,during B, week 2), only four subjects registered discontent with the fairness of the condition. However, 29 subjects complained that the implicit conditions were unfair because of the lack of rewards for some children. A greater percentage of older children saw the reward conditions as unfair (year 1 = 18.7 per cent; year 3 = 37.5 per cent; year 6 = 60.7 per cent), with the older children being far more definite regarding reasons why this was so (e.g., "Because we don't get our

writing sheets back"). Suggestions as to changing the reward conditions to make them fairer (e.g., "Give us all our sheets back"), and who was responsible for the perceived unfairness ("the lady who marks the writing") were also more definite amongst the older subjects. Although attribution theory is not considered as playing a central role in explaining the unexpected responses of targets during B_1, the data from this questionnaire do indicate that there was a marked tendency for older children to signify their attribution of causality regarding the unfair (implicit) reward condition to a person in comparison to the younger children.

The number of comments and complaints increased sharply from the first direct reward condition to the implicit reward condition (B = 7; B_1 = 235). The final direct reward condition registered few comments and complaints (6) except from the year six "groups" subjects (i.e., 64t, 64p) some of whom (n = 3), although they had not verbalized their negative reactions to the experimenter, refused to attend the final session, preferring to play with other children.

Although statistical analyses of the data collected on the principal dependent variable did not indicate significant differences between age groups, the attitudinal data (plus the unsolicited truancy in 64t and 64p) do indicate some differences according to age. Not only were the older children more fluent in their reactions to the unfairness associated with phase B_1, but some took overt action to avoid the experimental conditions during the final phase. By themselves these absences do not constitute an aversive reaction to B_1, but when combined with: a) the increase in comments and complaints regarding B_1; b) the attributional questionnaire responses of these groups towards B_1; c) the downward movement in correct handwriting responses by these groups during the final B phase (64t; $\underline{t}$ = -.44, df = 12, n.s.; 64p: $\underline{t}$ = -1.71, df = 12, n.s.), there does appear to be movement towards age differences in terms of reaction and dependent variable responses.

Return to direct reward conditions

The reintroduction of direct contingent rewards for all subjects during the final (B) phase of the study was designed to clarify the cause of response decrements during B_1. Without this reintroduction of previously reinforcing reward-administration procedures, the downward shift noted during B_1 may be interpreted as due to satiation effects. Figures 8 and 9 (pp. 93,95) dispute this satiation interpretation by showing the overall rise in response levels by both direct and implicit reward groups from intervention 1 (B) to intervention 3 (B) (direct: t level = 5.11, df = 12, $p < .05$; implicit: t level = 6.86, df = 12, $p < .05$). The reintroduction of direct reward procedures thus had a reinforcing effect upon subjects' response levels. The isolation of the B_1 phase response decrement therefore points to a powerful and isolated effect due to implicit reward conditions.

5.46 Summary of results

Data were collected over all four phases of the study at acceptable levels of reliability, both in terms of inter-scorer and post-check agreement. The reinforcing power of the chosen reward was demonstrated during both the direct-reward-to-all-groups phases (i.e., B in weeks 2 and 4). There was a uniform decrease in response levels for all subject groups during Week 3 (B_1) which was reversed during Week 4 (return to B). Significant differences according to group-size were found for direct reward groups on the principal dependent variable, with pairs scoring lower during B_1 than groups of eight. No significant differences in response levels were noted among these subject groups according to age, although attitudinal data revealed some differences in reaction to the unfair conditions of phase B_1.

5.5 Main Study 1: Discussion

Following baseline data collection, a clearly significant increase in the level of correct handwriting responses occurred in all subject groups with the introduction of the reward. These results were consistent with a typical operant paradigm in that the task response had been significantly altered as a result of consequence variation. A similar theoretical model applied to the testing of Hypothesis two. Decreases in response levels by those subjects who were undergoing the extinction process of a no-reward phase (following the reinforcing phase B during week 1) were predictable from an operant viewpoint. However, the decrease in responses by those subjects who were still receiving the same rewards during week 2 as during week 1 (and later during week 3) challenges an obvious operant explanation and supports the social learning position. This uniform decrease in correct responses during B_1 by both those subjects who were undergoing extinction conditions as well as those who were still being rewarded argues for the presence of a powerful extinguishing factor(s) during phase B_1. As a test of the extinguishing properties of the implicit reward condition, these data have replicated the earlier study (Sharpley, 1978). These extinguishing properties are not exclusively related to either in-classroom or teacher-as-consequence-giver situations. Relating back to the Rationale chapter (p.57), the extinguishing effects of implicit reward conditions were transferable to a non-classroom situation and therefore were not "caused" by the "social" variables present within a typical classroom or operating when teachers alone administered the rewards. The implicit reward condition in itself appears to possess extinguishing properties which can generalize across some environments.

When the data are examined from the viewpoint of the Equity theory tenet which suggests that size of group will affect reaction to the inequitable situation encountered during implicit reward conditions, results

support the hypothesized relationship. Subjects in large groups had significantly lower scores than subjects in pairs during B_1. The earlier result implies (within an Equity theory framework) that there was some attempt by targets to compensate for the unfair treatment of the peers in terms of reward-availability. This action fits into one of the methods which Adams (1965) suggests are used to restore equity: "Persons alter their inputs - decreasing them if inequity is disadvantageous to them." (see p. 47 above) While the actual reward-occurrence was not disadvantageous to the target subjects (i.e., those receiving direct rewards during B_1), the consequences of accepting and continuing to perform in such a way as to earn more rewards were disadvantageous - they would be seen as unfairly prospering while their peers did not. The effect of this social interaction condition upon target subjects' responses is verified by the significantly lower correct response level from those subjects who were in a large group than those who were only in pairs. When more children were witness to the unfair advantage which targets were receiving, the performance of targets decreased significantly more than when only the one disadvantaged peer was present. These data imply stronger social pressure upon targets when more children were present.

Regarding age or moral judgment differences, none were significant for the target subjects. However, the attitudinal data collected do indicate differences between the three age-levels in regard to judgment of and comments upon the inequitable conditions of B_1. Although not in the direction suggested by Piaget (i.e., with most anti-reaction to peer unfairness being noted with the year three children), there were differences in responses between years. The older children (year six) responded more vocally and dramatically to the unfairness of B_1, perhaps because of expected cognitive-maturation differences. In themselves these data may indicate that more cognitively developed children are clearer in their

understanding of reward conditions : this is not unexpected. The null-hypothesis (i.e., Hypothesis 5) was supported by significant differences according to age-group in the number of letters printed correctly from B to B_1.

In terms of the theoretical positions discussed in earlier chapters, these data have a number of implications. First, a purely operant explanation of the datais unsuitable because it does not account for the decrease of targets' performance on the principal dependent variable during B_1. Second, the social learning framework has received some verification by the implication that subjects apparently did make internal judgments regarding the reward procedures. Third, Equity theory's suggestion regarding group size has been seen to hold in this study. Fourth, there have been no definite results which support Piagetian notions of justice-development.

In summary, while each theoretical perspective has received some support from data collected in Main Study 1, there has been no clear cut and mutually exclusive decision made as to which theory best explains implicit reward effects. With this in mind, the next stage in this investigation was planned to return to the variable of sequential order of presentation of the implicit reward phase as an issue for empirical measurement. The plan of investigation shown in Figure 4 and reproduced overleaf, indicates that Main Study 2 (Stage C) was designed to follow the issue of sequential order plus that of free-talk between subjects -- discussed in the following chapter.

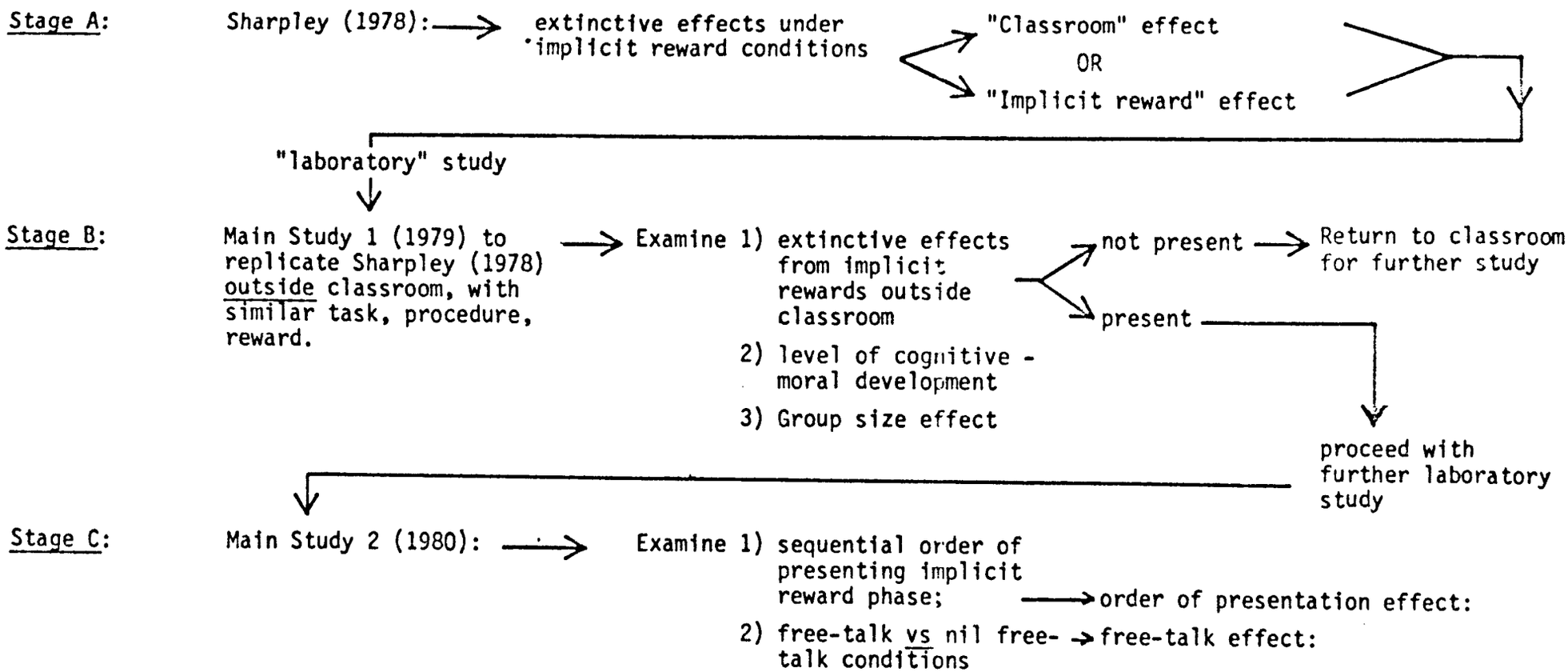


Figure 4: Plan of investigation

CHAPTER 6

RATIONALE - MAIN STUDY 2

CHAPTER 6

RATIONALE - MAIN STUDY 2

6.1 Introduction

As discussed above (p. 105) the inadequacy of each of the relevant theoretical positions to account for the noted extinctive effects associated with the implicit reward condition leads to a more searching examination of the factors which have been associated with these extinctive effects. By examining the experimental conditions which have accompanied the theoretically unpredicted extinction responses by target subjects, theoretical models may emerge. This chapter reviews the dependent and independent variables which arise from both the Plan of Investigation (Figure 4, p. 106) and the preceding Study 1. While the dependent variables remain virtually as in the previous study, between-session time and temporal position of the implicit reward phase are included in this second main study as major areas of investigation.

6.2 Dependent variables

6.21 Handwriting

The same copying of letters task was used as in Main Study 1.

6.22 Subject-evaluation of the reward conditions

The previously-used ongoing record of comments and complaints was used during all sessions of this study to measure informal subject-reactions to the reward conditions.

6.3 Independent variables

6.31 Direct/implicit rewards

No change was made in the definition of this variable.

6.32 Between-session time

In both the previous study (Sharpley, 1978) and Main Study 1 of this research, ample time was available between sessions (and phases) for subjects to reflect upon and discuss with each other the reward-

conditions. If, as is suggested by an Equity theory position, the "social pressure" of peers was a contributing factor to target-subject performance decrement, the opportunity afforded for "social pressure" to build was heightened by the time interval between sessions. It may be that the minimization of this between-session time (and therefore the opportunity for conversation and the building of "social pressure") could reduce performance decrement by target subjects. Since it was the actual freedom to discuss experimental conditions which was suggested as the effective factor, the next study was designed to minimize the time between sessions. Two conditions were utilized: nil free conversation vs free conversation time. Both of these were to be incorporated within a much shortened overall experimental time so that sessions were separated by only five minutes. For one set of subjects, there was to be a structured exercise between sessions with the experimenters present so as to prevent subject-discussion of the reward conditions. (This activity was piloted in a small study described below.) For the alternative set, experimenters were to allow subjects free conversation.

6.33 Temporal position of the nil-reward conditions

The two previous studies conducted (Sharpley, 1978; Main Study 1) were structured so as to present the peer subjects with a nil-reward condition after the presentation of a direct contingent reward condition (i.e., A B B_1 B, where B_1 = B for targets, A for peers). As defined by Skinner (1938, p. 21) this constitutes an extinction condition:

> The Law of Extinction of Type B *(conditioning)*. If the occurrence of an operant already strengthened through conditioning is not followed by the reinforcing stimulus, the strength *(i.e. the likelihood of the operant response recurring)* is decreased. (italics this author)

Kazdin (1980, p. 38) adds that "extinction refers to the cessation of reinforcement of a response", and suggests that this cessation of reinforcement will result in a decrease and eventual disappearance of the response. The experimental model used earlier in this research incorporated just such extinction conditions. However, the other research reviewed earlier (see section 2.32) did not. It is relevant to question whether the presence of the nil-reward condition for peers *per se* acts as an extinction condition for targets, or whether the presentation of the nil-reward condition for peers must constitute an extinction condition for the peers in order to act as an extinction condition for targets.

The following experimental design enabled comparison of the nil-reward-as-extinction vs the nil-reward-per se conditions.

	Condition 1	Condition 2
Targets	A B B	A B B
Peers	A B A	A A B

Condition 1 is abbreviated as A B B_1, condition 2 as A B_1 B.

6.4 Population

The subject population was chosen from the pool of all primary age children of ages C.A. 8-9 in a typical school. No children from special classes or schools were used, and no children were coerced into participation. No other criteria were used in selecting subjects. The rationale for choosing children from age-group 8-9 was simply because these were the oldest and most easily managed age-group which still used printing as its main form of handwriting. Since no age differences were found in the Main Study 1, comparisons between other age-groups were not included in this study, thus enabling the sample used to be homogenous according to age and developmental indices.

6.5 Design

As mentioned above (p.103) the design was similar to that of the previous study. The final direct-reward-to-all-groups phase was eliminated for logistic reasons-- all phases were to be carried out in one sequence. The inclusion of this final phase in the previous study was to enable the power of the reward as a reinforcer to be re-established. Since this was shown in the previous study, it was not included again. However, because trials were to be presented much more closely in time than previously, extraneous effects due to boredom or fatigue needed to be eliminated as much as possible. One method of accomplishing this was to minimize the number of trials within each phase. Both the relevant literature (Kazdin, 1980; Sulzer-Azaroff & Mayer, 1977; Journal of Applied Behavior Analysis) and the experimenter's own clinical experience suggested that five trials per phase could enable stable measures of performance to be taken. This change in design was piloted in a small study described in chapter 7.

6.6 Research questions

(a) Between-session conditions were manipulated so as to allow free conversation in one of the groups. Effects due to this variable were measured by testing the following hypothesis.

Hypothesis 1:

There will be a significantly greater decrease in the number of letters written correctly by target subjects from the free conversation group than by target subjects from the nil-free conversation group during the implicit reward phase (B_1) for those subjects in condition 1 (i.e., ABB_1).

(b) Temporal order of nil-reward-to-peers phase was suggested as a major independent variable. In order to determine if the extinctive effects on target subjects would be differentiated by the order in which the nil-reward phase was presented to peers, the following two hypotheses were generated for testing.

Hypothesis 2 (a):

There will be a significant decrease from B to B_1 in the number of letters written correctly by target subjects under condition 1.

Hypothesis 2 (b):

There will be no significant decrease from A to B_1 in the number of letters written correctly by target subjects under condition 2.

Both of these hypotheses must be accepted for the postulate to be verified.

Presented below, the experimental conditions may be seen as comparisons in Figure 11.

	Condition 1			Condition 2		
	A	B	B_1	A	B_1	B
free conversation time	targets		peers	targets		peers
nil conversation time	targets		peers	targets		peers

Figure 11: Experimental design, Main Study 2

CHAPTER 7

MAIN STUDY 2

CHAPTER 7

MAIN STUDY 2

7.1 Introduction

In order to determine if the introduction of new experimental conditions within the second main study would produce effects extraneous to the basic experimental paradigm from Main Study 1, a small preliminary study was conducted. Several new variables were tested to determine their effect upon the reinforcer-power of the rewards used previously and planned for use in Main Study 2. These variables are described below (7.21 to 7.27) and data from this preliminary study are presented. These data indicated that the procedures used were appropriate for inclusion in Main Study 2.

The second main study is described, with data presented for consideration and discussion. In terms of explaining the difference in results from other studies and those previously conducted by this author, a major finding emerged from this second main study.

7.2 Preliminary study for Main Study 2

Several innovations in procedure were included in this study. Because these represent more directly the foci of the second main study, this preliminary study is reported here rather than in an appendix as were the previous series of preliminary studies for Main Study 1.

7.21 Time between trials

The initial study (Sharpley, 1978) was carried out with one trial daily; the first main study of this series used two trials daily; the second main study was designed to have only 5-6 minutes (exact time to be determined by the pilot study) between trials, and to conduct all trials in one day. The latter procedure was trialled to determine if fatigue due to repeated trials within a shorter period than that used in the previous studies would adversely influence subjects' performances. Second, the actual time necessary for scoring subjects' writing sheets

needed to be determined so that the overall time necessary for the study could be estimated.

7.22 Design

Although the inclusion of a continued-reward condition (i.e., ABB) did not represent a departure from previous designs, the question of boredom due to repetition of the task, or satiation of reward leading to performance decrement (because of the shorter time between trials) needed to be answered at this point.

7.23 Between-trial activity

As suggested in the Rationale for this study (p.109)the free/nil free conversation time treatment was to be a major inclusion. Piloting of the suggested activity which was to prevent the conversation (free private reading) was thus carried out to ensure that this activity could be adequately supervised and did effectively maintain nil free-conversation between subjects.

7.24 Statistical analyses

The use of time-series analysis of operant data has been argued above (pp.78,79and elsewhere (e.g., Glass, Willson & Gottman, 1975), but the present study altered the previous design characteristics by reducing the number of trials per phase to five. There are some minor cautions to be observed in correctly identifying the data model from CORREL output with fewer data points, and the reliability of this procedure needed to be established prior to experimentation in main study two. Glass (1980, p. 2) suggests that, in correctly identifying the ARIMA model, "the value of d is critical, and sometimes one knows it almost a priori and it doesn't matter how long your baseline is." He suggests that one's "confidence - based on these n points or past experience or independent knowledge of the situation" is the critical factor in correct allocation of d to the model. Glass goes on to add that, once d is correctly estimated, changes in p or q values do not change significance outcomes. The inclusion of 10 subjects as the data pool for each contrast within the planned time-series analysis

for the second main study and the calculation of group means as input points for time-series analysis lends stability to the data obtained from five observation points, as well as the "past experience and independent knowledge" of this sort of data arising from the previous studies in this research. (It is also worth noting that at least one set of authorities in this field has analysed and published time-series analysis when using only three data points in one of the phases (Jones, Vaught & Weinrott, 1977).) The use of the time-series statistic was therefore trialled with data from this preliminary study.

7.25 Method

7.251 Subjects and Setting

Subjects were two girls and two boys from grade four of a typical primary school (this school had not previously provided subjects nor was planned for future use) in a large country town. The children's ages were 9.5, 9.8, 10.3, 10.5 years), and were reported by the teacher as "average" children with no obvious academic or personal difficulties. The children were chosen from a class which was composed of boys and girls of ages approximating Piaget's second stage of cognitive moral development. As discussed earlier (section 6.3) there were no comparisons to be made in this study with other age-groups. The teacher was asked to choose two girls and two boys at random "to practise their handwriting".

The study was carried out in a small room next to a library. The conditions of seating and presentation of the stimulus were as in Main Study 1. The author acted as experimenter.

7.252 Data-collection procedures

These were identical to main study one, except that five trials were implemented for each phase. Stimulus sheets, response sheets, and scoring were as in the previous study. Rewards used were also the same as previously.

7.253 Experimental conditions

All children received the same conditions.

A-Baseline

Handwriting was recorded for each subject over the five sessions of this intervention, with the experimenter's only comment being "Thank you" as the individual pieces of writing paper were collected. Any questions were politely answered in a non-commital fashion.

B-Intervention

During this direct-reward-to-each-subject phase, each child received their previous session's writing sheet back with the appropriate response as used in the previous study. After perusal of this sheet for about 10 seconds, children were given a blank sheet and asked to copy the next stimulus sheet onto it. Both sheets of the children's writing were collected at the end of the session.

Between-trial activity

The children were instructed to read quietly to themselves and not to talk between trials. Every child carried out these two instructions.

7.26 Results

Data appear in Table 9 and Figure 12, and indicate marked increases in the mean number of letters written correctly from baseline to the first five intervention trials. There was a slight drop from trial ten to trial eleven, although these were presented as an ongoing extension of previous intervention trials and no experimenter-comment was offered at this point. However, if Table 9 is examined, it is obvious that this drop in mean performance is due to an apparently random fluctuation in subject one's scores only. A similar random drop in the same subject's scores is noted at trial seven. None of the other three subjects showed similar drops and it may be concluded that these fluctuations represent random lapses of concentration in this subject. These are partially

Table 9

Individual and mean number of letters correct over all sessions

all subjects, preliminary study for Main Study 2

	Trials														
Child	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 male	12	5	9	7	13	11	5	11	15	17	8	9	12	11	14
2 male	1	0	0	0	0	0	4	4	4	9	11	10	11	12	12
3 female	15	6	13	5	9	17	19	17	19	20	20	19	21	22	23
4 female	18	20	19	16	18	18	20	24	26	26	25	26	24	26	25
$\bar{X}$ =	11.5	7.75	10.25	7	10	11.5	12	14	16	18	16	16	17	17.75	18.5

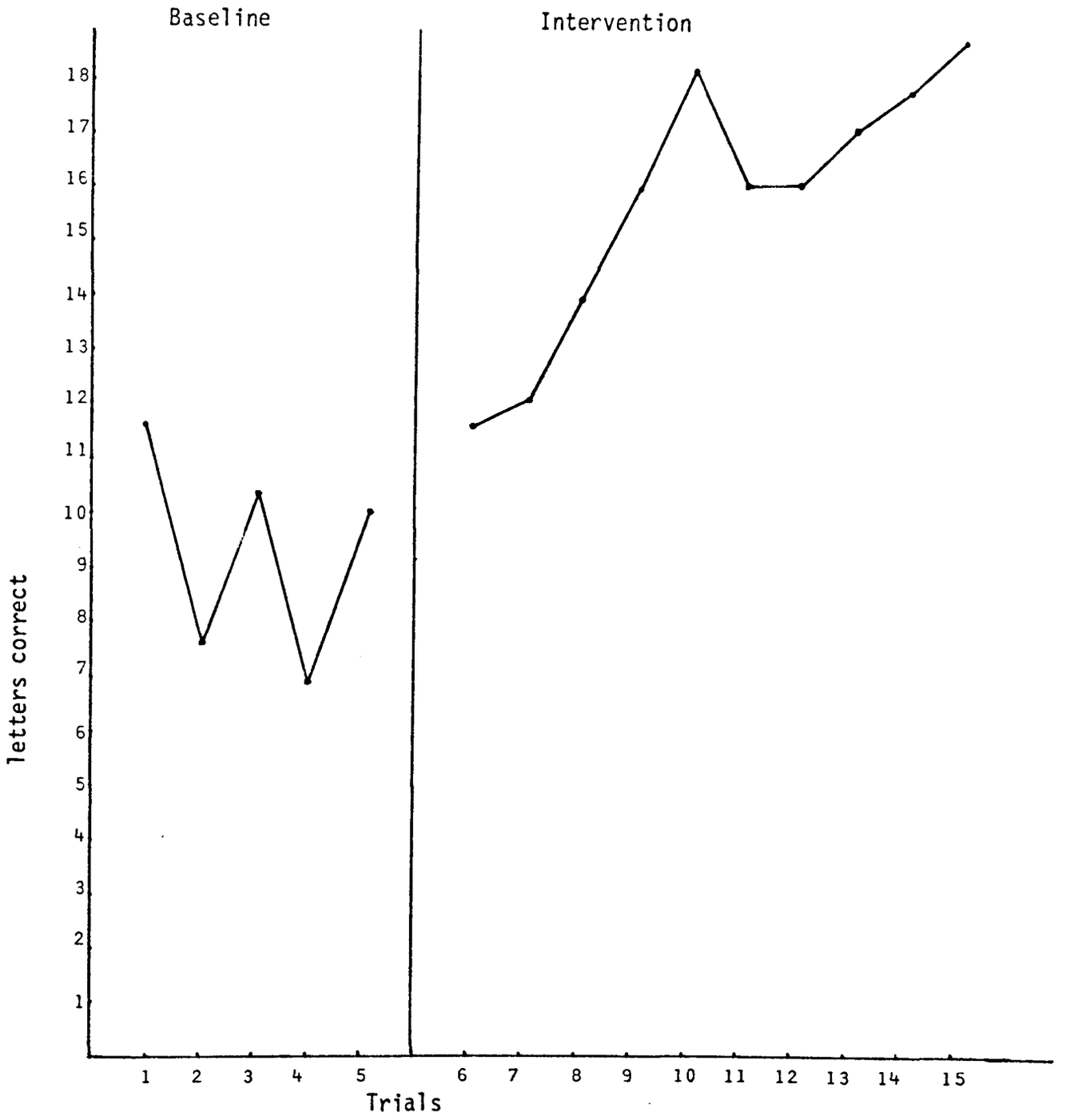


Figure 12 : Mean letters correct over all trials, preliminary study for main study 2

occluded by the other subjects' performances, and were judged likely to prove insignificant with the larger sample sizes planned for Main Study 2.

Time-series analysis of these data revealed the following results.

1. Significant increases in letters correct from baseline to intervention 1-5 : $\underline{t}$ (level) = 2.46, df = 6, $\underline{p} < .05$; $\underline{t}$ (slope) = 8.97, df = 6, $\underline{p} < .01$.

2. Nonsignificant changes in level from B (6=10) to B (11-15): $\underline{t}$ (level = 0.00, df = 6, n.s.

3. Significant slope changes from B (6-10) to B (11-15): $\underline{t}$ (slope) = 6.86, df = 6, $\underline{p} < .01$.

When these results are considered with Figure 12, several points emerge. First, although there were fluctuations between data points within baseline, the overall stability of these data enabled differencing (d) to be possible. Second, significance-testing verified conclusions drawn from visual inspection of the data for comparisons from A to B. Third, B (6-10) was not significantly different in level from B (11-15). Fourth, although slope changes were noted from B (6-10) to B (11-15) these were not in a different direction but at a different angle within the same direction: correct responses were still increasing at B (15), even if at a slower rate. In itself this is not surprising, bearing in mind that the scores obtained during B (10-15) probably represent the near ceiling of these children's ability on this task.

As a further test of these differencing procedures, Glass' (1980) advice was followed and alternative values for $\underline{p}$ and $\underline{q}$ were inserted into the ARIMA model. There were only minor changes in results, none of which altered previous significance figures, indicating that reliable differencing procedures had been performed. These results enable the use of five data points of group mean scores in the study as representative of phase-responses.

7.27 Conclusions

This preliminary study was carried out to measure effects due to several changes in procedure from Main Study 1. The following conclusions emerge:

1. There were no noted effects due to fatigue which may have arisen as a result of repeated trials within a shorter period than previous studies.
2. The time necessary to score four subjects' performances was approximately 5-6 minutes, and therefore trials could be carried out with only short time periods between in Main Study 2.
3. Neither boredom due to repetitions of the task nor satiation of reward were reported by the experimenter. It may be concluded that these factors did not lead to performance decrement.
4. The between-trial activity of free private reading posed no logistic problems.
5. Time-series analysis procedures appeared to be reliable with five data points per phase.

On the basis of these conclusions, it was decided to proceed with Main Study 2.

7.3 Main Study 2 : Method

7.31 Subjects and setting

Subjects were 67 children (37 boys, 30 girls) from a typical school (not used previously in this research) in a large country town. All children were from grade 4 (C.A. range = 9.0 to 10.4, $\overline{X}$ = 9.6). There were no outstanding academic or behavioural problems reported in any of the children, and all children were volunteers. The study was carried out in four normal classrooms during one morning (9.00 a.m. - 12.00 p.m.) of a typical school day. The principal, teachers, and children had agreed to the study on the basis that it would improve the childrens'

handwriting. The actual nature of the study was not revealed until after it had been carried out, although the handwriting of all children did, as promised, improve. The subjects were randomly divided into targets or peers and assigned to treatment groups.

7.32 Experimenters

There were two experimenters assigned to each condition, thus eight in all. Four of these were male, with the overall mean age being 27.1 years (range = 21 to 45). All of the experimenters were postgraduate students in special education.

7.33 Data-collection procedures

As outlined above, the handwriting task chosen for the first main study was again used as the main dependent variable. Subjects were asked to copy their names and the letters onto prepared slips of paper. According to the particular intervention strategy, all children received their papers from the previous session and the appropriate intervention response before completing the task for each session. The stimulus sheets were the same as had been used in the first study, and were presented under the same conditions (see Figure 6 of Method, Main Study 1, p. 70).

7.34 Dependent variable measures

Measures on handwriting were the same as those used in Main Study 1 (see p. 71).

7.35 Reliability

The correction of each session's responses was carried out immediately after the session by 17 independent evaluators who were naive as to the actual nature and phase of the study. These evaluators were all postgraduate students in special education who had received a minimum of 1½ hours training in use of the specified criteria and the transparent overlay as a correction method. Reliability during training was 100 percent agreement between all of the evaluators and the trainer. Post-

study checks were carried out between evaluators on one session per phase. Data regarding reliability appear in the Results section.

7.36 Procedure

7.361 Rewards

The rewards chosen were the same as in Main Study 1, i.e., feed back, improvement indicators ("Smiley" vs "Grumpy" faces), verbal praise and Smarties.

The validation of these rewards was performed during the actual study as in Main Study 1 by measuring the effects of the introduction of the reward to subjects in Condition 1 during the second phase of the study, (i.e., comparing phases A : B). Tables 10 and 11 show these data and indicate that the reward as used acted as a reinforcer of correct letters ($p < .05$).

7.362 Experimental conditions: a) Reward conditions

All children were exposed to the same reward conditions unless specified.

A-Baseline

Handwriting was recorded for each subject over the five sessions of this intervention, with the experimenters' only comment being "Thank you" as the individual pieces of writing paper were collected. Any questions were politely answered in a non-commital fashion by the experimenter.

B - Intervention 1 (Direct rewards to all subjects)

During this phase all children received their previous session's writing sheet back with the appropriate experimenter response as detailed above. After perusal of these sheets for about 30 seconds, children were given a blank sheet and asked to copy the trial's exercise onto it. Both sheets were collected at the end of the session.

Table 10

Changes in group means for number of letters correct over sessions for baseline (A) and direct contingent reward (B) conditions: subjects in condition 1 only

Condition	A					B				
	1	2	3	4	5	1	2	3	4	5
Free talk										
Targets	14.00	13.66	11.50	10.00	11.11	14.11	16.20	16.22	18.21	19.33
Peers	14.67	10.56	11.78	10.67	10.33	15.44	15.22	17.78	20.22	19.33
No talk										
Targets	13.75	15.00	13.50	11.25	13.50	19.00	18.38	22.25	21.63	22.50
Peers	11.55	14.89	13.33	11.00	11.44	16.33	18.89	19.78	23.00	22.20

Table 11

Time-series analysis of changes in response-levels from baseline to direct contingent reward conditions: subjects in condition 1 only

	level	slope
Free talk		
Targets	4.01*	10.62*
Peers	4.65*	6.33*
No talk		
Targets	6.99*	4.26*
Peers	5.42*	5.15*

* $p < .05$

B_1 - Intervention 2 (Implicit rewards)

During this phase, only half of each group received their previous session's sheet back. When questioned as to this, the experimenter replied that "The person who corrects them only gave me these ones back." That is, half of the group were experiencing the same reward conditions as during the previous phase and the other half of the group were experiencing a return to baseline conditions.

The presentation of these phases was performed as in Figure 11 (p. 112).

b) Between-session time

The division of the subject pool into targets and peers was followed by a random assignment to one of the two conversation time conditions explained above (Rationale, p. 112).

These two conditions were distinguished as follows:

-Condition A (Free conversation time): after each session's task had been completed, the children were allowed to talk quietly among themselves for five minutes but were not to begin any other work. One experimenter remained in the room as supervisor.

-Condition B (Nil free conversation time): in this condition, the interim five minutes between sessions was devoted to an activity which prevented conversation regarding the reward conditions. One of the two experimenters assigned to each of the four cells of the study remained in the room and supervised free private reading. The experimenters answered questions regarding the reading activity only and instructed children not to converse with each other.

The final allocation of subjects to the four cells of this study may be seen in Figure 13.

Conversation time / reward conditions	A B B_1 Condition 1		A B_1 B Condition 2	
Condition A	Targets	Peers	Targets	Peers
Free Conversation	n = 10 (4 boys, 6 girls)	n = 9 (6 boys, 3 girls)	n = 8 (5 boys, 3 girls)	n = 9 (6 boys, 3 girls)
Condition B	Targets	Peers	Targets	Peers
Nil Free Conversation Time	n = 8 (5 boys, 3 girls)	n = 9 (4 boys, 5 girls)	n = 7 (4 boys, 3 girls)	n = 7 (3 boys, 4 girls)

Figure 13: Allocation of subjects to experimental conditions, Main Study 2

7.363 Statistics

Because the analyses necessary to test data were essentially the same as in Main Study 1, the same two procedures were used--i.e., time-series analysis and repeated measures analysis of variance.

7.4 Main Study 1 : Results

7.41 Reliability

As mentioned above, interscorer reliability was maintained by the procedure used in training a large group of scorers (17) to correct each session's writing sheets. Prior to scoring data from the study, each scorer received training from the author until there was 100 percent agreement between all the scorers and the trainer. As an additional check on reliability, scorers were given children's sheets on a random basis for each session, thus ensuring that no single child's responses were biased by being scored by only one scorer for all sessions. Finally, 50 sheets were chosen at random and rescored by the author after the study.

Reliability was .961, which maintains the high level of Main Study 1. The scoring procedure is therefore generalizable across conditions and consistently dependable over the total span of the study.

7.42 Data from the study

Graphed representation of session-by-session group means are shown in Figure 14 (a) to (d). As for Main Study 1, statistical analysis of these data was firstly carried out by time-series analysis. These analyses will be presented in order of the cells depicted below.

	A B B_1	A B_1 B
free conversation time	1	3
nil free conversation time	2	4

Cell 1 : ABB_1, free talk (Figure 14 (a))

Both target and peer subjects' responses were decreasing during baseline, but showed significant increases in level and slope during phase B ($p < .05$: these results have been presented in Tables 10 and 11, p.124). The rewards thus acted as reinforcers for correct handwriting responses during this phase.

However, data from phase B_1 indicate that there were downward trends in the number of correct responses for both targets and peers during this phase (targets: t slope =-9.14, df = 6, $p < .05$); peers: t slope = -8.67, df = 6, $p < .05$). Level changes were not significant (targets: t level = -0.09, df = 6, n.s.; peers: t level = -0.79, df = 6, n.s.). This cell represents a replication of Main Study 1 in design and results.

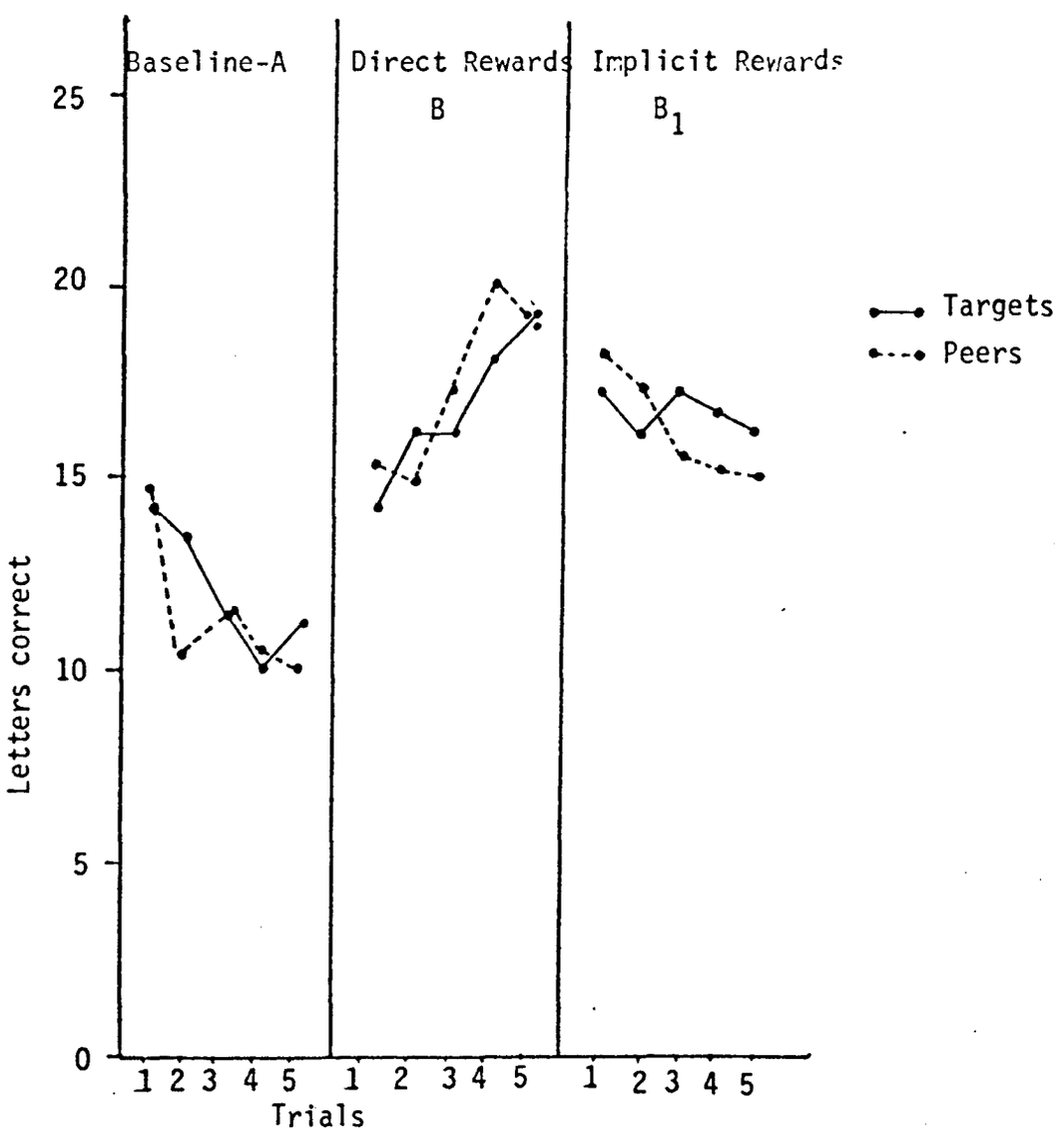


Figure 14(a): Mean letters correct over phases ABB_1, free talk condition

Cell 2 : ABB_1,nil free talk (Figure 14 (b))

Similar results were noted in this cell as in Cell 1. There were significant ($p < .05$) increases in level and slope for both targets and peers from A to B (see Tables 10 and 11), followed by downward trends in correct response levels during B_1 (targets: t slope = -6.38, df = 6, $p < .05$; peers: t slope = -4.86, df = 6, $p < .05$). Level changes did not reach significance in this group also (targets: t level = 1.30, df = 6, n.s.; peers: t level = 0.28, df = 6, n.s.).

Cell 3 : AB_1B, free talk (Figure 14 (c))

Following a decreasing performance of correct responses during A, both target and peer subjects increased in either level or slope or both, for correct responses during B_1 (targets: t level = 1.94, df = 6, n.s.; t slope = 2.48, df = 6, $p < .05$; peers: t level = 2.60, df = 6, $p < .05$; t slope = -4.39, df = 6, $p < .05$). This is a reversal of the results from Cells 1 and 2, and constitutes a major finding which will be discussed later. The application of direct rewards for all children during B led to significant increases in the level of correct responses for both targets (t level = 2.91, df = 6, $p < .05$) and peers (t level = 4.40, df = 6, $p < .05$), thus demonstrating that the reinforcing power of the rewards used had not been sufficiently negated by the previous implicit reward phase to cause significant level decreases. Slope data revealed no significant change (targets: t slope = -1.32, df = 6, n.s.; peers: t slope = 1.12, df = 6, n.s.).

Cell 4 : AB_1B, nil free talk (Figure 14 (d))

Results for this cell again did not reflect the decrease in level or slope of correct responses by target subjects during B_1 that was evident in Cells 1 and 2. Peer and target responses for this cell were not as similar as those in Cell 3, but instead parted after trial 5 of A. For targets, the receipt of rewards during B_1 reinforced correct responses

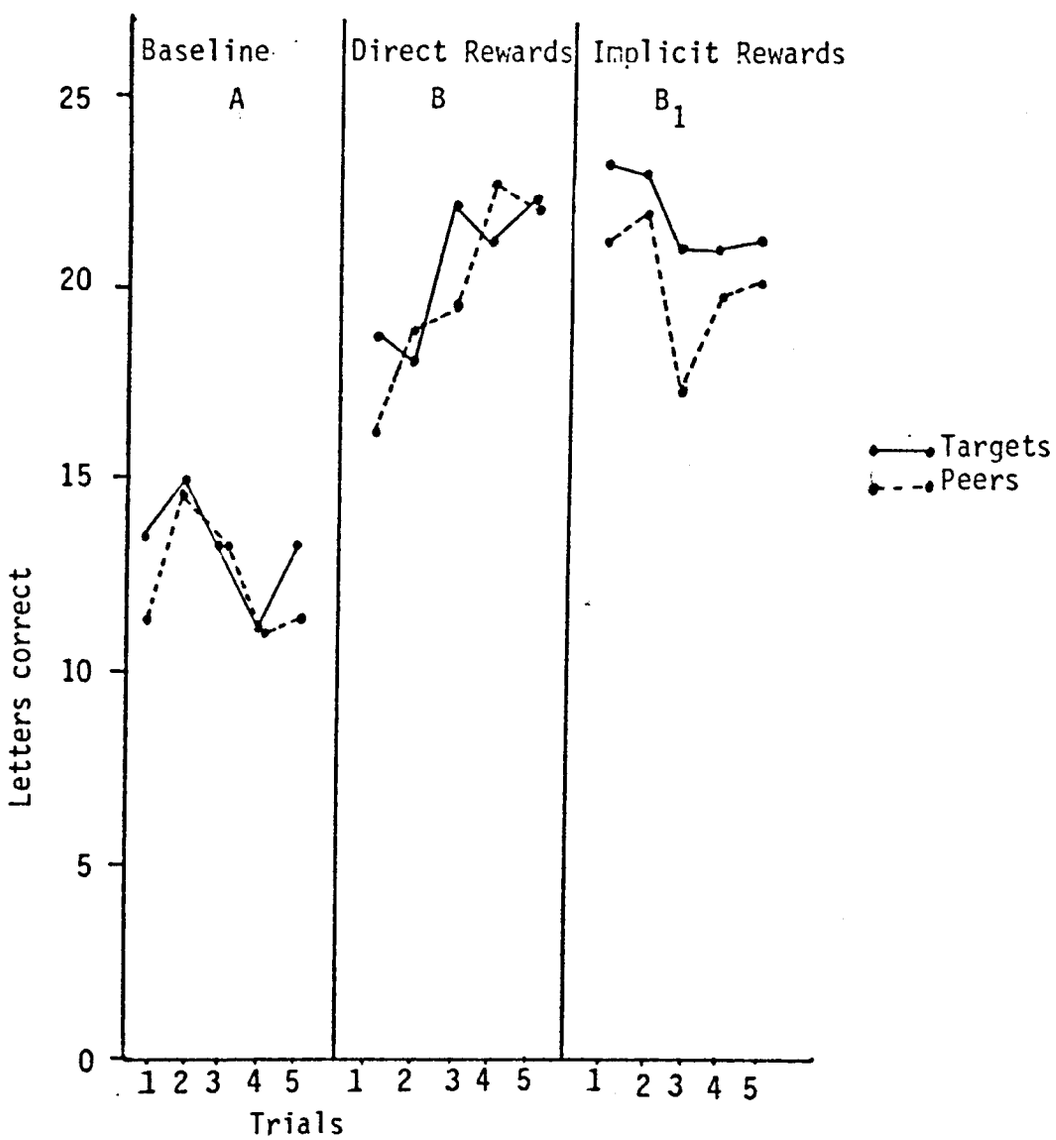


Figure 14(b): Mean letters correct over phases ABB_1, nil talk condition

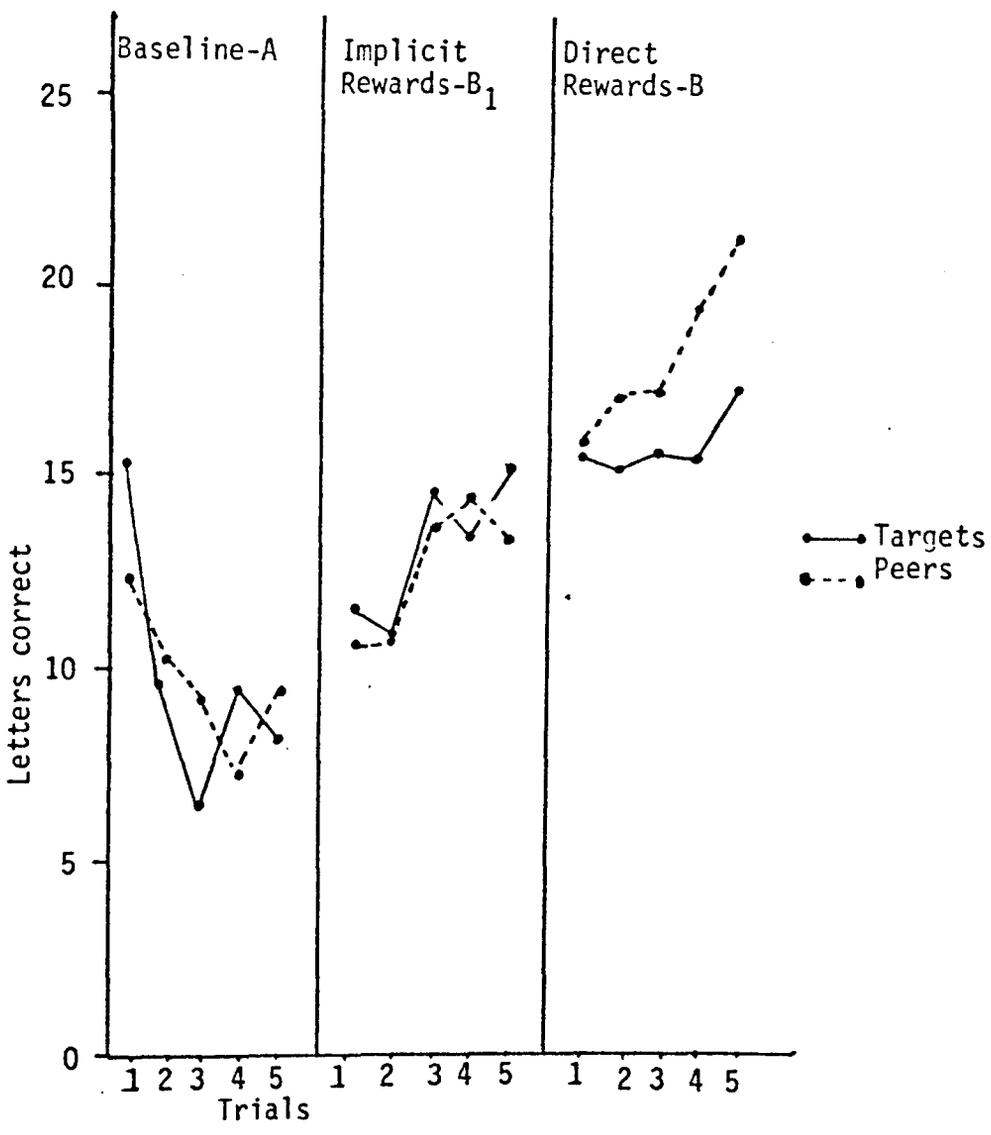


Figure 14(c): Mean letters correct over phases AB_1B, free talk condition

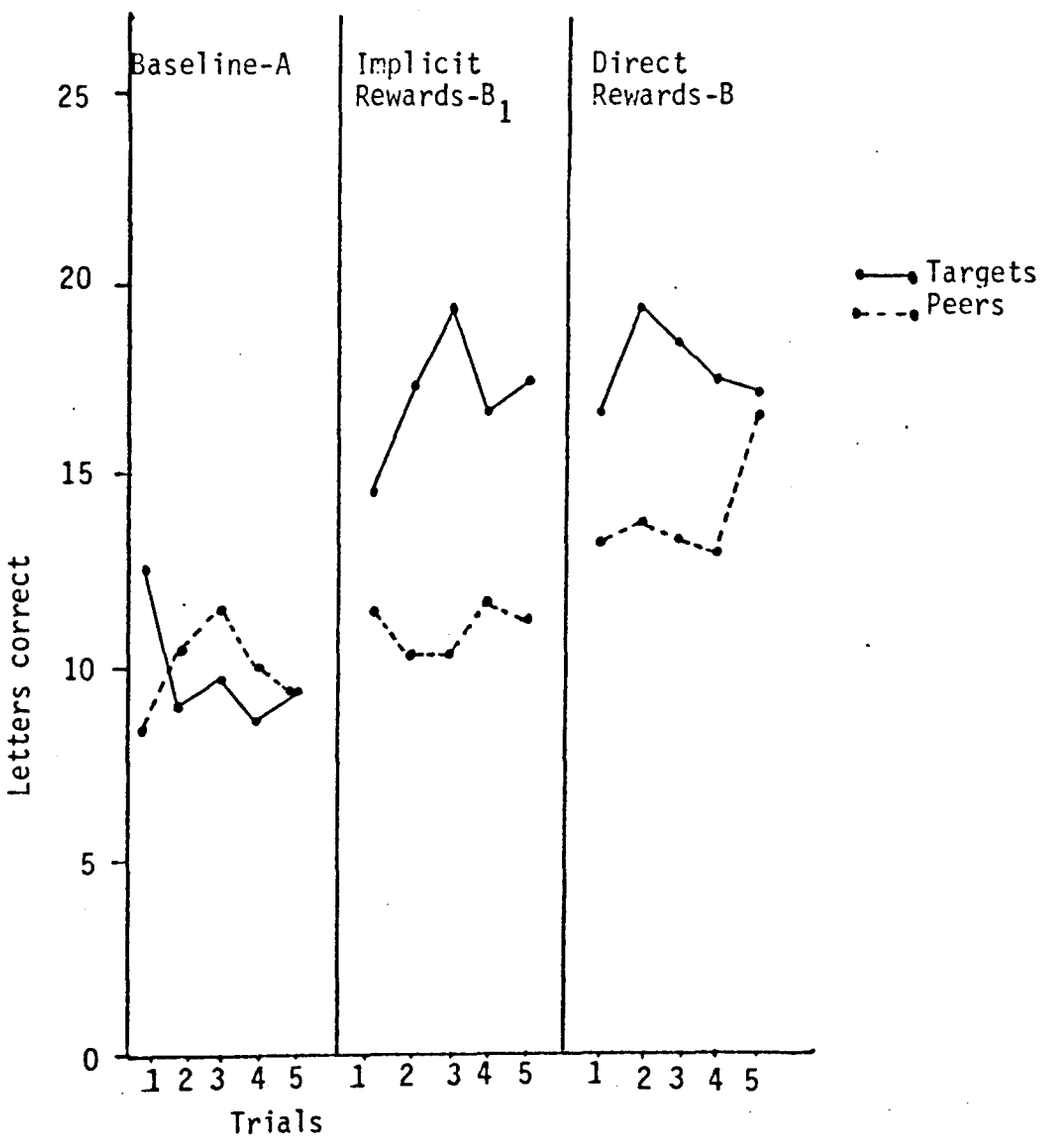


Figure 14(d): Mean letters correct over phases AB_1B, nil talk condition

(t level = 4.65, df = 6, $p < .05$; t slope = 2.19, df = 6, n.s.). Peers did not show significant changes in level (t = 1.66, df = 6, n.s.) or slope (t = 0.19, df = 6, n.s.). The introduction of rewards for peers during the third phase (B) did, however, reinforce correct responses for peers significantly (t level = 4.04, df = 6, $p < .05$). Targets maintained their previous high level (t level = 0.99, df = 6, n.s.). The rewards used can be seen to hold reinforcing power for both groups of subjects when administered directly and contingently during this no-talk condition.

7.43 Summary

1. The application of the rewards significantly reinforced all subject groups' correct letter writing responses when these rewards were applied directly and contingently to all subjects.
2. The significant decreases in correct responses for target subjects during B_1 which were noted in condition ABB_1 were not paralleled for target subjects in condition AB_1B.

7.44 Hypothesis-testing

Hypothesis 1: There will be a significantly greater decrease in the number of letters written correctly by target subjects from free conversation groups than by target subjects from nil-free conversation groups during the implicit reward phase (B_1) for those subjects in condition 1 (i.e., ABB_1).

Analysis of data relevant to this hypothesis revealed a nonsignificant outcome (F = .178, df = 5, 7, n.s.). Hypothesis 1 is therefore rejected. Lack of freedom to talk with peers did not affect the extinctive effects of B_1 upon target subjects.

Hypothesis 2 (a): There will be a significant decrease from B to B_1 in the number of letters written correctly by target subjects under condition 1.

Hypothesis 2 (a) was accepted (see Cells 1 and 2, above).

Hypothesis 2 (b): There will be no significant decrease from A to B_1 in the number of letters written correctly by target subjects under condition 2.

Hypothesis 2 (b) was accepted (see Cells 3 and 4, above).

The acceptance of both Hypotheses 2 (a) and 2 (b) affirms the theoretical postulate which suggested that the extinctive effects on target subjects would be differentiated by the temporal order of the nil-reward-to-peers phase. The presence of the nil-reward-to-peers condition does not constitute an extinction condition for targets *per se*, but must be presented as an extinction condition for the peers themselves (i.e., follow a direct contingent reward phase) in order to act as an extinction condition for targets.

To further measure the similarity of extinction effects for both targets and peers, a further repeated measures analysis of variance was performed upon target and peer data from B_1, with data from B covaried out. In neither the free-talk (F = 2.84, df = 5,8, n.s.) nor the no-talk condition (F = .84, df = 5,6, n.s.) were there any significant differences between the two groups. These results imply the presence of target performances which were not significantly different to those shown by peers who were undergoing an extinction condition.

7.45 Other data

In addition to the formal hypothesis-testing of principal dependent variable data (i.e., letters correct) some measures of students' verbal responses were examined.

Comments and complaints

Comments were similar for all groups throughout all phases of the study. The maximum variation in their number was for the AB_1B free talk group of peers from B_1 to B (12 to 19). These were recorded by the experimenters in this group as an expression of relief and satisfaction

by this hitherto unrewarded group at receiving the rewards under this phase of the study.

Complaints did vary markedly for the ABB_1 design groups, both free talk and no-talk. Table 12 shows that there were relatively small changes in number of complaints for the AB_1B design groups in comparison to those under condition 1. The changes noted under condition 1 (ABB_1) were principally from peer subjects (Free talk : 0-40; No talk : 2-22), but the target group in the no-talk condition also increased from 0 to 13. In themselves, these data represent a typical response to the doubly unfair reward-administration conditions of B_1. Peers were experiencing an extinction phase and witnessing their fellow students still being rewarded. One of the two target groups showed similar responses to peers during this phase, perhaps suggesting that the significant performance decrement on the principal dependent variable was paralleled by an attitudinal response by these subjects.

7.5 Main Study 2 : Discussion

This second major study revealed a number of facts which contribute towards a resolution of previously-noted contradictions between other research and that conducted by the author, as well as to the description of the phenomena under scrutiny.

First, the shortening of between-session time had no significant effect upon the extinguishing properties of implicit rewards when applied after direct rewards. In both of the previous studies -- Sharpley (1978), and the first main study of this research -- there were some hours between trials of the task. The reduction of this period to approximately 4-5 minutes did not affect the outcomes which were previously noted in terms of target subject reactions to peers receiving implicit rewards.

Second, the elimination of opportunity to converse, and thereby build "social pressure" as is suggested by an Equity theory position, did not reduce target-subject performance decrement during the implicit

Table 12

Complaints recorded for all groups over all phases

Group	Condition		
Free talk	A	B	B_1
Targets	0	0	1
Peers	0	0	40
No talk	A	B	B_1
Targets	0	0	13
Peers	0	2	22*
Free talk	A	B_1	B
Targets	0	0	1
Peers	0	4	0
No talk	A	B_1	B
Targets	2	1	4
Peers	1	1	7

* One child in this group refused to write any letters during the final three trials of this phase.