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ABSTRACT

The study investigated the manner in which locus of control (the degree to which an individual conceptualizes a relationship between his own behavior and the outcomes of this behavior) interacted with selected task and reinforcer variables in the performance of educable mentally handicapped boys. One hundred ninety-two adolescent males performed each of four tasks in four different reinforcement conditions. It was suggested that tasks themselves, as well as reinforcers, provided information to the individual concerning his behavior. Results were interpreted as generally supporting the hypothesis. Implications were drawn for the use of reinforcers in the classroom, the role of task interest in curriculum design, and the need to consider individual differences in motivational orientation when selecting instructional materials and methods. (CD)

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Locus of Control and Social Reinforcement in the Performance of EMR Boys

by

Philip Reiss

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Ferkauf Graduate School
Yeshiva University
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Abstract

Locus of Control and Social Reinforcement in the Performance of EMR Boys

by

Philip Reiss

The present study investigated the manner in which locus of control (LC), a personality variable, interacts with selected task and reinforcer variables in the performance of educable mentally retarded boys. LC refers to the degree to which an individual conceptualizes a relationship between his own behavior and the outcomes of this behavior. Reinforcers were considered to vary in terms of valence (positive or negative) and emphasis (approval or correctness). Tasks were viewed as providing high or low degrees of intrinsic feedback.

Performance was expected to be a function of LC, task feedback and reinforcement condition. For tasks with low intrinsic feedback, LC and performance scores were expected to be correlated in conditions of correctness and negative-approval reinforcement, while negative correlations were expected in conditions of positive-approval reinforcers. In tasks with high intrinsic feedback, positive correlations between LC and performance scores were expected in conditions

of negative reinforcement, and negative correlations were expected in conditions of positive reinforcement.

One hundred ninety-two adolescent male EMRs performed each of four tasks (marble dropping, serial learning, mirror drawing and object naming) in four different reinforcement conditions (approval-positive, approval-negative, correctness-positive, correctness-negative). Prior to performance, the Bialer-Cromwell LC scale was administered to each S. Ss were also asked to rank each task, in terms of perceived interest and difficulty, prior to and following performance. In addition, two non-reinforced periods of marble dropping were administered; analysis indicated that there were no significant differences between scores of the two periods.

Obtained correlations between LC and correct rate scores were in the predicted directions for both reinforcer dimensions only in the marble dropping task. Correlations obtained for the serial learning and mirror drawing tasks in regard to the positive-negative reinforcer dimension were obtained as predicted. The correlations between these scores for the object naming task were not in the predicted direction.

Percent correct scores were used to examine performance of Ss who completed ten minutes on a given task. Analyses of the marble dropping task indicated: (1) scores increased over time; (2) differences between scores in the two task orders were significant only in blocks 4 and 5 under conditions of positive reinforcement; and (3) scores obtained under conditions of negative reinforcement were higher than those obtained under positive reinforcement (blocks 2 through

5, first task).

Data for the serial learning task indicated significant differences between time blocks and significantly higher scores in negative than in positive reinforcement conditions (first task).

Object naming scores revealed a significant effect due to time blocks; no significant effects were related to reinforcement conditions on this task.

The next set of analyses considered percent correct scores for only the first three minutes of performance in each task. Scores increased over time and, in addition, for the marble dropping task there were significant differences between reinforcement conditions in the last time block (but not in the first).

Ratings were examined for (1) relationships between interest and difficulty and (2) shifts following performance. As expected, shifts were not related to reinforcement conditions under which tasks had been performed, except in the correctness-negative condition. The predicted negative correlation between interest and difficulty was found only in a few instances. An unexpected finding was that marble dropping was rated the most interesting task.

Results were discussed in terms of the interaction between LC, reinforcer dimensions and task characteristics. Implications were drawn for the use of reinforcement in the classroom, the role of task interest in curriculum design and possible modifications of programmed materials which could take into account individual differences in motivational orientation.

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Errata

Please note that the symbol for "less than" ($<$) has not printed clearly on the following pages: 71, 75 to 78, 80, 93 to 102, 107 to 111, 113 to 125, 128 to 132, 136 to 139, 209 to 211 and 213 to 214.

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Chapter I

Problem

It is a commonly held notion that rewards encourage and facilitate while punishments discourage and restrain. However, research has indicated that in actuality the effects of rewards and punishments are much more complex; indeed, not only may the effects vary but these variations may depend upon individual differences and situational variables. The present study investigates the manner in which one individual difference variable (locus of control) interacts with selected task and reinforcer variables in affecting the behavior of educable mentally retarded (EMR) Ss.

Locus of control (LC) is a personality construct which has been developed within the framework of Rotter's social learning theory (Rotter, 1966; Lefcourt, 1966) and which has been used to study the behavior of the mentally retarded (Bialer, 1961; Cromwell, 1963; McConnell, 1965). It refers to the extent to which an individual characteristically perceives reinforcers as contingent upon his own action (Internal LC) rather than as contingent upon chance or someone else's actions (External LC). This construct has generated research which has been helpful in differentiating the effects of positive and negative reinforcement on the behavior of mentally retarded Ss. The results of these studies have focussed attention on the role of the informational content of intra- and extra-task cues as determinants of behavior. Rotter (1966) and McConnell (1965) have pointed out the similarities between the LC construct and a number of other sociological and psychological concepts such as Seeman's concept of powerlessness, White's concept of competence and McClelland's "need for achievement".

Locus of control

> ...refers to the subjective probability that an individual's behavior determines the outcome of events, whether successful or not. That is, the construct is used to describe the degree to which an individual tends to conceptualize these events as due to chance...(McConnell, 1965, p. 89).

or due to his own efforts. An individual's locus of control may be measured by his responses to a verbal scale. Locus of control is a developmental phenomenon: the change from external (ELC) to internal (ILC) is related to increasing MA (Bialer, 1960).

ELC is a characteristic of the earlier (or hedonistic) motivational system. Such individuals are thought to be unable to conceptualize a relationship between their behavior and consequent events (such as reinforcers). Thus, they are likely to believe that these events occur due to some external machination - chance, luck or the efforts of others. Individuals who are ELC are most likely to react in terms of pleasure-seeking and pain-avoidance; that is, they are dependent upon cues which define the hedonistic quality of a situation. These cues are typically external to a given task (i.e., reinforcers). Thus, performance of ELC Ss would be expected to be improved by positive reinforcement (pleasurable) and debilitated by negative reinforcement (painful).

ILC is characteristic of the later motivational system. Individuals who are ILC are most likely to react to a situation in terms of success-approach and failure-avoidance. They have learned that there is a connection between their own behavior and subsequent events and try to act in ways which result in success (i.e., goal attainment). Such individuals are likely to respond to cues within the task which enable them to evaluate their own behavior. The later motivational system supplements but does not supplant the earlier system. If an ILC individual were placed in a situation in which the task did not provide feedback concerning behavioral effectiveness, he could use extra-task cues which convey such information. Thus, an ILC S would be expected to be relatively insensitive to reinforcers (extra-task cues). However, if such reinforcers either provided information not available from the task itself or information which conflicts with the S's self-perception, they might influence his performance.

The locus of control construct appears to offer a means of accounting for differences in the effectiveness of two classes of social reinforcers as defined by Zigler (1968).

He has proposed that social reinforcers (verbal comments) be classed as (1) approval and (2) correctness reinforcers. Approval reinforcers are statements which are directed at the child and connote praise; this category includes words such as "good" and "fine". Correctness reinforcers are statements which are directed at the performance and evaluate its quality; this category includes statements such as "right" and "correct".

Zigler (1963) suggests that approval reinforcers are more effective at a developmentally earlier stage due to their close association with parental reactions to the child. Correctness reinforcers become important as the child matures:

> He becomes ... primarily interested in obtaining mastery over his world. The motive of effectiveness becomes central, and he becomes interested in the quality of his own performance, (Zigler, 1963, p. 618).

Thus, at this more mature level, social reinforcers become important only insofar as they provide information concerning the quality of the individual's performance.

Attempts to relate the differential effectiveness of approval and correctness to such variables as age, MA and social class have produced conflicting results. The present study will attempt to use locus of control as a means of bringing order to the situation. It is suggested that ELC Ss, developmentally less mature, will be more responsive to approval than to correctness reinforcers to the extent that the former define the situation as pleasant or unpleasant. Performance of ILC Ss, on the other hand, is more likely to be affected by correctness than by approval reinforcers as the former provides information concerning behavioral adequacy.

However, at least two additional variables may affect such performance. The task itself may provide some information about the quality of performance. This information is thought to affect the performance of ILC Ss; the effects of additional information (in the form of reinforcers) also needs to be considered. A second variable concerns Ss' perceptions of the tasks (regarding interest and difficulty) and the manner in which these may be affected by the performance of a given task.

Chapter II

Review of the Literature

This chapter will review relevant literature in two areas: reinforcement effects and locus of control. The first section, dealing with reinforcement effects, enumerates variables which may affect performance on an experimental task. This section attempts to indicate the complexity of studies of reinforcer effects, highlighting some variables which may be overlooked too often (particularly task factors). Furthermore, it brings together some evidence concerning inconsistent conflicting results in studies of positive and negative reinforcers. Finally, social reinforcement studies are reviewed and social reinforcers are categorized as approval or correctness statements.

The second section discusses a personality construct, locus of control, which will be used to account for some of the reinforcer effects which are discussed in the first section.

A. Reinforcement Studies

Recent reviews of reinforcement studies involving retardates (Heber, 1964; Siegal, 1968; Watson & Lawson, 1966) indicate the state of confusion in this area. These reviews indicate the rather limited number of studies which exist and the broad range of questions which such studies attempt to investigate. Every reinforcement study involves three major events: a task, instructions and a reinforcer; each of these involves an interaction between the subject and the environment (including the E). Each of these events provides the S with some information which may guide his behavior; the focus is on the behavioral changes which may be attributed to the reinforcer. However, reinforcer effects are influenced by various facets of the task and the instructions. In order to gain precision in analyzing and constructing studies, it seemed desirable to organize the aspects of these events which may be experimentally varied. In the diagrams on the following pages, we attempt to delineate variables which may determine the information provided to the S in the experimental situation.

Figure 1 indicates the gross structure of the situation: left-to-right progression indicates the usual temporal order of the events. Thus, the initial event involves instructions. These may be of two sorts: (1) those which inform S only of what he is to do and (2) those which provide, in addition, information concerning the events which may follow the S's behaviors. The information concerning outcomes (Figure 2)

FIGURE I

DIAGRAM OF THE EXPERIMENTAL SITUATION

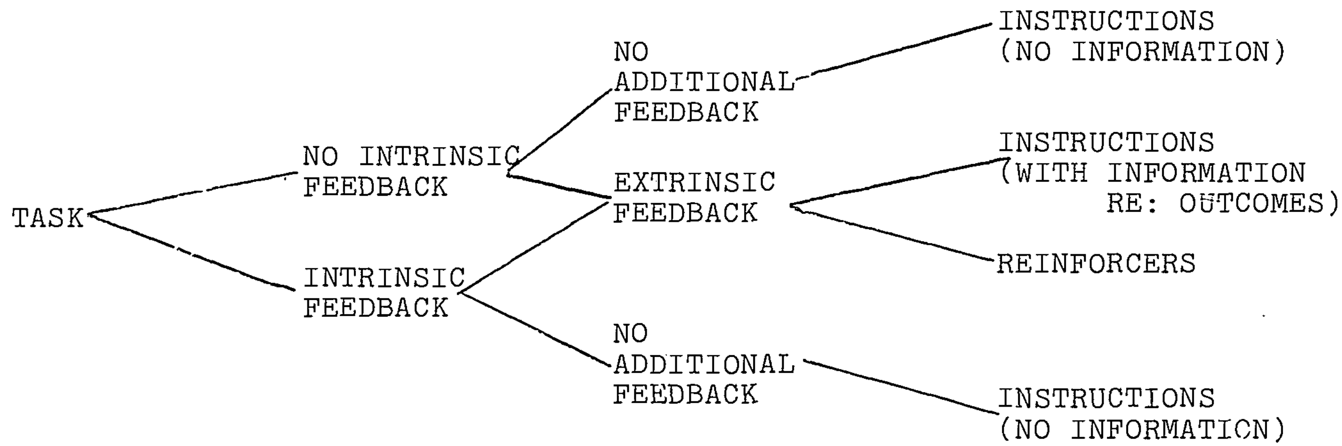
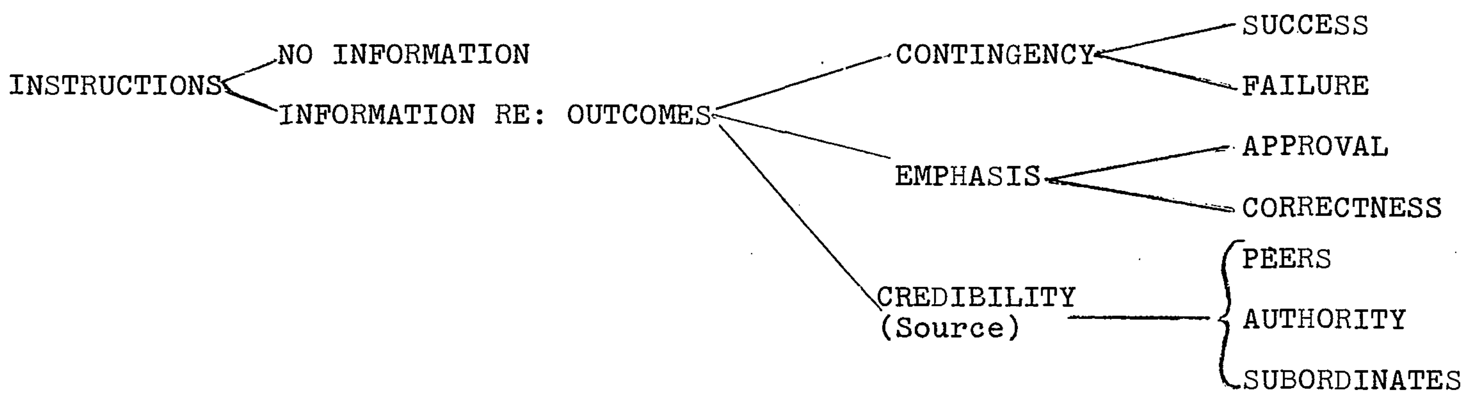


FIGURE 2

INSTRUCTIONAL VARIABLES



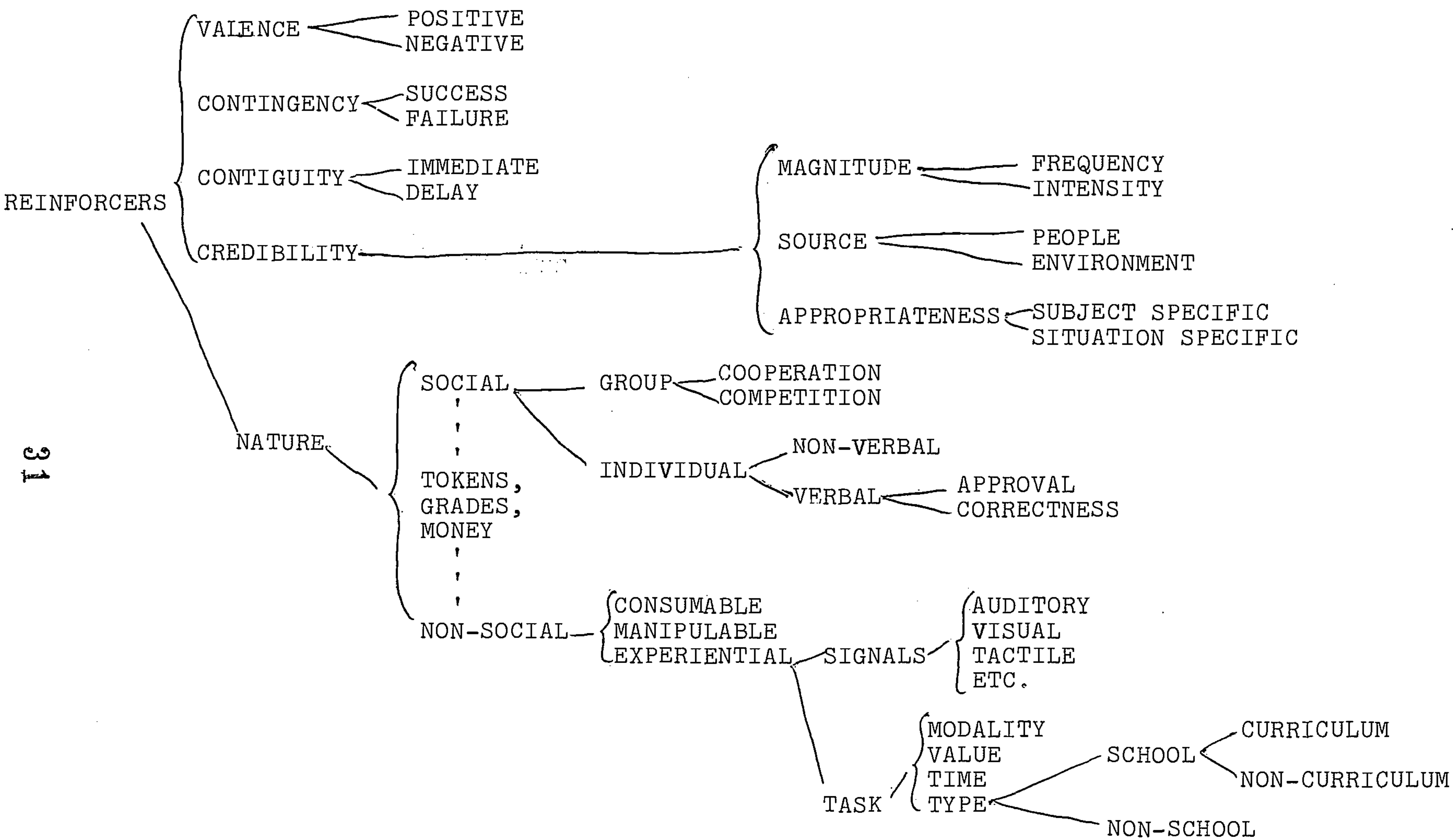
may include statements regarding contingencies or emphases; credibility refers to the source of the information.

The variables related to the reinforcer are more numerous (Figure 3). The major classes are valence, contingency, contiguity, credibility and nature. Credibility is subdivided into source of reinforcer, appropriateness (in terms of S and situational-factors) and magnitude (frequency and intensity). The most extensive class is nature: reinforcers may be social or non-social. Social reinforcers are those involving only interpersonal events, verbal or non-verbal. Non-social reinforcers include consumables (food), manipulables (toys) and experiences. Experiential reinforcers may be signals (in any sensory channel) or tasks.

Task variables have probably received less attention than any other of the variables mentioned. They include both the reinforcement value of the task used in the experiment and the value of a task which may be offered as a consequence of that performance. The experimental task must also be considered in terms of its intrinsic feedback (see Figure 1). Intrinsic feedback refers to events within the task which provide information to the S about his performance; all other sources of information are extrinsic.

In any experimental situation, nearly all of the variables mentioned will be involved, although not always explicitly. The following exceptions should be noted: (1) Instructions do not necessarily provide information about outcomes. If they do, contingency, emphasis and

FIGURE 3: REINFORCEMENT VARIABLES



credibility must be considered. (2) One or more classes of reinforcers may be included;for each reinforcer, all other variables must be considered. (3) Some degree of social reinforcement is involved in every situation.

In the following review, the major classifications of the experimental variables will be used as guides in grouping studies. Most studies will necessarily include several key variables; thus, some may be referred to under several headings.

The review will focus primarily on studies involving mentally retarded Ss; data based on the performance of normal IQ Ss will be discussed only in a few instances where there are no studies involving retardates. The present study is intended to elucidate certain facets of the behavior of mentally retarded Ss. Thus, few studies are reviewed which compare mentally retarded and normal Ss. Studies included in this review are those which compare behavior of mentally retarded Ss with that of other mentally retarded Ss under different conditions: the performance of various tasks under various reinforcement conditions.

1. Instructions

Instructions may simply inform the S of the behavior expected of him in the situation. They may also inform him that certain events will (or will not) occur if he responds in certain ways (e.g., "If you are right, a bell will ring; if you are wrong, you will hear a buzzer.") This kind of instruction provides information about the behavior, a means of evaluating it and the meaning of consequent events. Spence (1966) gave each type of instructions to each of two groups of normal and educable mentally retarded children. The addition of information regarding behavioral outcomes seemed to have less of an effect on performance of retardates than on performance of normals. The performance of the latter group was facilitated by the addition of such information. Hill and Moely (1969), using a marble dropping task, gave two kinds of instructions to their Ss: one set defined the task as a game, the other defined it as a test. Younger Ss (six to eight years old) were not affected by the differences in instructions; older boys (ten to twelve years old) achieved higher scores when given game instructions than when given test instructions, while the opposite was true of older girls. Few studies have attempted to systematically manipulate instructions in the manner of these two studies, although there are many differences to be found in the content and phrasing of instructions used in reinforcement studies.

2. Tasks

There have been few studies of the reinforcement values of various tasks *per se*. Studies of repetition choice behavior might fall into this category, but they are usually more concerned with effects of previous success or failure upon later choices (McConnell, 1965). Allen (1966) found that younger and older S's differed in time spent on each of three tasks in a neutral reinforcement condition. Furthermore, task variables (such as interest and difficulty) appeared to interact with reinforcement conditions (praise, reproof or neutral) and age to affect performance scores.

3. Reinforcers

a. Valence. Reinforcer valence (positive vs. negative) has long been an important experimental variable. Postman (1962), in a discussion involving Thorndike's law of effect, reviews some current thinking about the relative roles of reward and punishment.

> In spite of the many empirical and conceptual problems which still await solution, the basic propositions of Thorndike's [law of effect] have weathered with considerable success both theoretical critiques and attempts at experimental refutation. Time and again, as in his views on punishment and spread of effect, he appeared to have been proven wrong but eventually found new support from still further experimental analyses of these problems. The picture of the learning process which Thorndike sketched more than 50 years ago is still very much on the books (Postman, 1962, p. 397).

Stevenson and Snyder (1960) report that performance of institutionalized retardates on a marble-sorting task was facilitated by positive social reinforcement, debilitated by negative social reinforcement. Van de Riet (1963) reports a similar effect on paired-associate learning of underachieving students. He found that educationally retarded Ss receiving praise in a paired-associates task needed fewer trials to criterion than those receiving reproof.

On the other hand, Massey and Insalco (1969), using a 2-choice discrimination learning task, found that a group which received both aversive stimulation (white noise) and an M & M after each error learned most rapidly.

Rosenhan (1966) divided Ss into both racial and social class groups. Racial differences were found only among middle-class Ss; white and black lower-class boys performed similarly. In approval conditions, all lower-class boys had higher scores than white middle-class boys while the reverse was true in disapproval conditions.

Lingren (1967) attempted to relate the effects of positive and negative reinforcers to high- and low-anxiety states in the Ss. The results indicated that regardless of anxiety levels (as measured by CMAS scores), learning of mentally retarded Ss was facilitated by negative reinforcement. He suggests that the interpretation of failure as an incentive for some retardates, which has derived from locus of control theory, may account for these results.

One study (Gardner & Brandl, 1967) considered the effects of different reinforcement conditions during a serial learning task upon incidental learning. They report that Ss who had received praise during serial learning scored higher on the incidental learning task than Ss who had received prizes or no incentive. Dubros (1967) used a positive social reinforcer (approval) to condition verbal response classes in adolescent EMR's. He found that shifts occurred in classes describing people and animals, but not objects.

McGunigle (1968) found no difference in the number of trials to criterion between male mentally retarded Ss receiving social or candy reinforcers. Insalco (1970) presented a concept formation task to mentally retarded Ss under conditions of verbal and consumable reinforcers. No differences were found related to the reinforcement conditions but all groups showed learning across tasks.

The relationship between performance and reinforcer valence appears not to be simply a matter of equal and opposite effects of positive and negative reinforcers. S variables as well as task variables must be considered in order to account for the effects of reinforcer valences.

b. Contingency. A reinforcer may be delivered for every response, only for correct responses or only for incorrect responses (R-W, R-O, W-O). Studies indicate that performance is better under R-W or R-O than W-O (Stevenson, 1967). It has been suggested that a reinforcer contingent upon a correct response provides more information than either no reinforcer or one contingent upon an incorrect response, thus resulting in a higher level of performance.

c. Contiguity. It is usually thought that the smaller the time interval between a response and the delivery of the reinforcer, the more rapidly that response will be learned. Watson and Lawson (1966) review studies in which the delivery of the reinforcer is delayed and report that "retardates were no more adversely affected by any length of delay (relative to their performance with no delay) than are normals," (p. 11).

The concept of gratification pattern may be related to this. Typically, a study of delay of gratification offers the S a choice between an immediate reward and a later, but larger, reward. Bialer (1961) reports a positive relationship between LC and gratification pattern for both normal and retarded S's. That is, ILC Ss are more likely to delay gratification than ELC Ss.

d. Nature of Reinforcers. Reinforcers may be divided into two broad classes: social and non-social. Social reinforcers are interpersonal events (words, gestures, nods, etc.) which follow some behavior. Non-social reinforcers may be divided into three categories: consumable, manipulable and experiential. Consumables include items like candy, gum, cigarettes, food; manipulables refers to toys, pencils and other useful objects. Experiential reinforcers may take the form of a signal delivered to any sensory channel or some task S is offered.

d.1 Non-social - consumable and manipulable. Consumable and manipulable reinforcers are perhaps more easily compared than any other classes or reinforcers since one may exhibit them to S and ask for expressed preferences, as well as compare their effects by successive administrations.

Heber (1959) used a paired-comparisons method to have institutionalized Ss scale their preferences for five potential rewards. It was then found that Ss who received a highly preferred reward performed a simple motor task more efficiently than those who received the least preferred reward. Wolfensberger (1960) utilized the Heber preference ranking technique in two conditions of his study of the effects of reinforcers upon reaction time of institutionalized Ss. He found no differences among the five groups (concrete reward, symbolic reward, control, concrete punishment, symbolic punishment). Heber (1964) suggests that this may have been a function of S variability in reaction-time performance and the small cell sizes or it may be related to the possible social deprivation of institutionalized mentally retarded Ss: "the presence of the experimenter and his attention may have been so reinforcing as to overshadow any differences which might otherwise have emerged as a function of the incentive variable," (Heber, 1964, p. 158). In the Wolfensberger study, Ss were on a fixed ratio reinforcement schedule. Baumeister and Ward (1967) made reinforcement contingent upon speed of response. Performance of Ss in this situation demonstrated the effectiveness of reinforcers in speeding reaction times.

Siegal, Forman and Williams (1967) introduced a different method of scaling rewards. Twenty-five institutionalized mentally retarded Ss first scaled six tangible rewards by the method of paired comparisons. For the second method, the proportion of time Ss spent "working" (plunging a lever) for each incentive was used as a preference index. A high degree of agreement between the two methods was reported. The second phase of the study offered a high- and low-ranked (group data) reward in a two-choice object discrimination task. Ss' receiving the high-ranked reward learned at a significantly faster rate than Ss' receiving the low-ranked reward. This preference could be more accurately predicted from the work-index ranking than from the paired comparison method with five tangible rewards; in contrast to Heber, they reported a high degree of inter-subject agreement in the ratings. Watson and Lawson (1966) suggest that this may be due to the closer similarity of the rewards and a somewhat different rating procedure. Watson, Lawson and Sanders (1965) report a shift in reinforcer preferences (from manipulable to consumable) over sessions in severely retarded Ss, but the situation in which this was done was unspecified (Watson & Lawson, 1966, p. 13). Siegal (1968) in a recent review of research on incentive motivation among mentally retarded Ss, indicates that the most pressing need in this area is the improvement of methods of scaling reinforcer preferences.

d.2 Non-Social: experiential. Experiential rewards, as has been indicated, may consist of a task or a signal. The task may be the experimental situation itself (as has been discussed in Sec. 2) or it may be some subsequent task. Haywood and Weaver (1967) report that some retardates will work longer at a hole punching task when another task is offered as an incentive than when the incentive is money.

Signals are seldom used as reinforcers in and of themselves. Thus, McConnell (1965) had to explain the meanings of the signals when giving instructions: a bell means a correct response and a buzzer means incorrect. Such signals gain their information value to S only through E's instructions.

However, some kinds of sensory inputs can serve as reinforcers without this instructional aspect. Stevenson and Knights (1961) considered the reinforcement values of certain visual stimuli (pictures of common animals) for retarded and normal S's (of the same MA). It was reported that these stimuli maintained a reinforcing value for retardates for a longer period of time than for the normals. However, Hoats, Miller and Spitz (1963) report that retardates show more preference for symmetrical than for irregular visual stimuli. This has been related to the construct of curiosity in other research (Miller, 1970). Morgan (1970) allowed institutionalized mentally retarded Ss to view a visual display if they pushed a telegraph key. There were three intelligence levels of Ss: stimuli were grouped in three levels of complexity and two levels of novelty. A significant interaction between level of retardation, stimulus complexity and performance block was found. "The Ss in all groups showed a high rate of response with little satiation, with the only reward being sensory stimulation," (Morgan, 1970, p. 37).

d.3 Social Reinforcers. Social reinforcers include verbal statements, gestures, nods and facial expressions; in short, all means of interpersonal communication. Since nearly every experiment involves some sort of interaction between E and S, every experiment provides some quantity of social reinforcement. Bijou and Oblinger (1960) point out three situational stimuli, common to all studies of social reinforcement, which may have reinforcing properties: (1) performing the task; (2) being in a room with an attentive adult; and (3) being removed from school to participate in the experiment.

An additional class of reinforcers - including tokens, grades and money, may seem to be intermediate between social and non-social reinforcers. That is, their values are derived partly from the social definitions and partly from the tangible items which they may be used to obtain. It is possible, then, that their effectiveness in a particular study may depend upon which aspect of their value is stressed. Perry and Stotsky (1965) compared the effectiveness of money and grade-ratings on block assembly performance of mentally retarded, physically handicapped and college students. No differences between reinforcement conditions were reported. Watson and Lawson (1966), in a review of reinforcement studies with the mentally retarded point out that little research has been done in this area with retardates, and that which has been done has seldom taken the precaution of providing Ss with pre-experimental experiences to develop the value of the reinforcer.

Generally, studies have indicated that social reinforcers are more effective for mentally retarded Ss than manipulable or consumable reinforcers (Heber, 1964; Watson & Lawson, 1966). Furthermore, it has been found that retarded Ss perform a simple task (usually marble dropping) for longer times with praise than in a neutral or reproof condition. Effects due to age and sex (of both E and S) have been reported (Stevenson, 1965); the institutionalization variable has also received a good deal of attention (Zigler, 1966). Each of these authors also discusses some of the interpretations which have been offered for the effectiveness of social reinforcers. Unfortunately almost all of the studies of the effectiveness of social reinforcers have involved performance tasks judged by Es to be of little intrinsic interest to Ss;

it is necessary to explore their role in regard to other tasks and other criteria.

Two general groups of studies of social reinforcement may be considered. The first involves studies in which competition or cooperation is a factor. The second group was first distinguished by Zigler (1963), who suggested that approval and correctness reinforcers are different. Approval reinforcers (good, bad) imply evaluations of the individual while correctness reinforcers (right, wrong) are directed at the behavior itself. Most studies of social reinforcement do not carefully distinguish between these two classes of reinforcers. This review will indicate why it is important to do so. The first group of studies reviewed in the following section will be those including competition while the latter part of the discussion will concern studies involving approval and correctness reinforcers.

Competition. Gordon, O'Connor and Tizard (1954) considered goal setting (by E) and encouragement as reinforcers on a leg-persistence task. MR Ss were matched on the basis of pre-experimental performance of this task. Both groups performed at a higher level than the control group, with the performance of the goal group better than that of the encouragement group. In a second phase of this study, Ss were shifted to different incentive conditions. It was found that incentive sequence was important in determining performance. For the final phase, Ss were returned to their original incentive condition. Performance reflected the original condition rather than the second one, indicating the "significance of initial achievement level," (Heber, 1964, p. 159).

Gordon et al., in a second series of studies (1955), compared performance on a nail-frame task under the following conditions: goal (objective standard, visibly displayed), team competition, individual competition, neutral. Ss were assigned to an initial condition; then, all but those in the goal group shifted to a different condition. Finally, all Ss returned to the task under the initial condition. The goal-incentive group was best, neutral worst; there was little difference between the individual- and team-competition groups.

O'Connor and Claridge (1955) report that a group receiving goal-with-encouragement performed at a higher level than either a group with goal-with-indifference or a neutral group. In a second study (1958) they considered the effects of incentive shifts. It was found that shifts from a neutral to a goal condition, produced superior performance than constant goal condition; shifting from goal incentive to neutral produced no decrement in performance. Heber (1964) concludes that this supports the position that "the achievement level attained under an initial, highly effective incentive condition is relatively permanent," (p. 160). He points out that Walton and Begg (1958), also using severely retarded Ss, and the leg-persistence task, found no differences among four incentive conditions (goal, competition, encouragement and control).

Teasdale and Joynt (1967) report improvement in task performance following the introduction of cooperation and competition as incentives in a sheltered workshop situation. However, they point out that there were certain changes in observed behavior (e.g., decreasing amounts of vocal behavior) which were associated with the incentive conditions. In light of this, they suggest further evaluation of the effects of this type of incentive in sheltered workshops and similar situations. McManis (1965, 1967) compared the effects of praise, reproof and competition upon the persistence and accuracy of pairs of Ss in a marble dropping task. The earlier study indicated that both praise and competition resulted in a higher level of performance than neutral or reproof incentives for mentally retarded and normal Ss who had been matched for pre-experimental performance. The second study compared performance when Ss within each dyad received various pairing of incentives and pre-experimental performance levels. The results indicate that incentive effects vary when each of a pair of Ss is administered a different kind of reinforcer. Furthermore, the pre-experimental performance level of Ss was found to affect the direction and magnitude of the incentive effects differentially for the different incentive pairings. Thus, the effects of competition appear to be a good deal more complex than would have been apparent from the earlier British studies.

Approval and correctness. The second group of social reinforcement studies involves those which distinguish between approval and correctness reinforcers. This distinction was initially noted by Zigler (1963). In a discussion entitled, "Social reinforcement, environmental conditions and the child," he points out the need to classify social reinforcers in order to better understand and predict behavior. He draws on the research in child-rearing practices by A. Davis, E. Erikson and others. This suggested to Zigler that being correct is more reinforcing for middle than for lower-class children, while being praised is more reinforcing than being correct for lower-class children. Zigler and Kanzer (1963) confirmed this for the performance of two groups of seven-year-old children on a marble dropping task. They found that lower-class children achieved higher scores in approval than in correctness reinforcement conditions while middle-class children scored higher (than lower-class children) with correctness reinforcers.

Zigler takes a developmental position in interpreting these results. He states that in order for a performance reinforcer (correctness) to be effective, the child must have

> the ability to differentiate himself clearly from others and to comprehend clearly that his success is a direct outgrowth of his own efforts (Zigler, 1963, p. 617).

Furthermore, he must be able to experience satisfaction with success, dissatisfaction with failure. This is contrasted with the earlier period of development when it is the reactions of others towards him that are the important cues for the child. The similarity of this interpretation to the LC construct is apparent. Since, as will be seen, social class differences, sex and age were not consistently adequate predictors of responsitivity to the two classes of social reinforcers, it seemed that LC might be a more adequate predictor.

Rosenhan and Greenwald (1965) attempted to replicate and extend the Zigler and Kanzer findings. Their first experiment was a replication, with the addition of a second group of lower class Ss, so that there was one white and one Negro group. The second experiment compared the performance of older (sixth grade) and younger (second grade) Ss on the marble dropping task under conditions of performance (correctness) and person (approval) reinforcement. The results confirm a differential sensitivity to the two types of social reinforcement, but not on the same basis suggested by Zigler and Kanzer. That is, the 1965 study found that younger children are more responsive to approval than to correctness reinforcers, but that this difference in reinforcer effectiveness is not related to socioeconomic class differences. The authors point to a number of methodological problems which may account for some of these differences (e.g., variability of E effectiveness). They also make the point that if there is a developmental hierarchy of reinforcers, the data suggests that, with maturity, children do "become more responsive to performance reinforcers, but not at the expense of person reinforcers," (Rosenhan & Greenwald, 1966, p. 120). Thus, maturation is viewed as involving increasing sensitivity to a wider range of reinforcers.

The authors indicate the need for this to be tested with a variety of tasks.

McGrade (1966) presented the marble sorting task to boys from four social class levels in kindergarten, second and fourth grades. Although results indicated differential sensitivity to the two classes of social reinforcers, it could not be attributed to either age or social class. Thus, it seems necessary to consider other S variables in regard to this responsivity. The available research indicates that both normal and mentally retarded Ss distinguish between the two classes of social reinforcers, despite the apparent semantic similarities in the words used as reinforcers (good, right). However, there has been little success in identifying S variables which relate to this. O.L. McConnell (1967) explored relationships between responsitivity to social reinforcement and a number of personality traits (based on TAT stories) in cultural familial retardates. Results indicated that responsitivity to social reinforcers (approval) was related to dependency and nurturance motives. This is similar to the interpretation offered here for the behavior of ELC Ss; i.e., those who view reinforcers as contingent upon the behavior of others are more sensitive to approval reinforcers.

e. Credibility. A fifth variable which may influence reinforcer effects is credibility. Credibility refers to the degree to which the S acts on the information conveyed by the reinforcer. It may be seen to be a function of the magnitude, source and appropriateness of the reinforcer. Magnitude refers to the frequency and intensity of the reinforcer; that is, how often is it delivered and in what quantity. The source of the reinforcer may be the E or the environment. Reinforcer appropriateness depends on a variety of S and situational factors.

e.1 Magnitude. One aspect of the magnitude of a reinforcer is the frequency with which it is delivered, usually referred to as schedule. Watson and Lawson (1966), in a review of recent research, indicate that retardates respond to variations in schedules of reinforcement in much the same way as do normals.

The second aspect of magnitude, intensity, refers to the quantity of reinforcement. Studies comparing different quantities of the same reinforcer must be certain that the quantities are really different. Cantor and Hottel (1955), who compared the effectiveness of one peanut vs. three peanuts, found no differences. In a later study, Heber (1959) asked Ss to rate a number of reinforcers and found that peanuts were the least preferred of several rewards by mentally retarded Ss. Kahn and Burdett (1967) had institutionalized mentally retarded Ss perform each of three motor tasks under one of three reinforcement conditions (three pieces of candy; one piece per trial; one piece per trial of improved performance). There were no differences attributable to the reinforcement conditions. The authors suggest that S "awareness of improvement with or without reinforcement by the E, served as a sufficiently potent incentive to obscure possible differences in influence among other conditions," (Kahn & Burdett, 1967, p. 426). They do not specify in what manner the tasks (Stromberg Dexterity Test, "both hands" task of the Purdue Pegboards and an original bead stringing task) provided this information. Furthermore, as was found in the Cantor and Hottel (1955) study, the difference in reward magnitudes used may not be sufficient to produce behavioral differences or, candy per se may not be a meaningful reinforcer for these Ss. Thus, the differences between one and three units, particularly of a non-preferred item, may not have been enough to result in different performances.

Ellis (1962) offered various numbers (three vs one) of pieces of candy or cigarettes to institutionalized male retardates in an operant behavior situation (lever pressing). Here again, there were no differences in performance, perhaps because the rewards did differ significantly in intensity. Blank (1968) offered twenty-five cents to some Ss and one cent to others on a discrimination learning task; the high reward group made more correct responses. Thus, if intensity is sufficiently different, it can affect performance.

e.2 Source. A reinforcement may be delivered by the environment (e.g., a machine automatically delivers a chip for every correct response) or by a person. In the latter instance, the person may be (in relation to the S), a peer, a subordinate or an authority figure. In any case, the source may affect the credibility of the reinforcement. There has been remarkably little interest in comparing various sources of reinforcement. Stevenson (1965) cites only two studies which consider peers as sources of reinforcements and two in which parents are sources.

Patterson, Littman & Hinsey (1963) report a significant cross-sex effect upon rate of correct responses; mothers were more effective with their sons while fathers were more effective with their daughters. Stevenson, Keen & Knights (1963) had pre-school children perform the marble dropping task with parents or strangers as reinforcing agents. It was found that a higher response rate was obtained with strangers. However, it was not clear what effect children's perceptions of the role of the stranger may have had upon the results.

Patterson and Anderson (1963), using peers as reinforcing agents, found that (1) scores of older children (third and fourth graders) increased more than those of younger children (second graders), and (2) scores of older children (fourth graders) were changed more when the reinforcing agent was a friend than when the agent was a stranger. However, Hartup (1963) reports that performance of a group of four- and five-year olds was more affected by "disliked" than by "liked" peers. Further research is needed to establish the reliability of these results and to examine age-related differences.

McConnell (1965) found no performance differences as a function of source of reinforcement (experimenter or mechanical buzzer). Terrell and Stevenson (1967) report that normal children are more effective than retarded children as sources of reinforcement for both normal and retarded Ss. The interpretation calls attention to the importance of Ss perceptions of the intellectual and social status of the source of the reinforcement.

e.3 Appropriateness. The appropriateness of a given reinforcer in relation to a specific task may be affected by a number of factors specific either to the situation or the subject. For example, offering toothpicks as a reward to adolescents would probably be inappropriate as would be offering cigarettes to preschoolers. Stevenson (1965) reviews studies which have sought to identify the role played by a number of subject and experimenter variables (such as age, sex, IQ, MA, social class, birth order, social class). Butterfield and Zigler (1965) report that differing institutional social climates may affect responsivity to social reinforcement in mentally retarded Ss.

4. Summary

A variety of variables relevant to reinforcement have been identified; examples of studies involving mentally retarded Ss have been drawn upon to illustrate the effects of these variables. The occurence of many sets of conflicting results indicates that there are variables which are not being adequately accounted for.

There have been some instances in which performance has been shown to be related to task differences apart from reinforcer effects. Such variables as Ss perceptions of tasks, as well as objective qualities of tasks, need to be considered when attempting to evaluate reinforcer effects.

Previous reviews have indicated that social reinforcers are more effective than non-social reinforcers for mentally retarded Ss. It may also be noted that social reinforcers are much more available in our culture, particularly within the classroom situation. It has been shown that these reinforcers may be divided into two classes: approval and correctness. These may, in turn, be either positive or negative.

Conflicting research reports indicate that the effects of differences in either of these dimensions have not been adequately accounted for. The following section will review literature related to locus of control, a personality construct which may provide a means to accomplish this.

B. Locus of Control

Comprehensive reviews of the literature relating to LC have been prepared by McConnell (1965), Lefcourt (1966) and Rotter (1966). McConnell divides the studies into three categories: (1) studies which relate LC to the learning and/or performance of specific tasks; (2) studies which relate LC to personality measures "or to problems of a non-productive or contrived nature..." (p. 4); and (3) studies which relate LC to physical or sensory conditions or to group affiliations.

Since LC seems relevant to such a broad spectrum of behavior, few studies have been done in any one of these. Thus, there are no studies involving LC and performance tasks and only three involving learning tasks. In addition, though, there are several which relate LC to complex classroom learning.

The LC construct attributes an individual's responses in specific situations to his subjective perceptions of psychological events. The individual with external locus of control (ELC) is thought to employ the premise that most events are beyond his personal control; that is, they are determined by chance factors or by the actions of other individuals. In extreme terms, he fails to recognize a relationship between his own action and contingent events (i.e., reinforcers). Thus, he is unable to conceptualize events in terms of the success or failure of his own behavior. The individual with internal locus of control (ILC) is thought to employ the premise that there is a relationship between his own behavior and rewards which follow the behavior. He conceptualizes events in terms of success (goal attainment) or failure (non-attainment).

Bialer (1961) found that LC is a developmental variable in that it correlates with MA rather than with CA. Increasing MA is associated with development from ELC to ILC. That is, the younger, less mature individual tends to exhibit ELC characteristics while the more mature individual is more likely to exhibit ILC characteristics. Although, as Miller (1964) points out, the transition is not clearly spelled out:

> This latter system does not supplant the earlier one, but rather is an elaboration over the 'here and now' Hedonistic System. Somehow ...feedback based on the earlier system promotes...conceptualizing...success or failure (Miller, 1964, p. 14).

ELC individuals are thought to function in terms of what has been described as the hedonistic or early motivational system:

> The initial system of motivation of the human organism is to avoid noxious events and to approach satisfying events. This might be referred to as the hedonistic pleasure-approach and pain-avoidance, or the earlier, system (Cromwell, 1963, p. 79).

That is, they

> not only tend to see event-outcomes as a function of the manipulation or whim of others, but are dependent on such others to identify the situation for its hedonistic properties, as pleasurable or painful, ...[they] would need to lean on these sources, external to the task, for appropriate cues (Miller, 1964, p. 10).

The ELC individual, then, would be expected to react to a task only as it represents a pleasant or unpleasant experience. By doing so, he tends to respond to cues provided by the external environment to a larger extent than to cues provided by the task itself (Miller, 1961).

Bialer (1961) found ELC Ss were more likely to return to a previously completed puzzle than to one which had been interrupted. Completion of a puzzle was always followed by a positive comment from E, while interruption was accompanied by a negative comment. ELC performance, then, may be expected to be more influenced by positive and negative events external to a task than by variations in the task itself.

Cromwell (1963) refers to the ILC individual as functioning in terms of the later motivational system:

> The cumulative associations of the outcome of goal-approach and threat-avoidance events with one's own behavior evolve and become conceptualized over a period of time into a system of motivation to demonstrate one's own behavioral effectiveness. This may be referred to as the success-approach and failure-avoidance, or the later system (Cromwell, 1963, p. 79).

The ILC individual evaluates his behavior as it represents his attainment of a goal (success) or lack thereof (failure). In this way, he is thought to be more sensitive to task-related cues than to environmental cues.

> Rather than equating ILC with behavorial effectiveness, a more reasonable notion is that ILC heightens awareness of behavorial effectiveness to the point that extra-task climate cues are irrelevant or superfluous in the task performance (Miller, 1961), p. 36).

This statement makes the assumption that the task itself provides the means for evaluating one's success or failure. When it does, extra-task cues (such as reinforcers) may indeed be superfluous for ILC Ss. However, in the absence of such cues, extrinsic cues may be the only ones available. These may focus either upon the person or upon the responses. Since the ILC individual is able to function in terms of either the earlier or later motivational system, in the absence of appropriate success-failure cues, he may translate hedonistic cues into means of evaluating behavorial effectiveness.

LC has been used to predict differential sensitivity to positive and negative reinforcement. Miller (1961) reported that ILC Ss were relatively insensitive to reinforcement conditions (losing or winning tokens) on a serial learning task (although negative reinforcement resulted in improved performance under certain conditions). ELC Ss performed at a uniformly poor level under conditions of negative and neutral reinforcement; with positive reinforcement, their performance equalled that of ILC Ss. A second part of this study considered effects of shifts in reinforcement climate. One finding of this phase will be noted: ILC Ss who shifted from success to failure learned the task more rapidly under the second condition; that is, failure was found to improve performance after a successful experience. McConnell (1965), using a two-choice discrimination learning task, found none of the predicted differences in performance between ILC and ELC Ss under various reinforcement conditions. However, one finding indicated that ILC Ss scores were lower in a condition of positive reinforcement (experimenter approval) than in a condition of negative reinforcement (i.e., positive reinforcement, in the form of experimenters' statements, impaired performance).

Miller (1961) utilized a serial learning task to predict learning differences as a function of LC and learning climate. LC was found to predict differences under the failure and neutral conditions (ILC Ss' performance was superior to that of ELC Ss); under the success condition, ELC Ss performed as well as ILC Ss. McConnell (1965, p. 122) discusses a study by J. O. Miller in which a discrimination learning task was administered under several reinforcement conditions. Differences between high and low performance groups was unrelated to LC; McConnell (1965) attributes this to the absence of E and the mechanical administration of rewards.

McConnell's study (1965) involved a two-choice discrimination learning problem under several reinforcement conditions. Ss were divided into ILC-ELC groups. These groups were then assigned to conditions in which the E was present or absent and in which the reinforcement was delivered by E (either in person or via a tape recording) or by a mechanical signal (bell or buzzer). Unfortunately, the social reinforcements used mixed approval and performance reinforcers. In addition, the effects of the reinforcers may have been attenuated by the promise of a 10¢ reward to every S prior to the beginning of the experiment. These factors, in addition to some possible difficulties with the task and criterion, may account for his lack of results.

Apart from differences in the reinforcers used in these studies, there is an important difference in the tasks involved. A serial learning task using the anticipation method (e.g., Miller, 1961) provides intrinsic feedback in that it is self-correcting since the verbal response is shortly followed by a display of the correct item. In this way, any S supposedly task-oriented quickly knows not only whether his response was right or wrong, but, if it was wrong, what the right response should have been. External reinforcement would be superfluous for task-oriented (ILC) Ss. However, for Ss who are not task-oriented, it is assumed that intrinsic feedback must be amplified by additional information, such as that provided by extrinsic reinforcement. In the present theoretical context, the necessity for such amplification would obtain for ELC Ss, who are thought to be more dependent upon extrinsic reinforcement than upon intrinsic feedback from cues as to the hedonistic status of the situation.

In McConnell's (1965) study, the task was a two-choice discrimination problem. Such a task provides little, if any, intrinsic feedback. That is, there is nothing intrinsic to the task to provide S with a cue to evaluating his behavior. The only source of information available is the extrinsic reinforcement. McConnell administered positive or negative reinforcers (which mixed approval and correctness content) under various conditions of Es presence. No differences were found between ELC and ILC Ss, regardless of reinforcement condition.

In the theoretical formulation offered here, the negative results of McConnell's study would be accounted for as follows: ILC Ss, generally task-oriented, were not provided with the cues (intrinsic feedback) which enhance their performance. In the absence of such cues, it would be possible for them to make use of extrinsic reinforcers as performance clues if these were interpretable as evaluations of performance (e.g., correctness reinforcers), but these were not available.

When this is not possible, positive reinforcement may be experienced as an interference.

> This interpretation supposes that ILC Ss are, generally, distracted by E produced feedback, but that, because they tend to try harder under failure conditions [negative reinforcement], this distraction is not evident except under conditions of E produced positive reinforcement when other intra-task cues [intrinsic feedback] are not available (McConnell, 1965, p. 41).

ELC Ss, who are thought to depend on extrinsic reinforcement, would have been expected to exhibit different performance in conditions of positive and negative reinforcement; the former would be expected to enhance their performance. However, the results found no differences in performance under any conditions due to the confounding of correctness and approval reinforcers. (McConnell (1965) discusses the lack of positive results in terms of characteristics of discrimination learning problems; he also points out that the effects sought may have been rather subtle in terms of the treatments used to attempt to demonstrate them.

Miller's study involved a task with a high degree of intrinsic feedback in which extrinsic feedback differed only in terms of valence (positive or negative reinforcement). Thus, he capitalized on the suggested differential sensitivities of ELC Ss to intra-task cues by providing just one type of cue for each S group (approval and correctness, respectively). McConnell's study, on the other hand, presented a task with a very low degree of intrinsic feedback and several kinds of extrinsic feedback differing in terms of valence and source. As in Miller's study, a single task was used, allowing no opportunity for evaluating the possible influence of Ss' preferences. In addition, the extrinsic reinforcement did not differentiate correctness and approval, but mixed statements of both kinds. ILC Ss were not provided consistently with information regarding behavioral effectiveness (either intrinsic or extrinsic) and ELC Ss were not provided with a consistent form of extrinsic reinforcement (approval).

As McConnell (1965) points out, studies which relate LC to classroom learning report a variety of effects, probably due to the influence of extraneous variables as well as irregularities in the teacher's reinforcement schedule (1965, p. 124). These studies have tended to report a negative correlation between LC and school achievement.

However, more recent research (Coleman, 1966) reports a positive relationship when race is considered. A measure was used to determine "sense of control of own rewards" (Katz, 1969, p. 17). This score was found to contribute more to the variance of achievement scores for older Negro children than for older white children; furthermore, it contributed more than two other attitudinal measures. Hunt and Hardt (1969) report that Upward Bound programs increased scores of both black and white Ss on measures of extent of internal control.

Although there has not been consistent support for the hypotheses based upon the LC construct, the concept has sufficient common-sense validity and such intriguing ramifications that it continues to generate research. Although the scale may be deficient in certain aspects, it is easy to administer and has good reliability and freedom from response set (Gozali & Bialer, 1968). The construct should continue to be clarified and modified as data accumulates so that its role in behavior may be more clearly understood.

C. Rationale

It has usually been assumed that hedonistic cues derive primarily from sources external to the task while behavioral effectiveness cues derive from the task itself. However, intra- and extra-task cues may provide both hedonistic (pleasure-painful) and behavioral effectiveness (success-failure) information.

Intra-task cues provide information regarding behavioral effectiveness insofar as they make available to S information about the quality of his response. This type of intra-task cue may be referred to as intrinsic feedback. Other intra-task cues may also provide information about the hedonistic qualities of the situation to the degree that the S perceives the task as more or less desirable. Effects of this type of intra-task cue would be expected to be demonstrated in situations involving task choices or repeated performances on a single task.

Extra-task cues (reinforcers) provide information to Ss in terms of their valence and emphasis. Valence (positive or negative reinforcers) defines the hedonistic quality of a reinforcer. Emphasis defines whether a reinforcer provides information regarding the hedonistic aspect or the success-failure aspect of a situation. Thus, while extra-task cues will usually provide information of a hedonistic nature only, they may be structured so as to provide behavioral effectiveness cues (by emphasizing success-failure) for Ss likely to interpret them in this manner.

Zigler (1963) has drawn a distinction between two kinds of social reinforcers, in terms of their emphasis. He points out that social reinforcers may be directed at the person performing the task ("Good, you're doing well") or at the response itself ("Right, that's right, correct"). When reinforcers of the first type are used, an individual is told how some other individual evaluates him (approval or disapproval) but receives no information directly that obviously relates to his preceding behavior even though the influence is there. When reinforcers of the second type are used (correctness or incorrectness), an individual is given information regarding the adequacy of his behavior. If he is able to evaluate himself in terms of behavioral effectiveness, this information will affect his performance (Zigler, 1963).

ELC Ss, who do not conceptualize situations in terms of personal effectiveness and who may seek supportive comments from others, are more likely to be responsive to the first type of social reinforcers (approval) than to the second (correctness). ILC Ss, on the other hand, are likely to be more responsive than ELC Ss to correctness reinforcers since they are similar to intrinsic feedback insofar as they provide information concerning the quality of a response: correctness - success of goal attainment; incorrectness - failure of goal attainment.

It was indicated that social reinforcers could be dichotomized into correctness and approval reinforcers.

It was also indicated that differential effects of one or the other might be related to LC. The concept of LC was broadened so that ILC Ss are defined not only as sensitive to intra- (vs. extra-) task cues, but to correctness cues. Correctness cues were discussed as usually originating as intra-task cues but (as in the case of correctness reinforcers), may sometimes be extra-task cues. ELC Ss, considered less mature than ILC Ss, are expected to be sensitive to approval cues. These are generally extra-task cues in the form of approval reinforcers.

It has been said previously that ILC and ELC Ss are sensitive to different classes of cues and that this difference came about developmentally. The present discussion indicates that if LC is a developmental phenomenon, it seems more appropriate to consider the more mature (ILC) individual as one who is responsive to a broader range of cues. Thus, while the ILC individual's behavior is facilitated maximally by correctness cues, if these are unavailable in a given situation, he is able to make use of approval reinforcers.

Furthermore, performance on particular tasks was said to be related not only to LC and the kinds of extrinsic reinforcers available, but to the intrinsic feedback provided by the tasks themselves. Therefore, a number of tasks may be selected to represent varying degrees of intrinsic feedback. It is expected that the performance of ELC Ss will be relatively insensitive to the intrinsic feedback, but will be affected by extrinsic (particularly approval) reinforcers. On the other hand, it is expected that ILC Ss will be relatively insensitive to the extrinsic reinforcers in those tasks which provide sufficient intrinsic feedback. However, when the task feedback is insufficient, it is expected that their performance will be most facilitated by performance reinforcers.

In a task with high intrinsic feedback, the ILC S may be able to evaluate his own performance, independent of examiner feedback. Lacking intrinsic feedback, he may then be able to employ E provided cues (reinforcers) if these may be used to evaluate his behavioral effectiveness. This will be more readily possible when the cues are correctness than when they are approval reinforcers. Given neither intrinsic feedback nor correctness reinforcers, the ILC individual is not provided with the information necessary to enhance his performance.

The ELC S, on the other hand, is relatively insensitive to task feedback. He is most responsive to extra-task cues, which define the hedonistic quality of the situation although he may also react to intra-task cues of a hedonistic nature (those which make the task seem more or less pleasant). Correctness cues refer only to the quality of the response. These are thought to be not useful to the ELC individual because of his inability to conceive of a relationship between his response and the reinforcer. A correctness reinforcer carries no hedonistic information for this individual. Given a single task, the ELC individual's performance is related to the extrinsic feedback (approval). It would be necessary to offer several tasks in order to examine the possibility that ELC performance may also be related to the hedonistic quality of the task itself.

Performance scores of ELC Ss are likely to be higher with positive than negative reinforcements, while they are likely to be higher with approval than with correctness reinforcements. ELC Ss' scores are always expected to be higher with cues which define the hedonistic quality of the situation.

ILC Ss' scores are expected to be affected more by the intrinsic feedback of a task than by the extrinsic reinforcement accompanying it. Thus, they will be expected to exhibit performance differences related to external feedback only in tasks with low intrinsic feedback. In such tasks, it is expected that scores will be higher for conditions of correctness (rather than approval) and for negative (rather than positive) reinforcements. Furthermore, they are likely to score higher than ELC Ss with either correctness or negative reinforcement.

In addition to intrinsic feedback, tasks may vary in terms of the degree to which they are perceived by Ss as interesting and difficult. Such perception may affect performance on a task. Performance, in turn, may modify Ss' perceptions of the tasks by providing additional information. The reinforcement condition under which a task has been experienced may also influence subsequent judgements. Thus, it would be desirable to obtain two sets of judgements: one before and one after exposure to the tasks. This may be done by a simple ranking procedure. Some possible results of such ratings may be extrapolated from a consideration of the relationship between LC and risk-taking behavior. Liverant and Scodel (1960) suggest that ILC Ss (success-approach, failure-avoidance) are moderate risk takers; that is, given a choice, they will prefer a situation in which they can achieve a chosen goal. Very difficult tasks, with strong possibilities of failure, would be avoided. ELC Ss (hedonistic), on the other hand, seeking pleasurable situations, are likely to take only very low risks. They would, therefore, prefer very easy tasks (those with low risks). Thus, we may expect that ELC Ss interest ratings will be negatively correlated with difficulty ratings while for ILC Ss, the correlation is more likely to be positive.

Post-performance ratings will permit the examination of shifts in judgements. ELC Ss' interest ratings may be expected to shift in accordance with the reinforcement condition under which a task was experienced. Thus, tasks experienced under conditions of positive reinforcement may be seen as more interesting while those experienced under conditions of negative reinforcement will be seen as less interesting. ILC shifts would less likely be related to these factors.

The present study will be based upon the theoretical position outlined below. It will be recognized that this position is a synthesis and extension of concepts derived primarily from Bialer (1961), Cromwell (1963), Miller (1961, 1964) and Zigler (1963).

1. Locus of control

> ...refers to the subjective probability that an individual's behavior determines the outcome of events, whether successful or not. That is, the construct is used to describe the degree to which an individual tends to conceptualize these events as due to chance...(McConnell, 1965, p. 89)

or due to his own efforts. An individual's locus of control may be measured by his responses to a verbal scale.

2. ELC is characteristic of the earlier (or hedonistic) motivational system. Such individuals are thought to be unable to conceptualize a relationship between their behavior and consequent events. Thus, they are likely to believe that these events occur due to some external machination - chance, luck or the efforts of others. Individuals who are ELC are most likely to react in terms of pleasure-seeking and pain-avoidance; that is, they are dependent upon cues which define the hedonistic quality of a situation. These cues are typically external to a given task (i.e., reinforcers).

3. ILC is characteristic of the later motivational system. Individuals who are ILC are most likely to react to a situation in terms of success-approach and failure-avoidance. They have learned that there is a connection

between their own behavior and subsequent events and try to act in ways which result in success (i.e., goal attainment). Such individuals are likely to respond to cues within the task which enable them to evaluate their own behavior. The later motivational system supplements but does not supplant the earlier system. If an ILC individual were placed in a situation in which the task did not provide feedback concerning behavioral effectiveness, he could use extra-task cues which convey such information.

Thus, while ELC Ss can use only reinforcement cues (extra-task), ILC Ss may use either type of cue. However, under some conditions (tasks which provide no intrinsic feedback or tasks in which success has been experienced) performance of ILC Ss may be improved by negative reinforcement and impaired by positive reinforcement.

4. Hedonistic cues are typically extra-task cues (reinforcements). However, individual perceptions of a task as more or less interesting may also function as such a cue.

5. Success and failure cues are typically intra-task; that is, they are provided by the task itself. Tasks differ in the degree of intrinsic feedback they provide. In the absence of intrinsic feedback such cues may be provided by extrinsic reinforcers.

6. Reinforcers are events which follow a behavior and increase the probability of its occurence in the future. They may be of various kinds; this study will deal with social

reinforcers - verbal comments made by E following a response from S on a given task.

7. Social reinforcers may be divided in terms of two dimensions: valence and emphasis. Valence refers to the positive or negative character of the reinforcer. Emphasis may be upon the person (approval) or upon the response (correctness).

8. Individuals at an earlier level of development (e.g., ELC) are more responsive to approval than correctness reinforcers insofar as they are responsive to the hedonistic quality of the situation. In addition, it is expected that positive reinforcers will facilitate the performance of such individuals while negative reinforcement will result in a performance decrement.

9. More mature individuals (e.g., ILC) are more responsive to correctness than approval reinforcers since these may be used to evaluate their own behavior. Furthermore, positive reinforcement may interfere with ILC Ss' performance since it provides no useful information and may be a distraction. On the other hand,

> an ILC might be spurred by failure provided that there was some basis [e.g., previous experience] for him to assume that he could function adequately in a particular task situation, (Miller, 1964, p. 9).

Thus, it seems compelling to consider a situation in which several tasks, differing in terms of intrinsic feedback and hedonistic quality, will be presented under several reinforcement conditions. In order to test several skill areas, tasks should be selected to provide samples of learning and performance in both motor and verbal modes. The tasks should be chosen to provide a range of intrinsic feedback, perceived interest and perceived difficulty. The role of intrinsic feedback has been discussed: it is suggested that ILC performance is enhanced by this while ELC performance is relatively insensitive to it. The possible role of task preferences (i.e., expressed interest) will also be explored.

D. Hypotheses

The following specific hypotheses will be tested:

1. Scores on tasks with high intrinsic feedback will be positively correlated with locus of control in conditions of negative reinforcement and negatively correlated in conditions of positive reinforcement.

2. Correlations between locus of control and performance scores in tasks with high intrinsic feedback will not be affected by the approval-correctness reinforcer dimension.

3. Scores on tasks with low intrinsic feedback will be positively correlated with locus of control in conditions of negative reinforcement and negatively correlated in conditions of positive reinforcement.

4. Performance scores on tasks with low intrinsic feedback will be positively correlated with locus of control in conditions of correctness reinforcement.

5. In a task with high intrinsic feedback, ILC Ss will obtain higher scores in conditions of negative reinforcement than in conditions of positive reinforcement.

6. In a task with low intrinsic feedback, ILC Ss will obtain higher scores in conditions of correctness reinforcement than in conditions of approval reinforcement.

7. In a task with low intrinsic feedback, ILC Ss will obtain higher scores in conditions of negative reinforcement than in conditions of positive reinforcement.

8. Performance scores will increase in successive time blocks. The increase will be most apparent in comparisons of first and last time blocks.

9. Reinforcement effects are more likely to be apparent in later time blocks than in initial time blocks.

10. Ratings of interest and difficulty will be negatively correlated.

11. No shifts related to reinforcement conditions are expected for ILC Ss' ratings.

Chapter III

Method

A. Design

This study presented adolescent male EMR $\underline{S}$s with a series of four tasks selected to provide differences in intrinsic feedback as well as a potential range of difficulty and interest. The tasks were presented under four reinforcement conditions. Serial learning, a verbal learning task, provides a high degree of intrinsic feedback. A task with somewhat less clear intrinsic feedback is represented by mirror drawing, a motor learning task. In this task, feedback is provided by kinesthetic and visual cues; however, the latter, presented in a mirror, are not as clear as when $\underline{S}$ may look directly at what he is doing. In order to make maximum use of the reflected image, $\underline{S}$ must learn to correctly interpret the reversed directional cues it provides.

Object naming, a verbal performance task, may be considered to provide little intrinsic feedback. Some degree of feedback is available in the visual cues on the presentation of each item. However, since only one presentation of each item is available, there is no opportunity for S to employ this information as self-correction. Minimal intrinsic feedback is available in marble dropping, a motor performance task. Indeed, it is just this lack of feedback that had led Stevenson (1965), among others, to choose this task as most appropriate for studies of social reinforcement. In this task, no objective criterion of performance is available, apart from that set by E, thus making it more likely that extra-task cues will affect performance.

Tasks were administered under each of four reinforcement conditions: approval-positive, approval-negative, correctness-positive and correctness-negative. Each S performed all four tasks, each under a different reinforcement condition (thus experiencing all tasks and all reinforcement conditions).

Two different task orders were chosen to enable examination of the data for effects of sequence. Two tasks were considered likely to be most sensitive to this effect: serial learning and marble dropping. Miller (1961) reported that performance on a serial learning task was sensitive to previous experience with the same task (although a different list) as well as to shifts in learning climate (e.g., success vs. failure emphasis). The present study considers the effects of performance on this task following performance on other tasks in various reinforcement conditions. Marble dropping, which is considered the task most sensitive to social reinforcement, (Stevenson, 1965), may also be sensitive to effects of varying task sequences. In order to emphasize such order effects, these two tasks were placed in the extreme positions, first and last. Thus, half of the Ss received tasks in one order (marble dropping, object naming, mirror drawing, serial learning), while the remaining Ss received tasks in the reverse order.

Actual experience (i.e., performance) may modify Ss' perceptions of the tasks by providing additional information. The reinforcement condition under which a task has been experienced may also influence subsequent judgements. Thus, it would be desirable to obtain two sets of judgements: one before and one after exposure to the tasks. This was done by a simple ranking procedure.

B. Sample Description

Adolescent educable mentally retarded boys were selected to serve as Ss for this study. This age group was selected in an attempt to insure optimal reliability of responses to the LC questionnaire. The sample was limited to boys for logistical and methodological reasons. In terms of logistics, major sources of S pools which have been located are programs for boys only. Furthermore, as Stevenson (1966), among others, has indicated, sex seems to play an uncertain role in determining responsivity to social reinforcement. By limiting the sample to males, some degree of control may be achieved over this variable. Since a majority of EMR's are boys, there is additional justification for this procedure.

Data was collected from one hundred ninety-two male EMR's attending public school junior and senior high special classes in Buffalo and BOCES #1 (a major suburban school district). Ss' ages ranged from 13-0 to 18-0 with a mean of 15-10, IQ scores ranged from 50 to 75 with a mean of 66.7, adjusted MAs ranged from 7-2 to 13-7 with a mean of 10-7 and locus of control scores ranged from 2 to 20 with a mean of 13.5 (Table 1).

C. Procedure

Ss were randomly assigned to treatments; the makeup of each group can be summarized as follows (Table 2): Treatment groups: This refers to the task-reinforcement condition combinations, assigned via a Latin square arrangement, (Figure 4) consisting of 48 Ss in each group. The four treatment groups are designated by Roman numerals in the following discussion (Table 2). Half of each group received one task sequence (marble dropping, object naming, mirror drawing, serial learning) while the sequence was reversed for the other half. Furthermore, each of these task-order groups was divided in half to permit administration of tasks by two experimenters. Thus, half of the Ss were given the LC scale, pre-performance ratings the first marble dropping base period by E_1, and the experimental tasks and post-performance ratings by E_2 while the reverse experimenter order was used for remaining Ss. This resulted in four cells (designated by an Arabic numeral) and 12 Ss each within each treatment group.

Table 1

Means and Standard Deviations of Developmental Variables

Treatment Cell	Chron. Age $\bar{x}$	S.D.	IQ $\bar{x}$	S.D.	MA $\bar{x}$	S.D.	LC x	S.D.
1	192.8	16.6	66.0	6.0	127.2	14.5	12.3	3.8
2	192.7	14.3	65.9	7.0	127.0	19.7	13.0	3.7
3	172.5	10.8	67.8	7.9	117.0	17.7	13.9	6.6
4	185.1	11.5	65.2	5.8	120.7	11.1	12.9	2.7
5	184.5	14.3	66.0	7.2	121.7	15.9	13.8	2.6
6	190.0	16.9	64.8	8.3	123.1	20.4	12.3	4.7
7	196.9	17.0	64.3	5.7	126.6	15.3	12.9	3.9
8	201.5	19.4	68.1	4.4	137.2	19.4	13.6	2.8
9	191.9	14.7	67.0	6.3	128.6	16.0	13.2	2.6
10	177.4	13.0	69.1	4.6	122.6	13.2	13.8	3.0
11	193.9	15.9	69.3	7.1	134.4	14.8	12.8	2.6
12	192.9	14.8	66.3	6.7	127.9	15.7	14.0	2.9
13	192.6	16.3	68.3	6.3	131.5	16.9	14.8	1.8
14	190.2	20.3	66.8	5.8	127.0	15.5	13.6	3.4
15	189.1	15.8	67.1	6.8	126.9	14.5	14.6	2.7
16	195.8	17.1	64.8	6.6	126.9	14.5	14.6	2.7
All Ss	190.0	16.6	66.7	6.4	126.6	16.4	13.5	3.0

Note.-- N per cell = 12; Total N = 192

Table 2

Description of Experimental Design

Treatment Group (N=48)[a]	Treatment Cell (N=12)	Task Order[b]	Experimenter Order
I	1	1	1
I	2	1	2
I	3	2	1
I	4	2	2
II	5	1	1
II	6	1	2
II	7	2	1
II	8	2	2
III	9	1	1
III	10	1	2
III	11	2	1
III	12	2	2
IV	13	1	1
IV	14	1	2
IV	15	2	1
IV	16	2	2

[a]Task x Reinforcement Condition Combinations (C: Correctness: A: Approval):

Task:	Group: I	II	III	IV
Object Naming	C+	C−	A+	A−
Mirror Drawing	C−	A+	A−	C+
Serial Learning	A+	A−	C+	C−
Marble Dropping	A−	C+	C−	A+

[b]Task Orders:

1. Serial Learning, Object Naming, Mirror Drawing, Marble Dropping.
2. Marble Dropping, Mirror Drawing, Object Naming, Serial Learning.

Figure 4

Latin Square

Reinforcement Conditions	Tasks: Serial Learning	Mirror Drawing	Object Naming	Marble Dropping
Approval + (A+)	I	II	III	IV
Approval - (A-)	II	III	IV	I
Correctness + (C+)	III	IV	I	II
Correctness - (C-)	IV	I	II	III

These cells differ in terms of task order and experimenter order.

Each S was administered a form of the Bialer-Cromwell Children's Locus of Control Scale (Gozali & Bialer, 1968). Following that, they were asked to rate the four experimental tasks, as described below. They then performed each task under a different reinforcement condition. Last, they once again rated the tasks.

1. Locus of Control Scale

The version of the Children's Locus of Control Scale used by Gozali and Bialer (1968) was administered individually to a total of one hundred ninety-two Ss. (complete scale in Appendix A).

2. Ratings

Each S was asked to rank the tasks before and after performance, in terms of interest (preferences) and difficulty.

Each task was illustrated on a 3 x 5 card in a simple line drawing. Serial learning was represented by a number of cards with words on them, mirror drawing by a pencil tracing around a star and its mirrored reflection, object naming by a number of cards with pictures on them and marble dropping by a tray of marbles and a box into which a marble is being dropped.

To obtain rankings, the four cards were placed alongside one another and in front of the S. He was asked:

> Look at all four pictures. Which one of these games do you think is the hardest? (Remove indicated picture.) Now which is hardest? (Continue until all but one have been removed.)

3. Tasks

Each S performed each of the four tasks. A performance measure, as described below, was obtained for each. In addition, a persistence measure (time on) was obtained.

Prior to the introduction of each task, S was told:

> We are going to play a new game now. You can stop the game whenever you want. Remember, whenever you want to, we will stop the game.

Each S was permitted a maximum of ten minutes on each task.

When an S had continued to this deadline, he was told:

> We have to stop this game now. It's time for us to go on to something else.

Upon completion of the tasks and ratings, each S was thanked for cooperating.

a. Serial Learning. Serial learning was chosen as one of the tasks since it provides a maximum of intrinsic feedback to the S. In addition, it is possible to clearly indicate correct and incorrect responses. Finally, the task is one which has been found to be appropriate for use with mentally retarded Ss. Although Miller (1961) was able to locate only three serial learning studies involving MR S's, the research has increased recently. Thus, there are two reviews of such studies available (Butterfield, 1968; Goulet, 1968). The results of the studies reviewed have been quite consistent:

> Retardates take longer to reach criterion and make more errors prior to reaching it than do both CA- and MA- matched non-retardates. When error scores are corrected for overall efficiency, Ss who make more errors prior to criterion make a higher percentage of errors in the middle portion of the list. (Butterfield, 1968, p. 787).

This indicates the appropriateness of this task for retardates; furthermore, Miller's (1961) study indicates that the performance of these S's on this task is sensitive to reinforcement conditions as well as to LC differences.

Essentially the same materials and procedures described by Miller (1961) were used. A list of ten two-syllable pictured nouns selected from Milton Bradley primary grade flash cards were presented by the anticipation method. The pictures were presented as 35mm black and white slides on a desk top viewer by a Kodak Carousel 800 Slide Projector coupled to a Carousel Programmer Model 1. Each item was presented for 2 sec. with a 2 sec. interitem interval. There was a 10 sec. intertrial interval and a card with an "X" signalled the beginning of a new trial. The items used were: apple, kitten, letter, squirrel, basket, window, pencil, mother, table, farmer.

Miller (1961) reported that Ss took about nine trials, on the average, to reach a criterion of two errorless trials under the fastest learning condition. This would require close to the ten min. time limit used here. Thus it was anticipated that few Ss would attain this level of performance in the twelve trials available. For each S, number of trials, correct items per trial and errors per trial were recorded. The total number of errors divided by the number of minutes spent in the task were used as a performance measure, thus providing some comparability with the measure for the mirror drawing task.

Ss were told:

> Look at the pictures on the cards that I am going to show you. I'll tell you the names of the pictures and then I want to see if you can remember them. Try to do your best. I'll show you a card and you have to tell me the picture that comes next. Try to get the names of all the pictures.

Each response was reinforced appropriately.

b. Mirror Drawing. This was selected as the second task since it seems to provide some degree of intrinsic feedback; that is, the Ss observations of the mirror reflection inform him of the correctness of his response. However, particularly early in the task, it is not made clear what modifications of the response are needed to make it correct. Reynolds and Stacey (1955) and Ellis, Barnett and Pryer (1957) report somewhat different results for mirror drawing tasks. The former study reports a negative correlation between IQ and time on first trial and a positive correlation between time on first trial and decrease in time on later trials. The latter study reports no correlation between time on first trial and IQ but a positive correlation between time and errors. Denny (1964) points out that the Ellis et al. procedure, involving a simple pathway, does not reflect errors in a time score while in the Reynolds and Stacey study, which required Ss to connect 4-cm. circles, it does.

The procedure and apparatus described by Gimon (1967) for this task were used. Ss were required to trace a path around a 6-pointed star (Mirror Tracer, Lafayette Instrument

Company). An error was scored each time the pencil touched one of the printed boundary lines. In addition to the persistence measure, the number of errors per unit time were computed for each S.

Ss were given the following instructions:

> In this game you have to trace the path around the star. You can look at the star and watch your hand in this mirror. You have to keep the pencil between these lines. It shouldn't touch or cross the dark lines. Draw very carefully. You start here (E points to part of star closest to S), and go this way (E indicates counter-clockwise motion). O.K., you can start.

In order to obtain a performance measure on this task, as well as to facilitate the systematic administration of reinforcements and equal the number of potential responses on all tasks, the path was broken up into 150 segments (approximately 10 per leg). Each time a segment was traversed, a reinforcement was administered. If the pencil had touched one of the dark lines, the response was incorrect. If no lines had been touched, the response was correct. This procedure had the additional advantage of providing approximately equal opportunities to obtain reinforcement (in terms of frequency) as the remaining tasks.

c. Object Naming. This task was chosen to provide a simple verbal performance situation, analogous to the motor performance task. It is somewhat similar to a Binet item (Year II, Test 5, Picture Vocabulary). Ss will be presented with a series of pictures of common objects, one at a time, and asked to name the object depicted. No citations could be found in the literature involving the use of such a task.

Ss were presented with pictures of 150 objects, listed in Appendix B, and asked to name them. Pictures were selected from the Peabody Picture Vocabulary Test Plates (with the permission of the publisher, American Guidance Service). Each picture was shown for 2 sec. and there was a 2 sec. interitem interval. The pictures were presented as 35mm black and white slides on a desk top viewer by a Kodak Carousel 800 Slide Projector coupled to a Carousel Programmer Model 1. Thus, in order to achieve one trial on each item, a S had to remain in this task for the maximum of 10 min. The following directions were given:

> Look at the picture on each card I show you. Try to tell me the name of the thing in the picture. I will show you each picture just once.

d. Marble Dropping. Stevenson (1965) discusses a number of criteria which should be met by the "ideal" task to be used in studies of social reinforcement: he concludes that marble dropping is the task which best fits these criteria. In this simple, repetitive motor task, S simply drops marbles, one at a time, into a hole in a wooden box. If there are two holes (and marbles of two colors), E may designate one as correct and deliver reinforcements accordingly; in that case, the task may be referred to as marble sorting.

Measures of performance on this task include increase in response rate and the amount of time S will spend in the task. Parton and Ross (1965) analyze a variety of scores which have been used in this task and recommend the use of performance time as an index of the effectiveness of social reinforcers. The task is desirable since it "requires minimal prior learning (and) has no clear criteria for adequate performance..." (Stevenson, 1965, p. 99). Many studies which involved the marble dropping task have been reviewed in the section on social reinforcement; those studies indicated its appropriateness with MR S's and its sensitivity to reinforcement conditions.

A marble dropping task, similar to that described by Stevenson (1965), was used. The experimental apparatus consisted of a metal box with two holes in the top into which S could drop marbles. The marbles were returned, one every 4 sec., to an open tray at the front of the apparatus. The chutes through which the marbles traveled were lined with foam rubber in order to minimize auditory feedback. When S dropped a marble into one of the holes a microswitch was activated which pulsed an event recorder facing E. S was instructed to pick up one marble at a time and put it into one of the two holes in the metal box. Amount of time spent in the task and response rate were recorded.

In order to obtain an index of non-reinforced performance and the preferred hole, two 3-min. periods of non-reinforced performance were required of each S.

The first of these occurred prior to the presentation of all tasks. The second base period was obtained prior to the experimental presentation of this task. Thus, it came before all tasks for half of the Ss (those for whom marble dropping was the first task) and, for the remaining Ss, it came after they had experienced the other three tasks in three reinforcement conditions. This second base rate provided two kinds of information. First, it gave a reliability check of the measure. Second, it allowed an evaluation of the effect of differing reinforcement histories upon this performance.

For each S, the non-preferred hole for four or more of the six 1-min. base periods was designated correct during the experimental session. Each S was given the following instruction:

> We're going to play a game called Marble-in-the-hole. Pick up one marble at a time and drop it in one of the holes. Try to do your best. Remember, pick up just one marble at a time.

4. Reinforcement Conditions

Each task was performed under one of the following reinforcement conditions:

1. Approval, positive (A+) - good, fine, O.K., I like the way you're doing.

2. Approval, negative (A-) - bad, poor, I don't like the way you're doing.

3. Correctness, positive (C+) - Right, that's right. You're doing this right.

4. Correctness, negative (C-) - wrong, that's wrong. You're doing this wrong.

Thus a variety of comments within each class of reinforcer was available. In an attempt to gain some appearance of naturalness, comments were varied within each condition. Comments were delivered in an even tone of voice and were not accompanied by nods, gestures or changes in facial expression.

5. Experimenters

Two male graduate students served as Es. E_1 administered the LC scale, pre-experimental ratings and first marble dropping base rate. E_2 administered the four tasks, second marble dropping base rate and post-experimental ratings. Each experimenter served in each role for half of the Ss.

Chapter IV

Results

The results of the study will be presented in four major sections. The first presents the analysis of the marble dropping base rate data. Next locus of control scores are reported and the correlations between this score and the performance measures are considered.

The third section deals with the three performance measures used. Time on and correct rate scores are briefly presented, followed by the more extensive analyses based upon percent correct scores. The major analyses of ten minute performance data are followed by a set of analyses based upon scores during the first three minutes of performance.

Finally, the ratings of perceived interest and difficulty, obtained prior to and following performance, are considered.

A. Marble Dropping Base Rates

Two 3-min base rates (i.e., non-reinforced performance) were obtained from each S as a means of evaluating the stability of non-reinforced performance. The measure used was the number of marbles dropped for each 3-min period (both holes). In addition, this performance determined the designation of the correct response during the reinforced period of performance. The hole which was least preferred (the one into which fewer marbles were dropped) during four or more of the six minutes was designated correct.

The first base rate period was administered to all Ss prior to the presentation of any of the tasks. The second base rate was administered immediately before performance of the marble dropping task. For half of the Ss, then, base rate two was administered prior to any task, immediately after base one (marble dropping was the first task), while for the other half, it was administered after completion of three tasks (marble dropping was the last task). Those Ss for whom marble dropping was the first task may be considered to have had the same experimental reinforcement history (i.e., no reinforcement prior to the marble dropping base rate). However, Ss for whom marble dropping was the last task may be divided into four groups with different reinforcement histories.(Table 2). Thus, there are 96 Ss whose reinforcement history consists of no reinforcement prior to marble dropping and four other groups (of 24 Ss each) with varying reinforcement histories. Each reinforcement history group, consists, in turn, of two equal-sized subgroups, one for each of the two experimenters.

In order to analyse the base rate data, it was necessary to obtain cells of equal size for each reinforcement history. The groups which had varying reinforcement histories each consisted of 24 Ss (12 from each experimenter); it was necessary to select (randomly) 24 Ss from the larger (96 Ss) group for whom marble dropping was the first task. This was done, with the additional provision that there be equal numbers of Ss from each experimenter. This resulted in 10 cells of 12 Ss, differing in terms of reinforcement history and experimenters (Table 4).

It was expected that there would be no differences in base rate performance attributable to base one-two differences, experimenters or reinforcement history. A Lindquist (1953) Type IV analysis of variance was computed (Table 3), with reinforcement history as a between effect and base rates and experimenters as within effects. Results indicated that there were no significant effects attributable to the variables. Thus, it appears that marble dropping base rate performance in an unreinforced period was relatively stable and uninfluenced in this study by experimenters or reinforcement history.

B. Locus of Control

The distribution of locus of control scores (Table 5) made it impossible to divide Ss into equal sized ILC and

Table 3

ANOVA of Marble Dropping Base Rates

(Lindquist Type IV)

Source	df	ss	ms	F
Between Ss	119	249,436.4		
C (reinforcement history)	4	3,238.0	809.5	<1
AB(b)	1	3,096.0	3,096.0	1.43
ABC(b)	4	5,505.7	1,376.4	<1
error(b)	110	237,596.7	2,160.0	
Within Ss	120	153,455.0		
A(base)	1	756.1	756.1	<1
B (experimenters)	1	19.3	19.3	<1
AB(w)	0	0	0	0
AC	4	8,259.8	2,064.9	1.64
BC	4	6,180.0	1,545.0	1.22
ABC(w)	0	0	0	0
error(w)	110	138,239.8		
Total	239	402,891.4		

Table 4

Cell Means for Marble Dropping Base Rates[a]

Cell[b]	$\bar{X}$ Base 1	$\bar{X}$ Base 2	Exptr. Order[c]	Reinforcement History[d]
1	146.3	143.3	1	1
2	134.5	143.4	2	1
3	142.9	115.4	1	2
4	139.3	135.0	2	2
5	133.3	141.1	1	3
6	123.5	148.3	2	3
7	133.8	133.3	1	4
8	161.6	138.5	2	4
9	123.7	126.4	1	5
10	154.3	133.0	2	5
Overall	136.0 E_1	131.9 E_1		
	142.6 E_2	139.6 E_2		

[a]Mean number of marbles per 3 min. base period.

[b]N per cell = 12; Total N = 120.

[c]Order 1: Experimenter 1, Experimenter 2
Order 2: Experimenter 2, Experimenter 1

[d]Refers to reinforcement conditions experienced prior to the second base rate period. RH1: None (e.g., marble dropping as first task); RH2: A+, C+, C-; RH3: A-, C-, A+; RH4: C+, A+, A-; RH5: C+, C-, A- (RH2 through 5, marble dropping as last task).

Table 5

Frequency Distribution of Locus of Control Scores

Score	Frequency	Score	Frequency	Score	Frequency
0	0	12	14	14	19
1	0	13	19	15	27
2	1			16	21
3	0			17	16
4	0			18	14
5	0			19	3
6	1			20	1
7	0			21	0
8	7			22	0
9	9			23	0
10	18				
11	22				
Total	58	Total	33	Total	101

ELC groups (after discarding Ss scoring 12 or 13). Logistical problems and limited number of available Ss prevented the acquisition of sufficient low scoring Ss to fulfill the requirements of the ANOVA design. It was decided that a correlational analysis would be best in this situation.

All correlations involving LC were corrected for restricted range, using the technique described by McNemar (1962, p. 144). Data from Miller (1970) provided the estimated standard deviations of locus of control scores for an uncurtailed distribution. This estimate (s.d. = 5.15) was based on the scores of 100 Ss selected to provide a normally distributed IQ sample ($\bar{X}_{IQ}$ = 100.19, s.d. = 16.5).

Correlations between LC and the developmental variables are reported in Tables 6 and 7. As expected, correlations between LC and MA are substantial enough to warrant use of partial correlations in examinations of the relationships between LC and performance variables; partial correlations are reported in Table 8 (zero-order correlations in Table 9).

It may be noted that negative correlations were obtained between MA and object naming correct rate scores (Table 9). This may be an artifact of the scoring system used. A given pre-determined response was designated as the only acceptable correct response for each item (listed in Appendix B). Silence or any other response was treated as an incorrect response. The latter procedure may have penalized Ss with high MAs who may have been more likely to use synonyms or class labels as responses. Alternatively, it may have been

Table 6

Correlations Between Locus of Control and Developmental Variables (Corrected for Restricted Range)

Treatment Group[a]	N	Correlation with: CA	IQ	MA
I	48	-.02	.31*	.20
II	48	.13	.38*	.34*
III	48	-.26	-.17	-.29*
IV	48	.06	.33*	.28*
All	192	.02	.28*	.23

*p < .05

[a]For explanation, see Table 2 and Chapter III, B.

Table 7

Correlations Between Locus of Control and Developmental Variables

Treatment Group	N	Correlation with: CA	IQ	MA
I	48	-.01	.19	.12
II	48	.10	.29*	.26
III	48	-.14	-.09	-.16
IV	48	.03	.27*	.24
All Ss	192	.01	.17	.14

*$p < .05$

Table 8

Partial Correlations (Corrected for Restricted Range)

Between Locus of Control and Correct-Rate Scores

(MA Partialled)

A. Cast by Group

Group	Object Naming	Mirror Drawing	Serial Learning	Marble Dropping	N
I	.20	.24	-.49*	-.20	48
II	-.38*	-.05	.37*	.43*	48
III	.35*	.36*	.11	.59*	48
IV	-.30*	.08	.40*	-.66*	48

B. Cast by Reinforcement Condition

	Object Naming	Mirror Drawing	Serial Learning	Marble Dropping
A+	.35*	-.05	-.49*	-.66*
A-	-.30*	.36*	.37*	-.20
C+	.20	.08	.11	.43*
C-	-.38*	.24	.40*	.59*

*$p < .05$

Table 9

Zero-Order Correlations Used in Deriving Partial Correlations

A. Correlations between MA and Correct Rate and Locus of Control Scores

Group	N	Object Naming	Mirror Drawing	Serial Learning	Marble Dropping	LC
I	48	-.47*	.17	.08	.00	.12
II	48	.33*	.01	-.13	.40*	.26
III	48	-.19	.01	.22	.06	-.16
IV	48	-.28*	.18	.00	.11	.24

B. Correlations between Locus of Control and Correct Rate Scores

Group	N	Object Naming	Mirror Drawing	Serial Learning	Marble Dropping
I	48	-.18	.17	-.28*	-.13
II	48	-.33*	-.04	.21	.15
III	48	.21	.20	.02	.31*
IV	48	-.21	.09	.18	-.31*

C. Correlations between Locus of Control (Corrected for Restricted Range) and Correct Rate and MA Scores

Group	N	Object Naming	Mirror Drawing	Serial Learning	Marble Dropping	MA
I	48	-.29*	.27*	-.44*	-.21	.20
II	48	-.43*	-.05	.28*	.20	.34
III	48	.38*	.36*	.04	.55*	-.29
IV	48	-.41*	.18	.35*	-.59*	.28

*p < .05

that a single incorrect response led to a series of errors. That is, if, following an error, S attempted to correct himself or was disconcerted (perhaps if a synonym or class label had been unacceptable), hesitation could have resulted in several errors on this rapidly paced task. Thus, a negative correlation between correct rate scores and MA on this task could have arisen from either of two sources.

C. Performance Measures

Four measures of performance were obtained for each task from each S: time on (minutes of performance), correct response rate (total correct responses divided by time on), error response rate (total incorrect responses divided by time on) and percent correct. Distributions of the correct and error rates proved to be significantly different from a normal distribution (Kolmogrov-Smirnov Test). In order to normalize the distributions, prior to any further calculations, correct rate scores were subjected to the following transformation: square root of the score plus one half ($\sqrt{x + 1/2}$); error rate was transformed by: logarithm of the score plus one [$\log(x + 1)$]. Following this, all scores within each task were transformed to T-scores (with a mean of 50.0 and standard deviation of 15.0) in order to allow for comparability of measures.

Correlations between the performance rate measures were calculated (Table 10) and revealed a rather substantial relationship between correct and error rate scores on three of the four tasks (all but mirror drawing). Most of the

Table 10

Correlations Among Performance Measures

Treatment Group	Object Naming	Mirror Drawing	Serial Learning	Marble Dropping
A- Time On w/ Correct Rate				
I	-.08	-.02	-.04	-.22
II	-.15	-.01	-.44*	-.23
III	.11	-.09	-.12	-.28*
IV	-.30*	-.10	-.38*	-.10
All Ss	-.16	-.05	-.03	-.19
B- Time On w/ Error Rate				
I	-.13	-.02	.58*	.22
II	.18	.03	.52*	.23
III	-.12	.15	.31*	.37*
IV	.43*	-.17	.54*	.07
All Ss	.21	.01	.45*	.19
C-Error Rate w/ Correct Rate				
I	-.89*	.40*	-.41*	-.85*
II	-.96*	.27*	-.86*	-.84*
III	-.93*	.24	-.73*	-.72*
IV	-.93*	.62*	-.72*	-.79*
All Ss	-.92*	.62*	-.72*	-.79*

Note. --N per group = 48; Total N = 192.

*p $<$ .05

correlations were between -.72 and -.96, indicating the essential reciprocity of these measures. On this basis it was decided not to use the error rate scores for further analysis.

The positive correlations between correct and error rates obtained in the mirror drawing task appear to be indicative of some difficulties in administering the task. This was the only task in which the rate of response was not closely controlled; S had the entire maze before him and could work at his own pace. In the other tasks, responses were possible only at controlled intervals. In addition, Es did not always return Ss to the path at the point at which an error had occurred. Furthermore, it had been expected that due to the complex nature of the task, rate of performance would be considerably slower. Procedures which might have been used to control response rate (such as exposing only sections of the maze at a time) would have changed the nature of the task by providing additional information. For these reasons, the scores obtained from this task are thought to be of limited value and are not used in later analyses.

1. Time On Scores

An examination of time on scores (Table 11) indicated that while there were differences between tasks in mean time on scores, the differences within each task (which might have been attributable to differences in reinforcement conditions, task order or experimenters) are of a small magnitude. The

Table 11

Time On Scores (Minutes of Performance)

Treatment Cell	Object Naming		Mirror Drawing		Serial Learning		Marble Dropping	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1	9.8	0.58	3.8	2.79	8.7	2.66	8.3	2.78
2	9.8	0.66	3.5	2.38	8.3	2.71	7.9	3.39
3	10.0	0.00	4.4	3.87	8.4	3.17	7.4	3.27
4	9.8	0.87	3.8	2.83	7.8	3.25	3.5	1.87
5	9.0	2.78	4.5	3.34	8.3	3.20	8.1	3.04
6	10.0	0.00	6.3	3.13	9.8	0.60	9.3	1.67
7	8.8	2.93	3.6	3.07	6.1	3.85	3.2	2.82
8	9.4	2.19	5.4	3.07	7.3	2.96	7.4	3.38
9	10.0	0.00	3.8	2.57	8.7	2.55	8.4	2.68
10	10.0	0.00	4.1	2.99	6.6	2.85	6.3	3.35
11	9.9	0.26	5.5	2.92	7.3	3.80	5.7	3.62
12	10.0	0.00	4.6	3.70	8.8	2.58	6.9	3.38
13	9.6	1.36	4.5	2.78	7.7	4.03	8.2	3.20
14	9.3	2.51	4.9	3.25	8.6	2.02	7.4	3.16
15	9.5	1.47	5.0	1.98	8.1	3.43	6.5	1.74
16	10.0	0.00	6.2	3.24	8.7	2.18	8.3	3.12
All Ss	9.7	1.43	4.6	3.01	8.1	2.98	7.0	3.39

Note. --N per cell = 12; Total N = 192

few scores which are markedly different (for example, cells 4 and 7 in marble dropping) represent too small a sample on which to base a valid analysis. In addition, some chance variation (even though extreme) may occur in what can be considered a repeated sampling from a large population. Thus, the overall range of time on scores appeared to be sufficiently restricted to discourage further analysis.

The major source of the highly restricted variability of the time on scores seems to be a tendency for Ss to continue each task for nearly the maximum time available (10 min). This was most marked in the object naming task in which 180 Ss continued for 10 minutes. 97 Ss remained at marble dropping for 10 minutes while 118 Ss did so in serial learning.

Time on scores were markedly lower on the mirror drawing task, although here too there seems to have been little variability in scores. This was the only task in which response rate was uncontrolled; thus, many Ss were able to complete the task in a very short period of time.

Although previous studies (Allen, 1966; Rosenhan & Greenwald, 1965) indicated that 10 minutes seemed to be a sufficient interval in which differences in time on scores of normal Ss may become apparent, this does not appear to have been the case in the present study. It appears to be necessary to use longer time periods if this type of study is to be repeated with EMR Ss.

2. Correct Rate Scores

The specific hypotheses tested were:

1. Scores on tasks with high intrinsic feedback (serial learning, mirror drawing) will be positively correlated with locus of control in conditions of negative reinforcement and negatively correlated in conditions of positive reinforcement.

2. Correlations between locus of control and performance scores in tasks with high intrinsic feedback will not be affected by the approval-correctness dimension.

3. Scores on tasks with low feedback (marble dropping, object naming) will be positively correlated with locus of control in conditions of negative reinforcement and negatively correlated in conditions of positive reinforcement.

4. Scores on tasks with low intrinsic feedback will be positively correlated with locus of control in conditions of correctness reinforcement.

Partial correlations between LC and performance scores (corrected for restricted range) are reported in Table 8. As has been previously indicated it was desirable to partial MA from the LC-correct rate scores (the zero order correlations are reported in Table 8).

Hypothesis 1 received support from the correlations for the mirror drawing and serial learning tasks (Table 8), where there are positive correlations between LC and correct rate scores in conditions of negative reinforcement (although the correlation only approached significance for mirror drawing in the condition of correctness negative). In conditions of positive reinforcement, a significant negative correlation was obtained for serial learning only in approval-positive. However, it may be worth noting that the remaining correlations were low. Thus, although statistical significance was not obtained in all instances, this hypothesis will be accepted.

Hypothesis 2 was supported by the correlations obtained in serial learning and mirror drawing since there is consistency among correlations within either approval or correctness conditions.

Hypothesis 3 was supported only in the correctness-negative and approval-positive conditions for marble dropping. The remaining correlations between LC and performance scores in conditions of negative reinforcement for marble dropping and object naming were negative rather than positive, while those obtained in conditions of positive reinforcement were positive rather than negative. It appears that the effects of positive and negative reinforcement upon these tasks (marble dropping and object naming) are different than had been hypothesized. Therefore, hypothesis 3 is rejected.

Hypothesis 4 is most clearly supported by the results of the marble dropping task where high positive correlations were obtained in conditions of correctness and, contrasting with this, strong negative correlations obtained in conditions of approval. The results for object naming did not support this hypothesis (Table 8).

The preceding analysis confirmed certain predictions about the relationship between LC and performance scores on several tasks in various reinforcement conditions. However, in order to examine the effects on performance of the two reinforcer dimensions, additional analyses, described in the following sections, were needed.

3. Percent Correct Scores

Percent correct scores were used to test the following hypotheses:

5. In a task with high intrinsic feedback (serial learning) Ss will obtain higher scores in conditions of negative reinforcement than in conditions of positive reinforcement.

6. In a task with low intrinsic feedback (marble dropping and object naming) Ss will obtain higher scores in conditions of correctness reinforcement than in conditions of approval reinforcement.

7. In a task with low intrinsic feedback Ss will obtain higher scores in conditions of negative reinforcement than in conditions of positive reinforcement.

8. Performance scores will increase over time. The increase will (most likely) be most apparent in comparisons of first and last time blocks.

9. Reinforcement effects are more likely to be apparent in later time blocks than in initial time blocks.

It will be recalled that the socres used in previous analyses were rate scores - that is, they were derived by dividing the total number of each S's correct responses by the number of minutes spent on the task. Further it had been found that there was very little variation in time on scores within tasks. Because it was possible that the scores used were too heavily weighted by the time factor it was decided to test these hypotheses in terms of time blocks. Two such sets of analyses were performed, allowing a consideration of time effects without confounding performance and persistence measures.

Since the sample consisted of a majority of ILC Ss, it was expected that performance scores would be typical of ILC performance. It was also expected that no differences in performance would be attributable to experimenters since this factor had not been found to affect performance in the analyses of marble dropping base rates (Table 3) or correct rate scores (Appendix D).

The analyses which included time blocks as a factor were based on the assumption that performance is likely to improve over time (i.e., with practice). These analyses sought to evaluate the degree to which one or another of the reinforcement conditions seemed to facilitate this improvement.

The first of these analyses is based on the data for the entire ten minutes. The analyses of performance over the full ten minutes available for Ss offers the opportunity to evaluate reinforcer effect over time periods. This could prove to be more informative than more global analyses, by allowing the study of learning phase by phase.

A separate analysis was performed on each task since it was desired to compare the effects of each reinforcement condition within each task. Mirror drawing data was not included for reasons previously discussed (Chapter IV, Section C). This omission necessitated a separate analysis for each task since a single, overall design was not possible.

The second of these analyses involved performance during the first three minutes on each of three tasks (marble dropping, serial learning and object naming). These analyses attempted to evaluate the sensitivity of the performance measure to reinforcement effects within the first three minutes of the task.

The use of data obtained in only the first three minutes of performance preserved the scores of a larger number of Ss than were available for the analyses of 10-minute performance (since Ss had - and often used - the option to stop a task at any time). This set of data offers a microscopic, short-term view of the reinforcer effects which are the interest of this study.

Separate analyses were performed on each task to compare the effects of each reinforcement condition within each task. However, the analyses of the data for the first three minutes disregards the task order factor used in the 10-minute analyses. This could not be handled because of the asymmetry (due to the omission of mirror drawing) of the resulting design.

a. Ten Minute Performance. As was mentioned, the first analyses were based on performance for ten minutes. The measures used in this, and the following analyses, were percent correct responses for each time block. Since the available data did not fall into cells with even Ns an approximate Typ. III ANOVA was calculated. The approximation involved using an average N per cell in computing degrees of freedom. This was felt to be more useful than discarding Ss to obtain equal Ns. The latter procedure would have involved the loss of much data and would probably have resulted in a sample biased in unknown ways.

Data for all analyses of 10-minute performance were cast in a modified Lindquist Type III ANOVA, with time blocks (2-min) as the within factor and the following between factors: (a) approval-correctness reinforcement; (b) positive-negative reinforcement; (c) first-last task. The analysis for marble dropping is based on 97 Ss and is summarized in Tables 12 through 23. The analysis for serial learning is based on data from 118 Ss and is summarized in Tables 24 through 26, while the one for object naming is based on 180 Ss (Table 29).

a.1 Marble Dropping. The analysis for 10-minute marble dropping performance (Table 12) indicated a significant triple interaction (blocks by positive-negative reinforcement by first-last task). Cell means are recorded in Table 13. Each pair of cells with the same superscript differed only in terms of approval or correctness reinforcement. The similarity of the scores indicated how ineffective this dimension appears to have been.

A Type I ANOVA based on blocks by first-last for positive reinforcement (Table 14) revealed a significant interaction. An A by S ANOVA showed that there were no significant differences between blocks on the first task (Table 15). On the last task increases in scores between all blocks (except 3-4, 3-5 and 4-5) were significant. A simple factorial analysis of the data for each time block (Table 16) found significant differences between the task orders only in the fourth and fifth time blocks (with means higher for last task than for first task).

The analysis of corresponding data for negative reinforcement (Table 17) also resulted in a significant blocks by first-last interaction. However, there were no significant differences between blocks on the last task (Table 18). On the first task, a significant effect for blocks was found; all differences between increase in scores for blocks (except 2-3 and 4-5) were significant. Simple factorial analyses, one for each time block (Table 19), indicated no significant differences between task orders within blocks.

Although no effects were significant, some interesting trends may be noted in this data. In all but cell 2 (Table 13), there is a decrease in scores after block 3. When scores are collapsed on the approval-correctness dimension, this becomes less apparent. It seems, then, that although a comparison between the first and last time block may show a significant increase, there occur, at intermediate points, non-significant decreases. Most of these are small, and may involve no more than 1 or 2 responses. Thus, this decrement may be no more than occasional carelessness or a brief "testing" of the E for consistency of reinforcement delivery.

Table 12

ANOVA of Percent Correct Marble Dropping Scores

for Ss Performing for Ten Minutes

Source	df	ss	ms	F
Between Ss	95.8	598,533.2		
B (App.-Corr.)	1	4,050.2	4,050.2	<1
C (Pos.-Neg.)	1	46,872.4	46,872.4	7.91**
D (1st-last)	1	888.8	888.8	<1
BC	1	1,730.3	1,730.3	<1
BD	1	1,740.4	1,740.4	<1
CD	1	15,127.9	15,127.9	2.85
BCD	1	2,220.0	2,220.0	<1
error (b)	88.8	525,903.2	5,299.3	
Within Ss	387.2	108,894.0		
A (blocks)	4	8,049.5	2,012.4	8.38**
AB	4	565.2	141.3	<1
AC	4	4,338.8	1,084.7	4.52**
AD	4	891.3	222.8	<1
ABC	4	1,551.3	387.8	1.61
ABD	4	868.7	217.2	<1
ACD	4	5,069.3	1,267.3	5.27*
ABCD	4	2,245.0	561.3	2.33
error (w)	355.2	85,314.9	240.2	
Total	483	707,427.4		

$^{**}p < .01$

$^{*}p < .05$

Table 13

Cell Means for Percent Correct

Marble Dropping Scores for Ss

Performing for Ten Minutes

		Blocks				
Cell	N	1	2	3	4	5
1[d2]	15	57.0	61.5	62.2	68.8	65.8
2[c2]	6	42.3	75.2	77.8	89.2	98.5
3[b1]	18	49.3	54.7	57.2	56.5	62.8
4[a1]	7	36.0	51.3	50.1	45.3	36.3
5[d1]	13	63.3	76.6	79.9	78.3	73.9
6[c1]	10	64.5	83.4	84.3	86.2	85.5
7[b2]	14	55.4	57.8	61.6	63.2	58.7
8[a2]	14	49.6	49.1	50.1	36.5	42.1
All	97	52.1	63.7	65.4	65.5	65.5

[a]Positive reinforcement, first task

[b]Positive reinforcement, last task

[c]Negative reinforcement, first task

[d]Negative reinforcement, last task

[1]Correctness reinforcement

[2]Approval reinforcement

Table 14

Type I ANOVA of Percent Correct Marble Dropping Scores for Ten Minutes-Performance Within Positive Reinforcement

Source	df	ss	ms	F
Between Ss	52	356,418		
B (first-last)	1	9,986	9,986	1.47
error (b)	51	346,432	6,792	
Within Ss	212	41,314		
A (blocks)	4	1,215	304	1.66
AB	4	2,663	666	3.63**
error (b)	204	37,436	183	
Total	264	397,732		

**p .01

Table 15

Effects of Blocks in Positive Reinforcement

For Percent Correct Scores for

Ten Minute Performance on Serial Learning

A. Serial Learning as First Task

Source	df	ss	ms	F
A (blocks)	4	2,220	555	<1
S	20	28,822		
AS	80	132,728	1,659	
Total	104	163,770		

B. Serial Learning as Last Task

Source	df	ss	ms	F
A (blocks)[a,b]	4	1,659	415	3.64**
S	31	208,210		
AS	124	14,107	114	
Total	159	223,976		

[a]Means for blocks: (1) 52.4, (2) 56.3, (3) 59.4, (4) 59.9 (5) 60.8 (N = 32 per block)

[b]Differences between means

	2	3	4	5
1	3.9*	7.0*	7.5*	8.4*
2		3.1*	3.6*	4.5*
3			0.5	1.4
4				0.9

*p < .05

**p < .01

Table 16

Type I ANOVA of Marble Dropping Percent Correct Scores for Ten Minute Performance within Positive Reinforcement for Each Two Minute Time Block

Source	df	ss	ms	F
Block 1				
A (first-last)	1	602	602	< 1
Within	51	66,661	1,307	
Total	52	67,263		
Block 2				
A	1	483	483	< 1
Within	51	84,116	1,649	
Total	52	84,599		
Block 3				
A	1	999	999	< 1
Within	51	85,024	1,667	
Total	52	86,023		
Block 4				
A	1	5,077	5,077	3.93*
Within	51	76,319	1,496	
Total	52	81,396		
Block 5				
A	1	5,491	5,491	3.90*
Within	51	71,747	1,407	
Total	52	77,238		

Note - Means for Blocks 4 and 5

		Task	
		First	Last
Blocks	4	40.9	59.8
	5	39.2	60.7

*p < .05

Table 17

Type I ANOVA of Blocks by Task Order Interaction for Negative Reinforcement for Percent Correct Scores on Ten Minute Marble Dropping Performance

Source	df	ss	ms	F
Between Ss	43	195,243		
B (first-last)	1	6,031	6,031	1.33
error (b)	42	189,212	4,505	
Within Ss	176	67,580		
A (blocks)	4	11,173	2,793	8.83**
AB	4	3,297	824	2.60*
error (w)	168	53,110	316	
Total	219	262,823		

*p .05

**p .01

Table 18

Effects of Time Blocks Within Each Task Order for Negative Reinforcement for Percent Correct Scores On Ten Minute Marble Dropping Performance

Source	df	ss	ms	F
First Task				
A (blocks)	4	11,658	2,914	11.8**[a,b]
S	15	53,517		
AS	60	14,806	247	
Total	79	79,981		
Last Task				
A (blocks)	4	2,812	703	1.98
S	27	135,695		
AS	108	38,304	355	
Total	139	176,811		

[a]Means for each block: (1) 53.4, (2) 79.3, (3) 81.0, (4) 87.7, (5) 92.0 (N = 16 per block)

[b]Differences Between Means

	2	3	4	5
1	25.9*	27.6*	34.3*	38.6*
2		1.7	8.4	12.7*
3			6.7	11.0
4				4.3

*p .05

**p .01

Table 19

Type I ANOVA for Effects of Task Order Within Each Two Minute Time Block for Negative Reinforcement for Percent Correct Scores for Ten Minute Marble Dropping Performance

Source	df	ss	ms	F
Block 1				
A (first-last)	1	142	142	1
Within	42	36,285	869	
Total	43	36,427		
Block 2				
A	1	1,420	1,420	1.09
Within	42	54,523	1,298	
Total	43	55,943		
Block 3				
A	1	1,334	1,334	1.0
Within	42	55,909	1,331	
Total	43	57,243		
Block 4				
A	1	2,024	2,024	1.92
Within	42	44,364	1,056	
Total	43	46,388		
Block 5				
A	1	4,406	4,406	3.61
Within	42	51,243	1,220	
Total	43	55,649		

Table 20

ANOVA of Interaction of Blocks with Positive-Negative Reinforcement Within Each Task Order for Percent Correct Scores on Ten Minute Marble Dropping Performance

Source	df	ss	ms	F
First Task				
Between Ss	36	245,004		
B (Pos-Neg)	1	53,266	53,266	9.72**
error (b	35	191,738	5,478	
Within Ss	148	52,013		
A (blocks)	4	4,840	1,210	4.44**
AB	4	9,037	2,234	8.21**
error (w)	140	38,136	272	
Total	184	297,017		
Last Task				
Between Ss	59	352,640		
B	1	8,735	8,735	1.47
error (b)	58	343,905	5,929	
Within Ss	240	56,882		
A	4	4,102	1,025	4.52**
AB	4	369	92	1
error (w)	232	52,411	226	
Total	299	409,522		

**p .01

Table 21

ANOVA of Effects of Positive-Negative Reinforcement within Each Two Minute Time Block for Percent Correct Scores for Ten Minute Marble Dropping Performance (First Task)

Source	df	ss	ms	F
Block 1				
A (Pos-Neg)	1	1,127	1,127	1
within	35	42,649	1,219	
Total	36	43,776		
Block 2				
A	1	8,423	8,423	5.45*
within	35	53,182	1,519	
Total	36	61,605		
Block 3				
A	1	9,062	9,062	5.96*
within	35	53,204	1,520	
Total	36	62,266		
Block 4				
A	1	20,822	20,822	18.6**
within	35	39,128	1,118	
Total	36	59,950		
Block 5				
A	1	22,871	22,871	19.2**
within	35	41,709	1,192	
Total	36	64,580		

Note - Means for Above Table:

Reinforcement		Blocks				
	N	1	2	3	4	5
Positive	21	45.0	49.9	50.3	39.4	40.2
Negative	16	56.2	80.3	81.9	87.7	90.4

*p .05 **p .01

Table 22

Differences Between Means for Blocks in Negative Reinforcement for Marble Dropping as Last Task - Percent Correct Scores for Ten Minute Performance

	2	3	4	5
1	6.4*	8.9*	10.4*	9.0*
2		2.5	4.0	2.6
3			1.5	0.1
4				1.4

Note - Means for blocks : (1) 56.3, (2) 62.7, (3) 65.2, (4) 66.7, (5) 65.3 (N = 28 per block)

*p .05

Table 23

ANOVA of Positive-Negative by Task Order Interactions Within Each Two Minute Time Block for Percent Correct Scores for Ten Minute Performance on Marble Dropping

Source	df	ss	ms	F
Block 1				
A (Pos-Neg)	1	771	771	1
B (First-Last)	1	2,106	2,106	1.90
cells	3	2,880		
AB	1	3	3	1
Within	93	102,946	1,107	
Total	96	105,796		
Block 2				
A	1	8,872	8,872	5.94**
B	1	31	31	1
cells	3	10,776		
AB	1	1,873	1,873	1.25
Within	93	138,818	1,493	
Total	96	149,594		
Block 3				
A	1	8,633	8,633	5.67*
B	1	5	5	1
cells	3	10,965	2,327	1.53
Within	93	140,933	1,515	
Total	96	151,898		
Block 4				
A	1	17,309	17,309	13.3
B	1	753	753	1
cells	3	24,409		
AB	1	6,347	6,347	4.88*
Within	93	120,683	1,298	
Total	96	145,092		
Block 5				
A	1	14,292	14,292	10.8**
B	1	221	221	1
cells	3	24,189		
AB	1	9,676	9,676	7.31**
Within	93	122,990	1,323	
Total	96	147,179		

*p .05 **p .01

The next analysis considered the interaction between blocks and positive-negative reinforcement (Table 20). The analysis of this interaction for marble dropping as the last task found a significant effect for blocks but none for positive-negative reinforcement conditions. Further analyses (Table 22) showed that block 1 was significantly lower than the four other time blocks.

For marble dropping as the first task, analysis (Table 20) found a significant block by positive-negative reinforcement interaction. Analyses of the positive-negative effect, for each time block (Table 21), indicated that means for blocks two through five were significantly higher in negative than in positive reinforcement.

The final interaction considered was between positive-negative reinforcement and task order within each time block (Table 23). There were no significant differences in block 1 while in blocks 2 and 3 means for negative reinforcement were significantly higher than those for positive reinforcement. In blocks 4 and 5 a significant interaction was found: for marble dropping as first task, means for negative reinforcement were significantly higher than those for positive reinforcement (Table 21).

To summarize, the Type III analysis for marble dropping scores revealed a significant triple interaction (blocks x first-last x positive-negative). This interaction indicated that although scores increased over time, scores were higher in conditions of negative than positive reinforcement, particularly when marble dropping was the first task. When marble dropping was the last task, Ss expected reinforcement for their performances and so would more readily shift from the preferrred hole when this response was met with silence. It should be noted that the approval-correctness reinforcer dimension was not a significant factor. The results of the various analyses necessary for the interpretation of this triple interaction may be summarized as follows:

1. Blocks: No significant differences among blocks were found in a condition of positive reinforcement on the first task or for negative reinforcement on the last task (Tables 14 and 15). In a condition of negative reinforcement for the first task, scores of blocks 2 through 5 were significantly higher than those of block 1 and scores of blocks 3 through 5 were significantly higher than those of block 2 (Table 18). Scores increased significantly between the first and last blocks, although not progressively.

In a condition of positive reinforcement for the last task, scores of blocks 2 through 5 were significantly higher than those of block 1 and scores of blocks 3 through 5 were significantly higher than those of block 2. (Table 15) Scores progressively increased from block 1 to block 5. Furthermore, it was found that for the last task, when scores for both reinforcement conditions were combined, scores for block 1 were significantly lower than all others.

Thus, there is limited support for hypothesis 8 in these data. There was a significant increase when scores for the first and last time blocks were compared in conditions of negative reinforcement-first task and both reinforcers last task. However, the scores did not increase progressively and, indeed, showed some intermediate decreases.

2. Task Order: In most conditions, there were no significant differences when comparing scores of the two task orders (Tables 14-19). However, in blocks 4 and 5 under conditions of positive reinforcement, scores for marble dropping as last task were significantly higher than those for marble dropping as first task. (Table 16).

3. Positive-Negative Reinforcement: Significant differences between the effects of each type of reinforcer were evident only when marble dropping was the first task (Tables 20 and 21) except in blocks 2 and 3 where scores for negative reinforcement were higher than those for positive reinforcement regardless of task order (Table 23). On blocks 2 through 5 scores were higher in conditions of negative reinforcement than in conditions of positive reinforcement (although there was no significant difference in block 1).

In sum, then, the analysis for percent correct scores for 10-minute performance on the marble dropping task confirmed hypothesis 8 regarding improvement over time. The findings in regard to positive and negative reinforcement support hypothesis 7, while hypothesis 6, concerning the relative effects of correctness and approval reinforcers, was not supported. Furthermore, hypothesis 9 was supported in that there were no significant differences between positive and negative reinforcement conditions in block 1, but such differences in later time blocks were significant.

a.2 Serial Learning. The Lindquist Type III ANOVA (Table 24) for percent correct for 10-minute performance on the serial learning task (based on 118 Ss) indicated a significant main effect for blocks and a significant interaction (positive-negative x task order); the analysis is summarized in Tables 24-28. A test of the means for time blocks (Table 26) indicated that all differences between blocks are significant and scores progressively increase from first to last block. The analysis of the DC interaction (Tables 27 and 28) indicated that the mean score for first task, negative reinforcement was significantly higher than the mean for first task, positive reinforcement (Table 28) and the mean for last task, positive reinforcement was significantly higher than the mean for first task positive reinforcement (Table 27).

These results confirmed hypothesis 8 regarding increases in score over time blocks. The finding in regard to the reinforcement effect (scores for first task were higher with negative than positive reinforcement) confirms hypothesis 5. While this was true in one task order, it was not true in the other order (last task). Apparently, task order may result in some changes in reinforcer effects. Indeed, this possiblity was the reason for varying task order. However, the effects did not appear consistently. In this instance, it would seem that a reinforcer effect which was observable when serial learning was the first task became masked when this was the last task. Short-term exposure

Table 24

Type III ANOVA of Percent Correct Serial Learning Scores for Ten Minute Performance

Source	df	ss	ms	F
Between Ss	117.4	174,351.2		
B (App-Corr)	1	3,619.6	3,169.6	2.61
C (Pos-Neg)	1	1,973.3	1,973.3	1.43
D (1st-last)	1	2,308.3	2, 308.3	1.67
BC	1	4,878.4	4,878.4	3.53
BD	1	740.1	740.1	<1
CD	1	6,710.3	6,710.3	4.87**
BCD	1	1,525.1	1,525.1	1.10
error (b)	110.4	152,696.1	1,383.1	
Within Ss	473.6	167,752.4		
A (blocks)	4	146,635.0	36,658.8	458.8**
AB	4	748.1	187.0	2.34
AC	4	230.4	57.6	<1
AD	4	429.9	107.4	1.34
ABC	4	449.8	112.4	1.40
ABD	4	207.1	51.7	<1
ACD	4	535.0	143.2	1.79
ABCD	4	166.5	41.6	<1
error (w)	441.4	35,279.6	79.9	
Total	591	342,103.6		

**$p < .01$

*$p < .05$

Table 25

Means for Percent Correct Serial Learning Scores for Ten Minute Performance

		Blocks				
Cell	N	1	2	3	4	5
1[a]	16	29.3	39.5	52.4	57.8	70.8
2[b]	16	35.5	49.5	65.9	68.3	84.3
3[c]	20	39.6	54.4	69.6	68.5	81.7
4[d]	9	41.8	61.3	71.3	76.9	90.1
5[a]	12	36.7	46.7	65.7	74.0	80.3
6[b]	15	45.1	63.5	73.2	82.6	88.5
7[c]	16	40.0	58.5	71.8	77.3	88.3
8[d]	14	32.9	48.6	58.8	70.6	84.2
All	118	37.5	52.5	66.0	71.3	83.1

[a]Positive reinforcement, first task

[b]Positive reinforcement, last task

[c]Negative reinforcement, first task

[d]Negative reinforcement, last task

Table 26

Differences Between Mean Percent Correct Scores for Each Two Minute Time Block for Serial Learning, Ten Minute Performance

	2	3	4	5
1	15.0*	28.5*	33.8*	45.6*
2		13.5*	18.8*	30.6*
3			5.3*	17.1*
4				11.8*

Note - Means for each block: (1) 37.5, (2) 52.5, (3) 66.0, (4) 71.3, (5) 83.1 (N = 118 per block)

*$p \leqslant .05$

Table 27

ANOVA of Effects of Task Order Within Positive and Negative Reinforcement for Percent Correct Serial Learning Scores for Ten Minute Performance

Positive Reinforcement

Source	df	ss	ms	F
A (first-last)	1	8,714	8,714	15.0**
Within	293	169,919	580	
Total	294	178,633		

Note.--$\bar{X}$ (positive reinforcement, first task) = 55.3
$\bar{X}$ (positive reinforcement, last task) = 65.5

Negative Reinforcement

Source	df	ss	ms	F
A (first-last)	1	303	303	1
Within	293	178,122	608	
Total	294	178,425		

Note.--$\bar{X}$ (negative reinforcement, first task) = 65.0
$\bar{X}$ (negative reinforcement, last task) = 63.7

**p .01

Table 28

ANOVA of Effects of Positive and Negative Reinforcement Within Task Order for Percent Correct Serial Learning Scores for Ten Minute Performance

First Task

Source	df	ss	ms	F
A (Pos-Neg)	1	8,173	8,173	14.3**
W	318	181,826	572	
T	319	189,999		

Note.--$\bar{X}$ (positive reinforcement, first task) = 55.3

$\bar{X}$ (negative reinforcement, first task) = 65.0

Last Task

Source	df	ss	ms	F
A (Pos-Neg)	1	655	655	1.05
W	268	166,069	620	
T	269	166,724		

Note.--$\bar{X}$ (positive reinforcement, last task) = 65.5

$\bar{X}$ (negative reinforcement, last task) = 63.7

**p .01

to varied and very concentrated social reinforcement may vitiate the effects of any one reinforcer.

a.3 Object Naming. Analysis of variance of percent correct performance scores for object naming (Lindquist Type III) revealed no significant differences due to any of the reinforcement conditions (Table 29). Task order did not figure in this analysis since it was not manipulated in regard to object naming. A significant main effect of time blocks was found (Table 29). Comparisons of the mean percent correct scores for each time block indicated that all differences(except between blocks 3 and 5) were significant, supporting hypothesis 8. No other hypotheses were supported.

b. Three Minute Performance. The next set of analyses (Table 30 to 41) compared task scores within each reinforcement condition for the first three minutes of performance (in three 1-min blocks). Four Lindquist Type 1 ANOVA's were computed, one for each reinforcement condition. In each instance, blocks was the within factor and tasks the between factor.

The use of data obtained in only the first three minutes of performance preserved the scores of a larger number of Ss than were available for the analysis of 10-minute performance (since Ss often stopped before the full 10-min limit). This set of data offers a microscopic, short-term view of the reinforcer effects which are the interest of this study.

Table 29

ANOVA of Per Cent Correct Scores for Object Naming

(Ten Minute Performance)

Source	df	ss	ms	F
Between Ss	179	66,214		
B (App-Corr)	1	136	136	<1
C (Pos-Neg)	1	22	22	1
BC	1	42	42	<1
error (b)	176	66,014	375	
Within Ss	720	67,528		
A (blocks)	4	34,892	8,723	189.6**a,b
AB	4	164	41	<1
AC	4	242	61	1.3
ABC	4	79	20	<1
error (w)	704	32,151	46	
Total	899	133,742		

[a]Means for each block: (1) 56.7, (2) 74.0, (3) 71.7, (4) 66.0, (5) 71.8 (N = 180 per block)

[b]Differences between means:

	2	3	4	5
1	7.3*	5.0*	9.3*	15.1*
2		2.3*	8.0*	2.2*
3			5.7*	0.1
4				5.8*

*p < .05

**p < .01

Table 30

Type I ANOVA of Per Cent Correct Scores for First Three Minutes Under Approval-Positive Reinforcement

Source	df	ss	ms	F
Between Ss	130	237,356		
B (tasks)	2	22,216	11,108	6.61**
error (b)	128	215,140	1,681	
Within Ss	262	67,553		
A (blocks)	2	9,297	4,649	108.1**
AB	4	47,248	11,812	274.7**
error (w)	256	11,008	43	
Total	392	304,909		

Note: Means for Above Analysis

	Blocks			
Tasks	1	2	3	N
Object Naming	58.2	54.5	78.8	48
Serial Learning	29.7	35.2	38.3	44
Marble Dropping	50.9	54.5	52.7	39

**p . .01

Table 31

ANOVA for Each 1-Minute Performance Block

Within Approval-Positive Reinforcement

Block 1

Source	df	ss	ms	F
A (tasks)	2	19,730	9,865	16.7**
Within	128	75,374	589	
Total	130	95,104		

Note: ON-SL and SL-MA

Sig. dif. ($p < .05$)

Block 2

Source	df	ss	ms	F
A	2	10,924	5,462	9.19**
Within	128	76,021	594	
Total	130	86,945		

Note: ON-SL and SL-MA

Sig. dif. ($p < .05$)

Block 3

Source	df	ss	ms	F
A	2	38,812	19,406	25.5**
Within	128	97,475	762	
Total	130	136,287		

Note: Means for all tasks

Sig. dif. ($p < .05$)

Table 32

ANOVA of Per Cent Correct Scores on Each Task

Within Approval-Positive Reinforcement

Object Naming

Source	df	ss	ms	F
A (blocks)	2	16,555	8,250	128.9**
S	47	14,543		
AS	94	6,043	64	
Total	143	37,086		

Note: Blocks 1-3 and 2-3 sig. dif. (p .05)

Serial Learning

Source	df	ss	ms	F
A	2	1,685	843	2.41*
S	43	35,401		
AS	86	29,984	349	
Total	132	67,070		

Note: Blocks 1-3 sig. dif. (p .05)

Marble Dropping

Source	df	ss	ms	F
A	2	244	122	1
S	38	127,079		
AS	76	13,097	172	
Total	116	140,420		

**p .01

*p .05

Table 33

Type I ANOVA of Per Cent Correct Scores for First Three Minutes Under Approval-Negative Reinforcement

Source	df	ss	ms	F
Between Ss	128	218,947		
B	2	36,911	18,456	12.8**
error (b)	126	182,036	1,445	
Within Ss	258	106,363		
A	2	15,841	7,921	23.5**
AB	4	5,692	1,423	4.22**
error (w)	252	84,830	337	
Total	386	325,310		

Note: Means for Above Analysis

Tasks	Blocks 1	2	3	N
Object Naming	58.9	56.6	78.3	47
Serial Learning	36.9	41.0	45.4	42
Marble Dropping	41.6	54.8	59.1	40

**p .01

Table 34

ANOVA for Each 1-Minute Performance Block

Within Approval-Negative Reinforcement

Block 1

Source	df	ss	ms	F
A (tasks)	2	12,044	6,022	7.79**
Within	126	97,361	773	
Total	128	109,405		

Note: ON-SL and SL-MA

Sig. dif. (p .05)

Block 2

Source	df	ss	ms	F
A	2	6,222	3,111	4.46*
Within	126	87,727	696	
Total	128	93,949		

Note: ON-SL and SL-MA

Sig. dif. (p .05)

Block 3

Source	df	ss	ms	F
A	2	24,338	12,169	18.7**
Within	126	81,778	649	
Total	128	106,116		

Note: All means

Sig. dif. (p .05)

**p .01

*p .05

Table 35

ANOVA of Per Cent Correct Scores on Each Task

Within Approval-Negative Reinforcement

Object Naming

Source	df	ss	ms	F
A (blocks)	2	13,360	6,680	89.0**
S	46	17,219		
AS	92	6,933	75	
Total	140	37,512		

Note: Blocks 1-3 and 2-3 sig. dif. (p .05)

Serial Learning

Source	df	ss	ms	F
A	2	1,526	763	6.75**
S	41	42,891		
AS	82	9,226	113	
Total	125	53,643		

Note: Blocks 1-3 sig. dif. (p .05)

Marble Dropping

Source	df	ss	ms	F
A	2	6,648	3,324	3.77*
S	39	121,927		
AS	78	68,670	880	
Total	119	197,245		

Note: Blocks 1-3 sig. dif. (p .05)

**p .01

*p .05

Table 36

Type I ANOVA of Per Cent Correct Scores for First Three Minutes

Under Correctness-Positive Reinforcement

Source	df	ss	ms	F
Between Ss	136	267,036		
B	2	102,306	51,153	41.6**
error (b)	134	164,730	1,229	
Within Ss	274	94,064		
A	2	~~17,117~~	8,559	33.3**
AB	4	8,218	2,055	7.99**
error (w)	268	68,729	257	
Total	410	361,100		

Note: Means for Above Analysis

Tasks	Blocks 1	2	3	N
Object Naming	34.4	54.6	79.2	48
Serial Learning	37.9	43.7	51.5	42
Marble Dropping	40.4	49.4	49.5	37

**p .01

Table 37

ANOVA for Each 1-Minute Performance Block

Within Correctness-Positive Reinforcement

Block 1

Source	df	ss	ms	F
A (tasks)	2	25,839	12,920	24.4**
Within	134	71,082	530	
Total	136	96,921		

Note: ON-SL and ON-MA

Sig. dif. (p .05)

Block 2

Source	df	ss	ms	F
A	2	25,346	12,673	21.0**
Within	134	80,873	604	
Total	136	106,219		

Note: ON-SL and SL-MA

Sig. dif. (p .05)

Block 3

Source	df	ss	ms	F
A	2	59,393	29,697	62.6**
Within	134	63,158	471	
Total	136	122,551		

Note: ON-SL and ON-MA

Sig. dif. (p .05)

**p .01

Table 38

ANOVA of Per Cent Correct Scores on Each Task

Within Correctness-Positive Reinforcement

Object Naming

Source	df	ss	ms	F
A (blocks)	2	19,438	9,719	123.0**
S	47	11,032		
AS	94	7,464	79	
Total	143	37,934		

Note: -- Blocks 1-3 and 2-3 sig. dif. (p .05)

Serial Learning

Source	df	ss	ms	F
A	2	3,910	1,955	4.18*
S	41	6,611		
AS	82	38,312	467	
Total	125	48,833		

Note: -- Block 1-3 sig. dif. (p .05)

Marble Dropping

Source	df	ss	ms	F
A	2	2,041	1,021	3.21*
S	36	147,087		
AS	72	22,899	318	
Total	110	172,027		

Note: -- Blocks 1-2 and 1-3 sig. dif. (p .05)

**p .01

*p .05

Table 39

Type I ANOVA of Per Cent Correct Scores for First Three Minutes Under Correctness-Negative Reinforcement

Source	df	ss	ms	F
Between Ss	128	176,119		
B	2	57,507	28,754	30.6**
error (b)	126	118,617	941	
Within Ss	258	81,217		
A	2	22,157	11,079	55.1**
AB	4	8,453	2,113	10.5**
error (w)	252	50,607	210	
Total	386	257,336		

Note: Means for Above Analysis

Tasks	Blocks 1	2	3	N
Object Naming	56.0	55.1	79.2	45
Serial Learning	35.6	41.1	44.0	44
Marble Dropping	54.3	71.7	78.2	40

**p $<$ .01

Table 40

ANOVA for Each 1-Minute Performance Block

Within Correctness-Negative Reinforcement

Block 1

Source	df	ss	ms	F
A (tasks)	2	11,184	5,592	14.3**
Within	126	49,430	392	
Total	128	60,614		

Note: ON-SL and SL-MA

Sig. dif. (p .05)

Block 2

Source	df	ss	ms	F
A	2	19,672	9,836	21.3**
Within	126	57,932	460	
Total	128	77,604		

Note: All means

Sig. dif. (p .05)

Block 3

Source	df	ss	ms	F
A	2	35,104	17,552	14.6**
Within	126	151,856	1,205	
Total	128	186,960		

Note: ON-SL and SL-MA

Sig. dif. (p .05)

**p .01

Table 41

ANOVA of Per Cent Correct Scores On Each Task Within Correctness-Negative Reinforcement

Object Naming

Source	df	ss	ms	F
A (blocks)	2	16,789	8,395	102.0**
S	44	3,145		
AS	88	7,277	82	
Total	134	37,211		

Note. --Blocks 1-3 and 2-3 sig.dif. (p .05)

Serial Learning

Source	df	ss	ms	F
A	2	1,581	791	1.26
S	43	28,160		
AS	86	53,833	626	
Total	131	83,574		

Marble Dropping

Source	df	ss	ms	F
A	2	12,245	6,123	24.1**
S	39	77,312		
AS	78	19,819	254	
Total	119	109,376		

Note. --Blocks 1-2 and 1-3 sig.dif. (p .05)

**p $<$ .01

In each analysis, there was a significant AB interaction (between blocks and tasks). Separate analyses were performed to interpret each of the interactions. In each reinforcement condition, object naming scores were significantly higher than serial learning scores in each time block. Also, object naming scores were higher than marble dropping scores; the differences were significant in the following situations: approval-positive, block 3; approval-negative, blocks 1 and 3; correctness-positive, blocks 1 and 3; correctness-negative, block 2. Marble dropping scores were significantly higher than serial learning scores in conditions of approval-positive (all blocks), approval-negative (blocks 2 and 3), and correctness-negative (all blocks). The task scores, for the first three minutes of performance, may be ordered (high to low) as follows: object naming, marble dropping, and serial learning (Tables 31, 34, 37, and 40).

When scores for each block were compared within each task (Tables 32, 35, 38, and 41), it was found that when scores were significantly different, in every instance, the higher scores were obtained on later blocks (as predicted by hypothesis 8). Differences between the first and last time block in each reinforcement condition for each task were frequently significant.

These four analyses, comparing tasks within each reinforcement condition for the first three minutes of performance, offered some support for hypothesis 8. An additional analysis was needed in order to compare performance across reinforcement conditions within each task.

A final set of four Lindquist Type I analyses were performed using the data of the first three minutes to compare performance for each task under each of the four reinforcement conditions during each of the three 1-minute time blocks.

For the serial learning task (Table 42), there was a significant main effect for blocks and for reinforcement conditions. All differences between blocks were significant, confirming hypothesis 8. The means for correctness-positive were significantly higher than those for approval-positive. A difference in scores due to the correctness-approval reinforcement dimension was not predicted for this task; however the direction of the difference is the same as that predicted (hypothesis 6) for tasks with low intrinsic feedback.

The analysis of data for object naming (Table 43) indicated a single significant effect: blocks. All differences between blocks were significant; as in serial learning, scores progressively increased from block 1 to block 2 to block 3. These results supported only hypothesis 8.

The finding of a percent correct scores decrement in block 4 (10-min) and block 2 (3-min) (although non-significant), raises the possibility that there may have been inadvertent clusters of more difficult material. However, this could also have been a fatigue effect.

The scores for the marble dropping task showed a significant blocks by reinforcement condition interaction

Table 42

ANOVA of Per Cent Correct Scores

During First Three Minutes for Serial Learning

Source	df	ss	ms	F
Between Ss	171	119,758		
B (reinfor.)	3	6,695	2,232	3.31*[c,d]
error (b)	168	113,063	673	
Within Ss	344	99,730		
A (blocks)	2	8,188	4,094	15.2**[a,b]
AB	6	514	86	<1
error (w)	336	90,668	270	
Total	515	219,488		

[a]Means for blocks: (1) 35.0, (2) 40.2, (3) 44.8

[b]Differences between block means:

	2	3
1	5.2*	9.8*
2		4.6*

[c]Means for reinforcement conditions: A+ = 34.4, A- 41.1, C+ = 44.4, C- = 40.2.

[d]Differences between reinforcement condition means:

	A-	C+	C-
A+	6.7	10.0*	5.8
A-		3.3	0.9
C+			4.2

**$p < .01$

*$p < .05$

Table 43

Type I ANOVA of Per Cent Correct Scores

During First Three Minutes for Object Naming

Source	df	ss	ms	F
Between Ss	187	56,197		
B (reinf)	3	308	103	<1
error (b)	184	55,889	304	
Within Ss	376	93,804		
A (blocks)	2	65,593	32,797	431.5**
AB	6	444	74	<1
error (w)	368	27,767	76	
Total	563	150,001		

[a]Means for blocks: (1) 56.9, (2) 51.3, (3) 70.7 (N = 188 per block).

[b]Differences between block means:

	2	3
1	5.6*	13.8*
2		19.4*

**$p < .01$

*$p < .05$

Table 44

Type I ANOVA of Per Cent Correct Scores

During First Three Minutes for Marble Dropping

Source	df	ss	ms	F
Between Ss	155	503,943		
B (reinf)	3	50,539	10,180	3.26*
error (b)	152	473,404	3,115	
Within Ss	312	145,663		
A (blocks)	2	15,554	7,777	19.0**
AB	6	5,622	937	2.28*
error (w)	304	124,487	410	
Total	467	649,606		

Means for above:

Reinforcement Condition	Blocks 1	2	3	N
A+	50.9	54.5	52.7	39
A−	41.6	54.8	59.1	40
C+	40.4	49.4	49.5	37
C−	54.3	71.7	78.2	40

$**p < .01$

$*p < .05$

Table 45

Analysis of Data Within Each 1-Minute Block

for Marble Dropping, Three Minute Performance

Source	df	ss	ms	F
Block 1				
A (reinf.cond)	3	5,540	1,847	1.49
Withins Ss	152	188,323	1,239	
Total	155	193,863		
Block 2				
A	3	11,196	3,732	2.70*[a]
Within Ss	152	209,542	1,379	
Total	155	220,738		
Block 3				
A	3	19,431	6,477	4.92**[b]
Within Ss	152	200,020	1,316	

[a]Differences Between Reinforcement Condition Means in Block 2

	(A-)	(C+)	(C-)
(A+)	0.3	5.1	17.2*
(A-)		5.4	16.9*
(C+)			22.3*

[b]Differences Between Reinforcement Condition Means in Block 3

	(A-)	(C+)	(C-)
(A+)	6.4	3.2	25.5*
(A-)		9.6	19.1*
(C+)			28.7*

**p .01

*p .05

Table 46

ANOVA of Data Within Each Reinforcement Condition for Marble Dropping Percent Correct Scores for Three Minute Performance

Source	df	ss	ms	F
Approval-Positive				
A (blocks)	2	245	123	<1
S	38	127,079	3,344	
AS	76	13,096	172	
Total	116	140,420		
Approval-Negative				
A	2	6,647	3,324	3.77*
S	39	121,926	3,126	
AS	78	68,671	880	
Total	119	197,244		
Blocks 1-3 sig. dif. ($p < .05$)				
Correctness-Positive				
A	2	2,041	1,021	3.21*
S	36	147,087	4,086	
AS	72	22,899	318	
Total	110	172,027		
Blocks 1-2 and 1-3 sig. dif. ($p < .05$)				
Correctness-Negative				
A	2	12,244	6,122	24.1**
S	39	77,311	1,982	
AS	78	19,820	254	
Total	119	109,375		
Blocks 1-2 and 1-3 sig. dif. ($p < .05$)				

*$p < .05$ **$p < .01$

(Table 44). Interpretation of the interaction indicated that there were no significant differences between reinforcement conditions in block 1 but that in blocks 2 and 3 scores in correctness-negative were significantly higher than in all other reinforcement conditions. (Table 45). A comparison among blocks within each reinforcement condition indicated no significant differences within the approval-positive conditions. However, in the approval-negative condition, scores in block 3 were significantly higher than those of block 1; in correctness-positive and correctness-negative the scores of blocks 2 and 3 were significantly higher than those of block 1 (Table 46).

The results of this final set of four analyses may be summarized as follows:

1. Hypothesis 5 (scores on serial learning will be higher with negative than with positive reinforcement) was not supported.

2. Hypothesis 6 (scores on marble dropping and object naming will be higher with correctness than with approval reinforcement) was not supported.

3. Hypothesis 7 (scores on marble dropping and object naming will be higher with negative than with positive reinforcement) was not supported.

4. Hypothesis 8 (scores will increase with time and the increase will be most apparent in comparisons of first and last time blocks) was supported by the data from serial learning, object naming and marble dropping (except in the approval-positive reinforcement condition).

5. Hypothesis 9 (reinforcement effects are more likely to be apparent in later than in initial time blocks) was supported by the data from marble dropping

D. Ratings

Ss were asked to rank each task in terms of interest and in terms of difficulty. One set of rankings was obtained prior to performance and a second set was obtained after performance. In these rankings, 1 means most interesting or most difficult and 4 means least interesting or least difficult. The ratings were used to test the following hypotheses:

10. Ratings of interest and difficulty will be negatively correlated. That is, Ss are expected to perceive tasks of moderate difficulty as most interesting. Tasks seen as extremely difficult will be rated low on interest.

11. No shifts related to reinforcement conditions are expected for ILC Ss ratings.

Pearson product moment correlations were used to examine relationships among the ratings while chi-square analyses were used to investigate shifts. Pearson correlations were deemed appropriate because the ratings although derived from a ranking procedure, were quantitative measures rather than rank scores. Comparisons were made within each task within each reinforcement condition.

The first set of tables summarizes the correlations and chi-squares obtained for the comparisons of pre- and post-ratings for each task. The data for marble dropping (Table 47) indicates that significant correlations occurred in the following ratings: pre-interest, post-interest for A+, A-, and C+; pre-difficulty, post-difficulty for A-;and post-interest, post-difficulty for C-. Significant shifts were found in pre-difficulty, post-difficulty ratings for A-; pre-interest, post-interest ratings for C+ and C-.

Serial learning ratings (Table 48) were significantly correlated in the following instances: pre-interest, post-interest for A+, C+ and C-; pre-difficulty, post-difficulty for A-, C+ and C-; and post-interest, post-difficulty for A-, C+ and C-. Significant chi-squares were recorded for pre-difficulty, post-difficulty for A- and C- as well as for pre-interest, pre-difficulty.

The correlations reported for mirror drawing (Table 49) were significant in these conditions: pre-interest, post-interest for A-, C+ and C-; pre-difficulty, post-difficulty for A+ and post-interest, post-difficulty for A+. The obtained chi-squares were significant for pre-interest, post-interest for A+, A-, and C-; for pre-difficulty, post-difficulty for A+ and C-.

The ratings for object naming (Table 50) resulted in significant correlations under the following conditions: pre-interest, pre-difficulty for A+; pre-interest, post-interest A+, A-, C+, C-; and pre-difficulty, post difficulty for A+, A-, C+ and C-. Significant chi-squares were obtained in conditions of: pre-interest, post-interest A+, C-; pre-difficulty, post-difficulty A-. C+ and post-interest, post-difficulty C-.

Table 47

Correlation Coefficients and Chi-Square Values for Comparisons of Ratings

Marble Dropping

Rating	Reinforcement Conditions			
	Approval +		Approval -	
	r	X^2	r	X^2
Pre-interest, Post-interest	.37*	13.7	.32*	9.9
Pre-difficulty, Post-difficulty	.20	9.7	.27*	21.8*
Pre-interest, Pre-difficulty	-.03	6.9	.03	11.4
Post-interest, Post-difficulty	.04	17.9*	.05	5.8
	Correctness +		Correctness -	
Pre-interest, Post-interest	.41*	32.7*	.23	29.3*
Pre-difficulty, Post-difficulty	-.06	11.3	.13	14.6
Pre-interest, Pre-difficulty	.03	9.7	-.07	4.8
Post-interest, Post-difficulty	-.30*	9.0	.05	8.5

*$p < .05$

NC: not computable due to zero frequencies

Table 48

Correlation Coefficients and Chi-Square Values for Comparisons of Ratings

Serial Learning

Rating	Reinforcement Conditions			
	Approval +		Approval -	
	r	X^2	r	X^2
Pre-interest, Post-interest	.26*	14.6	.20	7.4
Pre-difficulty, Post-difficulty	.15	8.3	.55*	31.0*
Pre-interest, Pre-difficulty	-.01	3.3	-.21	6.2
Post-interest, Post-difficulty	.21	14.4	-.26*	14.7
	Correctness +		Correctness -	
Pre-interest, Post-interest	.39*	10.2	.30*	12.9
Pre-difficulty, Post-difficulty	.27*	10.0	.38*	22.0*
Pre-interest, Pre-difficulty	-.13	13.2	-.10	19.9*
Post-interest, Post-difficulty	.33*	13.7	.36*	4.7

*p .05

NC: not computable due to zero frequencies

Table 49

Correlation Coefficients and Chi-Square Values for Comparisons of Ratings

Mirror Drawing

Rating	Reinforcement Conditions			
	Approval +		Approval -	
	r	X^2	r	X^2
Pre-interest, Post-interest	.15	23.0*	.47*	22.6*
Pre-difficulty, Post-difficulty	.43*	22.4*	.08	NC
Pre-interest, Pre-difficulty	-.10	10.2	.18	5.7
Post-interest, Post-difficulty	-.26*	13.2	.03	NC
	Correctness +		Correctness -	
Pre-interest, Post-interest	.26*	13.5	.28*	18.6*
Pre-difficulty, Post-difficulty	.21	16.2	.20	20.9*
Pre-interest, Pre-difficulty	-.06	5.5	.03	6.6
Post-interest, Post-difficulty	.18	5.0	-.16	6.5

*$p < .05$

NC: not computable due to zero frequencies

Table 50

Correlation Coefficients and Chi-Square Values

for Comparisons of Ratings

Object Naming

Rating	Reinforcement Conditions			
	Approval +		Approval -	
	r	X^2	r	X^2
Pre-interest, Post-interest	.44*	26.3*	.35*	10.7
Pre-difficulty, Post-difficulty	.31*	NC	.31*	17.1*
Pre-interest, Pre-difficulty	.26*	16.0	.01	12.7
Post-interest, Post-difficulty	-.15	NC	.05	11.4
	Correctness +		Correctness -	
Pre-interest, Post-interest	.27*	9.4	.45*	17.0*
Pre-difficulty, Post-difficulty	.30*	22.5*	.36*	10.1
Pre-interest, Pre-difficulty	-.03	12.2	.10	7.8
Post-interest, Post-difficulty	-.20	8.0	0.3	17.3

*p ⁄ .05

NC: not computable due to zero frequencies

Table 51

Frequency Distribution of Ratings for All Tasks

Rating	Task: Marble Dropping	Serial Learning	Mirror Drawing	Object Naming
Pre-interest				
1	80	27	71	16
2	73	30	60	30
3	21	70	28	72
4	18	65	35	74
Post-interest				
1	96	20	56	33
2	46	46	42	54
3	32	80	19	64
4	17	45	74	39
Pre-difficulty				
1	19	39	126	11
2	60	54	42	35
3	49	57	15	72
4	64	42	12	74
Post-difficulty				
1	8	19	158	7
2	29	101	20	41
3	41	46	9	41
4	113	25	3	49

Table 52

Frequency Distribution of Ratings for Marble Dropping

Rating	Approval +	Approval -	Correctness +	Correctness -
Pre-interest				
1	24	17	17	22
2	13	19	24	17
3	2	10	6	3
4	9	2	1	6
Post-interest				
1	21	22	30	23
2	14	11	8	13
3	6	9	9	8
4	6	6	1	4
Pre-difficulty				
1	5	5	3	6
2	14	18	18	10
3	13	13	14	9
4	16	12	13	23
Post-difficulty				
1	3	1	2	2
2	3	10	12	4
3	7	19	8	7
4	34	18	26	35

Table 53

Frequency Distribution of Ratings for Serial Learning

Rating	Approval +	Approval -	Correctness+	Correctness-
Pre-interest				
1	10	7	5	5
2	5	6	7	12
3	18	16	21	15
4	15	19	15	16
Post-interest				
1	6	5	3	6
2	13	13	10	10
3	21	21	17	21
4	8	9	18	10
Pre-difficulty				
1	4	12	9	14
2	16	14	15	9
3	17	11	15	14
4	11	11	9	11
Post-difficulty				
1	3	7	3	6
2	25	19	29	28
3	7	16	12	11
4	13	6	4	12

Table 54

Frequency Distribution of Ratings for Mirror Drawing

Rating	Approval +	Approval -	Correctness+	Correctness-
Pre-interest				
1	21	18	14	18
2	9	19	17	15
3	11	3	8	6
4	9	8	9	9
Post-interest				
1	11	15	17	13
2	11	12	12	7
3	5	4	5	5
4	21	17	13	23
Pre-difficulty				
1	33	28	29	36
2	7	13	16	7
3	6	5	2	2
4	5	2	2	3
Post-difficulty				
1	38	43	35	43
2	5	5	7	3
3	4	0	3	2
4	1	0	1	1

Table 55

Frequency Distribution of Ratings for Object Naming

Rating	Approval +	Approval -	Correctness+	Correctness-
Pre-interest				
1	3	5	3	5
2	5	7	9	9
3	21	22	14	15
4	19	14	22	19
Post-interest				
1	7	2	7	17
2	13	11	17	13
3	19	16	13	16
4	9	18	10	2
Pre-difficulty				
1	5	1	3	2
2	10	9	7	9
3	19	19	16	18
4	14	19	22	19
Post-difficulty				
1	0	4	2	1
2	10	10	9	12
3	29	24	20	20
4	9	9	16	15

The frequency distributions of the ratings for each task are reported in Table 51 while Tables 52 through 55 summarize the ratings given each task in terms of the reinforcement condition under which the task was experienced.

Hypothesis 10 (ratings of interest and difficulty will be negatively correlated) was tested by the correlation between interest and difficulty ratings, for each reinforcement condition. The hypothesis was supported in the following instances: (a) marble dropping: only in C+ post-ratings; (b) serial learning: only in A- post-ratings; (c) mirror drawing: only in A+ post-ratings. There were a number of other instances (Tables 47-50) in which correlations were not significant but, as predicted, were negative. Also, it may be noteworthy that significant negative correlations were obtained only for the ratings made after performance and that there was no consistency in terms of the reinforcement condition under which a task had been performed.

While these results seem hardly sufficient to accept the hypothesis, they do seem to indicate that additional research in this area is warranted. The ranking technique used may have lacked sufficient sensitivity. However, it did reveal some weak relationships between interest and difficulty, of the kind predicted.

Hypothesis 11 (changes in interest ratings will not be related to reinforcement conditions) was tested by comparing differences in the pre-interest and post-interest ratings by the chi-square statistic (Tables 47-50). There were significant changes for two tasks (mirror drawing and object naming) in the A+ condition; only mirror drawing showed a significant shift in the A- condition; only marble dropping showed a significant shift in the C+ condition; and, in the C- condition, three tasks (marble dropping, mirror drawing and object naming) evidenced significant shifts. More shifts occurred in the mirror drawing task (three) than in any of the other tasks and there were no significant shifts in the serial learning task.

An examination of the frequency distributions of the ratings (Tables 51 to 55) indicates that the shifts in ratings within each task were in the same direction in all reinforcement conditions. Thus, for marble dropping and object naming, there was some increase in the frequency with which they were rated very interesting while in mirror drawing the shift was towards lower interest ratings. Thus, the shifts which did occur seem more likely to have been a product of some factor other than the reinforcement condition under which the task was performed, supporting hypothesis 11. As predicted, ILC Ss did not shift their ratings in response to reinforcement conditions.

One of the most interesting (and least expected findings) in Ss' ratings of the tasks was the high interest seen in the marble dropping task (Table 51). 153 Ss rated it most interesting prior to performance and only slightly fewer (142) rated it most interesting after performance (considering ratings of 1 and 2). The strong expression of interest in this task stands in strong contrast to the *a priori* judgement of this task by Es. Stevenson (1965) recommends this task as the most desirable for use in studies of social reinforcer effectiveness since it is a dull, uninteresting task. The majority of social reinforcement studies reported in the literature have used this as the only experimental task. If the ratings of the Ss in this study were to be replicated with other samples, there would be urgent need to re-examine assumptions being made about tasks chosen for experimental purposes.

E. Summary of Results

One hundred ninety-two adolescent male EMRs were asked to perform each of four tasks (marble dropping, serial learning, mirror drawing and object naming) in four different reinforcement conditions (approval-positive, approval-negative, correctness-positive, correctness-negative). Prior to performance, the Bialer-Cromwell LC scale was administered to each S, who was also asked to rank each task in terms of interest and difficulty (rankings were repeated following performance). In addition, two non-reinforced base rate periods of marble dropping were obtained, one prior to all tasks and the second just before the marble dropping task.

Analysis of the marble dropping base rate scores indicated that as predicted there were no differences between the two base rates.

LC scores were not distributed as expected, preventing the division of the sample into ILC and ELC groups. Correlations between LC and other variables were corrected for restricted range; partial correlations (MA partialled) were then computed between LC and correct rate scores. This analysis indicated that the approval-correctness reinforcement dimension was useful in predicting scores only for the marble dropping task while the positive-negative reinforcement dimension was useful in predicting scores on the other three tasks.

Further analysis of performance data was based upon percent correct scores. Two other measures, time on and error rate, proved not to be useful. In addition, there were no significant differences as a result of administration of tasks by two Es.

Percent correct scores were used first to examine performance of Ss who completed ten minutes on a given task (See Table 56). Analyses of the marble dropping task (96 Ss) indicated that: (1) scores increased with time, although not significantly in all reinforcement conditions or in both task orders; (2) differences between scores in the two task orders were significant only in blocks 4 and 5 under conditions of positive reinforcement; and (3) scores obtained under conditions of negative reinforcement were higher than those obtained in positive reinforcement (for serial learning as the first task and in blocks 2 through 5).

The data for the serial learning task (118 Ss) resulted in significant differences between time blocks and significantly higher scores obtained in negative reinforcement than in positive reinforcement (serial learning as first task).

Object naming (180 Ss) scores revealed a significant effect due to time blocks; no significant effects were related to reinforcement conditions on this task.

The next set of analyses considered percent correct scores for only the first three minutes of performance in each task. These analyses indicated that task scores could be ordered (from low to high) as follows: serial learning, marble dropping, object naming. Again, as predicted, scores increased with time. In addition, where reinforcement effects were apparent (marble dropping) there were differences in the last time block but not in the first, as predicted.

The ratings were examined with respect to relationships between interest and difficulty and shifts in ratings (before and after performance). As expected, for a sample of primarily ILC Ss, shifts in ratings were not related to reinforcement conditions under which tasks had been performed, except in the negative correctness condition. The predicted negative correlation between interest and difficulty was found only in a few instances. An unexpected finding was that marble dropping is rated the most interesting task by these Ss.

Table 56

Summary of Significant Differences Between Time Blocks

Task	Analysis			
	3-min Performance	No. of Ss	10-min Performance	No. of Ss
Serial Learning	All differences between time blocks significant (all reinforcement conconditions).	172	All differences between time blocks significant (all reinforcement conditions and both task orders).	118
Object Naming	All differences between time blocks significant (all reinforcement conditions).	188	All differences between time blocks significant except between blocks 3 and 5 (all reinforcement conditions).	180
Marble Dropping	Block 3 scores significantly higher than block 1 scores in A- and C+. Block 2 scores significantly higher than block 1 scores only in C+.	156	As first task: block 1 scores significantly lower than all other blocks in negative reinforcement only; also, block 2 scores significantly lower than block 5. As last task: all differences between time blocks (except 3-4 and 4-5) significant in all reinforcement conditions	96

Chapter V

Discussion

Although many of the specific hypothesis were only partially supported by the data, the results of the present study were sufficiently consistent to lend credence to the theoretical position on which the study was based. That is, social reinforcers may be differentiated both in terms of valence (positive or negative) and emphasis (approval or correctness) and the effects of these reinforcers may vary from task to task. These effects may be predicted from an evaluation of the intrinsic feedback provided by a given task. In addition, and more importantly, this interaction between tasks and reinforcers can be predicted from knowledge of Ss motivational orientation (locus of control). Furthermore, there was some indication that Ss' perceptions of tasks may be related to some facets of performance.

A. Locus of Control

The initial difficulty encountered in the present study involved the distribution of LC scores. Earlier research (McConnell, 1965) had indicated that in an EMR population, 30% to 40% of Ss would score 12 or 13 and of the remaining

Ss, half would score above 13 and half below 12. The present research planned, therefore, to eliminate Ss scoring at the midpoint (12 and 13) and to use only extreme scores in defining ELC and ILC groups. However, the distribution actually obtained was such as to make this impossible. Only about 15% of the Ss scored at the midpoint and the remainder were very unevenly divided: about 35% scored below 12 and 50% above 13.

Recently, Hersch and Scheibe (1967) have suggested that norms be developed for each sample prior to division into internal and external groups. That is, rather than define ELC or ILC in terms of set scores, the range for the classification would be set for a particular sample. The distribution of scores obtained in the present study could have been more easily handled in this manner. However, this procedure could result in a set of data which would not be comparable to other studies which define LC in the conventional manner.

The problems presented by the use of a verbal self-report scale to measure LC are numerous. The construction of a performance measure seems indicated. A modified concept learning task, developed by McManis and Bell (1968), appears to have been successful in differentiating between reward-seeking and punishment-avoiding mentally retarded Ss. An extension of this might be developed into an appropriate performance measure of locus of control.

Several authors have recently recommended some modifications in the distinction between ILC and ELC. Katz (1969) suggests that locus of control scales should differentiate between an external environment which is perceived "as merely capricious or indifferent, and [one which is perceived] as biased, discriminatory and malevolent," (Katz, 1969, p. 25). Gurin, Gurin, Lao and Beattie (1969) suggest, in addition, that the scale might be constructed to accommodate the following considerations: (1) External control by people versus external control by disembodied forces (luck, chance), another way of considering this in terms of effects of individuals as opposed to social systems" effects. (2) Perceptions regarding differing sources of positive or negative outcomes. (3) The separation of beliefs attributed to one's self from those attributed to others; the present scales mix both types of items. In addition, they raise the point that for many Ss, external control may be a very realistic perception.

Despite the skewed distribution of LC scores obtained in the present study, correlations between LC and CA, MA, and IQ scores were similar to those reported previously (McConnell, 1965; Gozali & Bialer, 1968), indicating that there were some similarities between the present and earlier experimental samples. Since LC was a major variable in the present study, the skewed scores were controlled statistically. Relations between LC and performance scores were analyzed through partial correlations. These correlations, as well as some other analyses, indicated that the positive-negative reinforcement dimension was useful in predicting correlations between LC and performance in three tasks, while the approval-correctness dimension was useful for the fourth task. Differentiating among tasks in terms of intrinsic feedback (See Section C) appears to play an important role in deriving such predictions.

1. Locus of Control and Tasks with High Intrinsic Feedback

It had been hypothesized that tasks with high intrinsic feedback provided sufficient information concerning the quality of the response to make extrinsic reinforcement superfluous for Ss who respond to this information (usually ILC Ss). Scores on such tasks were expected to be positively correlated with LC scores in conditions of negative reinforcement and negatively correlated in conditions of positive reinforcement. This was found to be so for negative reinforcers but did not hold true in conditions of positive reinforcement. Miller (1961) has suggested that negative reinforcement spurs the performance of ILC Ss while positive reinforcement interferes with such performances as if "applause from the audience" was a disturbance to ILC Ss. It appears that the effects of this disturbance are marked - note that the correlations (Table 8) are quite different in positive and negative reinforcement conditions.

Apparently, then, negative reinforcement on a task with high intrinsic feedback provides some added stimulus for ILC Ss; perhaps E's comments heighten their awareness of an unpleasant event (an error). This becomes important insofar as Ss are actively seeking to make correct responses. Thus, a negative reinforcer leads to increased effort to perform better. However, positive reinforcement merely confirms Ss' perceptions of a satisfactory situation. The distracting effect of these comments may result in poorer performance than in conditions of negative reinforcement.

It does not appear that performance is influenced on tasks with high intrinsic feedback by differences in reinforcers along the approval-correctness dimension. It seems that if the task itself provides information about the quality of the response, adding such information in the form of extrinsic reinforcement is redundant for ILC Ss.

2. Locus of Control and Tasks with Low Intrinsic Feedback

Marble dropping seems to be the only task to fit the model of the task with low intrinsic feedback. Scores on this task, as predicted, were much affected by the approval-correctness reinforcer dimension: scores were negatively correlated with locus of control in approval reinforcement conditions and positively correlated in correctness reinforcement conditions. Evidently, in a task where there is no objective standard available to Ss to evaluate their performance, Es' comments can strongly affect behavior. Correctness reinforcers appear to foster improved performance for ILC Ss, whether the reinforcer valence is positive or negative. That is, as ILC scores increase, performance is facilitated by information concerning the quality of the response. When this information does not come from the task itself, extrinsic reinforcement may provide it.

The effects of the positive-negative reinforcement dimension appear to be similar both on tasks with high and those with low intrinsic feedback.

This study assumed that object naming was similar to marble dropping in that it provided little intrinsic feedback. However, analyses revealed that correlations between scores on object naming and LC were similar to those obtained from tasks with high intrinsic feedback in that there was more consistency in relation to the positive-negative reinforcer dimension than to the approval-correctness dimension. However, the direction of the obtained correlations was opposite: positive correlations were obtained in conditions of positive reinforcement and negative correlations in conditions of negative reinforcement.

The direction of the correlations obtained from scores on this task may be related to the scoring criteria and administration procedures referred to previously (Results, Sec. B). This procedure, it was suggested, may have disconcerted Ss, resulting in repetitions, hesitations, etc. which were scored as errors. This may have produced feelings of uncertainty in Ss and an inability to rely on one's own judgement, a sort of "situational ELC." On the other hand, object naming performance may simply be different from other tasks in terms of some characteristic (other than intrinsic feedback) which also influences performance.

B. Performance Measures

1. Time On Scores

A major variable which gave no fruitful results was the persistence, or time on, score. Each S was given the option of terminating each task at any time; after ten minutes, E would end the task. The persistence measure has been used in several studies of social reinforcement (Stevenson, 1965; Noonan & Barry, 1967; Zigler & Williams, 1963) and in at least some of these a 10-minute maximum was set (Allen, 1966; Rosenhan & Greenwald, 1965). Studies involving a single task have permitted longer maximum time periods while those involving two or more tasks have limited performance time on each to between ten and fifteen minutes. The present study, involving four task periods in addition to certain procedures before and after performance, needed to maintain a short performance time. It seemed unlikely that Ss would remain cooperative for longer than an hour; in addition, there might have been exaggerated difficulties with the school program if more time had been required.

Thus, a 10-minute maximum seemed reasonable. However, the results indicated that the obtained persistence scores were of limited value in that there was too little variability within tasks and between reinforcement conditions. It is possible that most Ss were willing to perform all tasks for close to the maximum time permitted, since the alternative would have been a speedier return to the classroom routine. In addition, the variety of tasks and the intrinsic interest of each task may have been sufficiently motivating to obliterate any differences in time on which might have been attributed to reinforcement conditions.

Time on scores for the mirror drawing task were generally much shorter than those of any other task. This was the only task in which the rate of response was not closely controlled. S had the entire maze before him at once and could work at his own pace. In the other tasks, items were timed exactly. It was expected that, due to the complex nature of this task, rate of performance would be considerably slower. Furthermore, it seemed that measures which might have been used to control response rate (such as exposing only sections of the maze at a time) would have too drastically altered the nature of the task. Thus, it seems as though this task should not be used in studies where the effectiveness of social reinforcers is measured by a time on score.

It should be noted that the persistence score has generally been used as a measure of social reinforcer effectiveness only in combination with the marble dropping task. In the current study, there was an attempt to employ it with three other tasks as well. If persistence scores are to be used with EMR Ss, it seems as though maximum performance times of more than ten minutes need to be allowed.

2. Percent Correct Scores

Two sets of analyses were based upon the percent correct scores. The first group considered performance for the full ten minutes while the second set of analyses was concerned with only the first three minutes of performance. Mirror drawing was omitted from these analyses because, since rate of response had been uncontrolled, it was impossible to assess percent correct scores within descrete time blocks.

The 10-minute performance data was analyzed in five 2-minute blocks. Although many Ss were lost by eliminating those who had not completed a full 10-minutes on a task, this analysis did allow comparisons of the reinforcement conditions within each task. The 3-minute performance data divided scores into three 1-minute blocks. These analyses preserved the scores of a larger number of Ss than were available for the 10-minute performance data. It also had the advantage of enabling a comparison both of reinforcement conditions within each task and of tasks within each reinforcement condition. Furthermore, it offered a miscroscopic, short-term view of the reinforcer effects which are the interest of this study.

These analyses, which considered time blocks as an experimental factor, found, as predicted, a general increase in performance scores over time, with the increment most often significant only between first and last time blocks. This would indicate a gradual improvement in performance, rather than any sharp changes between time blocks.

a. Mirror Drawing. The many difficulties with the administration of this task limited the conclusions which could be drawn from the data obtained from it. First, unlike the other tasks, there was no control over the rate of response. Second, although reinforcements were appropriately delivered, Es were not consistent in returning Ss' pencils to the maze path following errors. In addition, this was the only task in which there were substantial positive correlations between correct rate and error rate scores. It would seem that the longer Ss performed, the more correct and incorrect respones they made; i.e. lengthy performance did not change either error or correct rate.

Despite the difficulties with the task, the correlations obtained between correct rate and LC scores were, as predicted, positive in conditions of negative reinforcement. Thus, there is some data which indicate that LC can predict performance as a function of the reinforcement condition in which this task is performed.

b. Object Naming. For object naming, the analysis of percent correct scores showed no differences attributable to reinforcement conditions, while the correlation analysis indicated that the relationship between LC and correct rate scores was positive in conditions of positive reinforcement and negative in conditions of negative reinforcement. Thus, as suggested in Section A.2, in this task with little feedback and where Ss have little (if any) real possibility of changing their behavior, they seem to behave like ELC Ss - the perception of externality being rather realistic in this case. This may be further supported by the fact that 180 Ss continued this task for the full ten minutes, indicating that Ss may have perceived that the entire performance was under E's control. However, this does not appear to have affected performance to a sufficient extent to have resulted in significant differences between performance scores obtained in the various reinforcement conditions.

c. Marble Dropping. Marble dropping, a task with little intrinsic feedback, was expected to evidence sensitivity to both reinforcement dimensions. It had been expected that scores on this task would be higher in the correctness reinforcement condition than in the approval condition and higher in the negative reinforcement condition than in the positive condition. The differences as a result of the approval-correctness dimension were apparent in the correlation analysis as well as in the analysis of 3-minute percent correct scores. The positive-negative reinforcement effects appeared to be significant in both the 10- and 3-minute percent correct analyses. It would seem that performance may be affected by reinforcement conditions on this task, but the manner in which these effects may be demonstrated varies with scoring and length of performance. The obtained differences in reinforcement effects are of the kind which had been predicted and which had also been previously reported for this task (Rosenhan & Greenwald, 1965; Zigler & Kanzer, 1962).

Designating as a correct response the opposite of a preference shown during a non-reinforced base period seems to create some special problems in this task. That is, many Ss seemed to perseverate the base rate preference very strongly and never even had the opportunity to learn that there was a designation of a specific correct response. Table 21 indicates that for blocks 2 through 5 (first task) scores in conditions of negative reinforcement are about double of those in positive reinforcement. Apparently, this came about when Ss in the positive reinforcement conditions continued to drop marbles in the hole which had been preferred during the base period, thus scoring zero. In this reinforcement condition, there would have been no comment made following wrong responses. Thus, Ss who received no feedback on their performances were able to continue to make only "incorrect" responses, scoring zero on this task. At least 7 of 21 Ss scored zero in each time block for positive reinforcement conditions (Table 57), while no more than 3 of 16 did so in negative reinforcement conditions (where marble dropping was the first task). Numerous zero scores were not found when marble dropping was the last task since, by that time, Ss would have learned to expect some reinforcement for their responses. Any S who continued the "incorrect" hole would, when met by silence, be more likely to change responses.

Marble dropping has been cited for special utility in social reinforcement studies (Stevenson, 1965) and has been extensively used in such studies (Allen, 1966; McGrade, 1966; Zigler, et al, 1966) because it is thought to be more sensitive to social reinforcement effects than most tasks. This seems to be so insofar as it was the only task in which both reinforcer dimensions appear to have affected performance scores. Additional replications may be needed to resolve the issue of appropriate measures for comparisons of performance on various tasks in various reinforcement conditions (Parton & Ross, 1965; Stevenson & Hill, 1966).

Table 57

Ss With Zero Scores in Marble Dropping

(10-minute Performance)

Reinforcement Condition	Number of Ss with Scores of Zero				
	Block				
First Task	1	2	3	4	5
Positive	7	7	7	7	8
Negative	3	2	2	0	1
Last Task					
Positive	8	8	8	7	5
Negative	1	3	3	3	4

d. Serial Learning. It was expected that the results of these analyses of serial learning scores would indicate performance similar to that predicted for ILC Ss since the obtained sample consisted predominantly of such Ss. Thus, for this task with high intrinsic feedback, it was expected that performance scores would be: (1) higher in a condition of negative reinforcement than in a condition of positive reinforcement and (2) unaffected by approval-correctness reinforcer differences. This was so only in 10-minute performance when serial learning was the first task.

The serial learning task seemed to present no difficulties in administration and led to clear results. Score differences between conditions of positve and negative reinforcement were expected. This task provided a good deal of intrinsic feedback. However, if extrinsic reinforcement is added, negative reinforcement facilitates performance (by adding a "challenge") while positive reinforcement results in a performance decrement (by serving as a distraction). These results and those found in the correlation analyses already discussed are similar to those reported by Miller (1961).

During the first three minutes of performance in serial learning, higher scores were obtained in conditions of correctness-positive reinforcement than in approval-positive reinforcement. This was also true in each 2-minute block for 10-minute performance, although the effect was not significant. This suggests that correctness reinforcers may facilitate performance as LC scores increase, but that this effect is dissipated by the passage of time in a task with high intrinsic feedback. In a situation where ILC performance is influenced by correctness or approval reinforcers, it is consistent with the theory that correctness reinforcers facilitate performance, since these reinforcers focus on the quality of the response.

C. Intrinsic Feedback

It is now quite apparent that intrinsic feedback plays an important role in performance. Although there is some question of how best to distinguish among tasks in terms of this characteristic, the present research clearly supports its importance. Scores obtained on the serial learning and mirror drawing tasks were typical of those expected in tasks considered to provide high degrees of intrinsic feedback. The predicitions were confirmed by the correlation between correct rate and LC scores. This was also true for the marble dropping task, a task with little intrinsic feedback. However, predictions predicated on the assumption that the object naming task provides little intrinsic feedback were not supported.

It would appear, then, that the <u>a priori</u> categories (based on degrees of intrinsic feedback) to which tasks were assigned in this study need some clarification. While the classification led to appropriate predictions for three of the tasks, it did not do so for the fourth. A first step towards sharpening the basis on which the classification is made could involve some empirical evaluations of the intrinsic feedback provided by various sets of tasks. However, this could prove to be only half of the issue. That is, such a procedure might lead to an accurate classification in terms of the information emitted by a task, but it could overlook what might prove to be the more important consideration: the information received by the S.

That is, intrinsic feedback may involve a complex chain of events: information provided by the task, the perception of such information by Ss, and the manner in which this perception influences performance of the task. In addition, it seems likely that there are other task variables which, by themselves or through interactions with S characteristics, may affect performance.

D. Reinforcer Effects

The lack of division of Ss into discrete ILC-ELC groups probably has made the results less clear than they would have been had such a division been possible. It should be noted that where significant reinforcement effects were found, they were more often for the first task. This was true in the analyses of percent correct scores which have been discussed and also in an ANOVA based upon correct rate scores (Appendix D).

In addition, analyses of performance over time blocks indicated that where there were performance differences between time blocks which were related to reinforcement effects, such effects were significant only in later (rather than initial) time blocks. This suggests that some time is needed before a reinforcer affects performance. However, when social reinforcers are repeatedly and steadily presented on a succession of tasks, their effectiveness seems to be diluted. Thus, there were no differences between reinforcement conditions in serial learning or marble dropping scores when these were in last position. Cairns (1964) and Rosenhan (1966) are among those who have reported such a satiation effect in studies of social reinforcer effectiveness.

It is also possible to consider these observed reinforcer effects in terms of Ss' reinforcement histories. Each S entered the experiment with a unique behavior potential determined by his previous history, or, in terms of Rotter's formula, BP=f(E&RV) (Cromwell, 1963, p. 45). He can be assumed to have had a certain generalized expectancy (E) for receiving reinforcers, each of which has some particular value (RV) to him. In the course of performing each task under some particular reinforcement condition, every S may be thought to have experienced the same overall set of events (i.e., was given the same "short term" reinforcement history).

The consistency with which reinforcers were delivered throughout the tasks may have influenced Ss' situational expectancies so that all Ss' expectancies became rather similar. In a like manner, that component of reinforcement value which involves an expectancy that the previous reinforcer will lead to further reinforcers may also have become more uniform. This possibility could be more clearly studied in a situation in which reinforcement schedules and/or contingencies are manipulated so that Ss would differ in their development of situational expectancies. Zigler and Williams (1968) have noted that differences in the pre-institutional reinforcement histories may be one of the factors responsible for differences in the responsivity of institutionalized MR Ss to social reinforcers. The present findings may be interpreted to support a variant of this statement: individuals with the same (short term) reinforcement history do not differ in responsivity to social reinforcement.

Baron (1966) discusses the role of past experience as it forms an expectancy of frequency for social reinforcement. He suggests that individuals come to expect a certain range of occurrences of social reinforcement. A deviation in any direction from this expected range causes discomfort in the individual. When this occurs, the individual modifies his behavior in an attempt to influence the frequency with which E delivers reinforcers. Thus, E may provide more or fewer reinforcers, depending on the frequency which S seeks to obtain. From this viewpoint, too, we may look upon behavior in the experimental situation in terms of Ss' expectancies. Ss with similar reinforcement expectancies may evidence similar performances, seeking to maintain an optimum level of reinforcement.

An alternative explanation might suggest that Ss become satiated by the repetitive use of social reinforcers and thus, after having performed four tasks with consistent reinforcement, differences in performance may have been obliterated.

Stevenson and Wright (1966) report studies by Abel (1936) and by Garmezy and Harris (1953) in which this appears to have occurred. Cairns (1964) reports that

> the more frequently the child's exposure to this class of events [social reinforcers] in the home, the less effectively they serve as reinforcers in the lab, (p. 20).

This observation was based on studies of experimental performance and information gained from interviews with Ss parents. It does suggest that frequent application of social reinforcers may lead to satiation. Rosenhan (1966) suggests that approval reinforcers may be ineffective for children entering school who come from homes in which these reinforcers are frequently available since the children may be satiated on such reinforcers.

While these authors have reported on satiation as an effect of relatively long-term exposure, it is possible that the concentration of reinforcers available in the present study might have had a similar effect. Thus, due to the high intrinsic interest of the tasks, Ss tended to work on each task for a relatively long period of time. However, since they soon became satiated on the reinforcers (i.e., reinforcers were not attended to or were not perceived as adding any useful information to task feedback), there were no systematic differences in performance scores on final tasks as a function of reinforcement conditions. Other studies have generally varied reinforcement conditions while maintaining the same task. Perhaps, as Stevenson (1965) suggests, the effects of social reinforcers are best seen in dull, uninteresting tasks. The present study seems to be the only one which has considered different social reinforcers in combination with different tasks for the same Ss. More research of this nature needs to be done if we are to move in the direction of influencing classroom practices through the application of research findings: it is imperative that the research situation be made as similar as possible to the real-life situation in which findings will be applied.

While there was this observed attenuation of reinforcer effects over time, it should be recalled that the analyses indicated that EMR Ss respond differentially to approval and correctness reinforcers. That the subtle semantic difference between words such as "good" and "right" should be sufficient to result in behavioral differences among the mentally retarded, as well as among normal children continues to be intriguing. It would certainly seem worthwhile to investigate this phenomenon more closely. One possible approach would involve evaluating, rather directly, the differences in meaning-content between words which have been identified as approval or correctness reinforcers. This might be done through the use of a semantic differential or some similar technique. It might be possible to scale reinforcers in terms of the degree of approval or correctness conveyed.

It would also be intersting to consider the manner in which these words take on their reinforcement value. Perhaps there is some early stage in development when both classes of reinforcers convey the same meaning. Research concerning the process whereby an individual progresses from an ELC to an ILC orientation might parallel research on developmental progression in reinforcer effectiveness.

An additional aspect of reinforcer effectiveness which is in need of further study concerns the source of the reinforcer. Previous studies have reported that when different Es are used, one may obtain E-specific reinforcement effects (Gerwitz, 1954; Stevenson & Knights, 1962). The present study did not find any effects related to the use of two Es. In this case, Es were alike in sex, age, race, social class and experience with MR Ss. Identification of E characteristics which would permit the control of these E-specific effects would be useful both as an improvement in research technique and in applications.

E. Ratings

Besides considering the effects of reinforcement conditions and task characteristics upon performance scores, this study has been concerned with the possible effects of Ss' perceptions of tasks as potential influences upon performance. It therefore included an attempt to assess such perceptions and certain changes in them. Specifically, Ss were asked to rank the tasks, in terms of interest and difficulty, before and after performance.

Ss who were predominantly ILC were expected to rate as least interesting those tasks seen as very difficult. Thus, negative correlations were expected between interest and difficulty ratings. This hypothesis was supported in only a few instances and then only by ratings obtained after performance. It seems, then, that the difficult tasks were not viewed as threateningly difficult.

For all Ss, marble dropping and mirror drawing were most often rated highly interesting, and serial learning and object naming were most often rated as least interesting. The only task whose ratings changed markedly after performance was marble dropping: it was then rated much more frequently as highly interesting.

The strong expression of interest in the marble dropping task stands in marked contrast to the a priori judgement of this task by Es. Stevenson (1965) recommends this task as the most desirable for social reinforcement studies since it is a dull, uninteresting task. The majority of social reinforcement studies now to be found in the literature have used this as the only experimental task. If the opinions expressed by the Ss in this study were to prove replicable, there would be an urgent need to re-examine assumptions made about tasks chosen for particular experimental purposes. Of course, it is possible that marble dropping is a very dull task--but that it was compared to even less interesting tasks in the present study. In either case, in order to properly evaluate the degree to which intrinsic task interest may affect performance, apart from or in combination with reinforcer effects, it is necessary to obtain information from the Ss rather than to expect them to perform in terms of Es' perceptions.

Furthermore, in order to best study these opinions (and any changes which may occur in them) more precise techniques of measuring these perceptions are needed.

Although Ss' perceptions of the interest of the tasks differed from E's, Ss' ratings of the perceived difficulty of the tasks seemed fairly consonant with E's judgement. Difficulty ratings obtained prior to performance indicated that the mirror drawing task was seen as extremely difficult, while the marble dropping and object naming tasks were viewed as relatively easy. Opinions became even more clearly defined when ratings were obtained subsequent to performance: mirror drawing was more frequently rated as most difficult and marble dropping was more frequently rated as least difficult. Apparently, E and Ss were sharing some common, objective criteria in evaluating the relative difficulty of these tasks.

Attempts to relate Ss' rankings of tasks to other variables were generally disappointing. Considering the relative crudity of the information obtained from the ranking procedure (contrasted with what might be gained from a pair-comparison procedure) this was most likely an artifact of the measurement technique. Thus, although there were few significant correlations obtained between interest and difficulty ratings, the possibility should not be overlooked that a more refined measurement technique may reveal such relationships. The obtained correlations between ratings made before and after performance seem to indicate that changes in these ratings are few - that is, Ss judgements appear to have been little affected by performance or by particular reinforcement conditions.

F. Implications

The results of this study indicate that, in order to maximize performance, it is imperative to consider the interaction between individual differences in motivational characteristics, task characteristics and reinforcement dimensions. Positive and negative reinforcers do not simply act as opposite and equal forces: for some individuals, in certain circumstances, negative reinforcement may facilitate behavior while positive reinforcement debilitates it. Furthermore, there is at least some indication that approval and correctness reinforcers, by providing different kinds of information, have differential effects upon performance.

The personality variable studied here, locus of control, appears to provide a means of analyzing individual differences which contribute to differential effectiveness of reinforcers. That is, ILC seems to be associated with the ability to employ information concerning the adequacy of performance, while ELC seems to be associated with information concerning interpersonal affect. As has been shown, this information may come from a variety of sources.

Individual differences in motivational orientation have been found to be related to differences in responsivity to a variety of cues which may be intrinsic or extrinsic to the task. This could prove useful in designing programmed learning materials and devices so that there is a better match between the individual's learning style and the learning environment provided for him. Some individuals might learn most effectively when the program provides high degrees of intrinsic feedback; that is, when the task is self-correcting as is the serial learning task used in the present study. Others might learn most effectively in situations where such information was supplemented by some form of extrinsic reinforcement.

The occurrence noted in the marble dropping task must also be borne in mind: Ss did not learn that a response was correct, or that a reinforcer was available, in a situation where reinforcement was contingent upon a correct response. This suggests the need to define goals and criteria for children when placing them in situations where there may be no obvious objective.

Taken together, the results of this study suggest that classroom programming may be made prescriptive not only by adapting content to children's cognitive differences, but also by adapting presentation to their motivational differences. The possibility that children may become satiated on social reinforcers should be recognized and attempts made to limit their overuse by providing other kinds of feedback and reinforcement.

In addition, it appears important that more attention should be paid to task characteristics as an influence upon learning. Research has demonstrated that different types of tasks are learned differently (serial learning, paired associates learning, pursuit rotor learning, to name a few). However, many other factors should be considered. The present study has indicated the role played by task feedback and Ss perceptions of tasks.

The recognition of the importance of task interest has long been part of educational preaching, if not always part of educational practice (as in the great stress on "motivational" activities found in many texts and courses dealing with methods of teaching). Various educational systems of the past, such as the Montessori program, have placed interest in learning tasks at the center of their concern. More recently, such proposals have been embodied in the structuring of community, "underground", infant and Summerhill-type schools. The current study indicates that such task characteristics can and should be systematically studied in terms of their effects upon learning.

Research Needs

The range of research needs outlined below have, as their goal, a replication of the present study, one which would overcome its many weaknesses and shortcomings. The findings of this study seem promising, but are in need of strengthened support.

One area for additional research indicated by this study involves the development of an improved locus of control scale. The current verbal self-report scale should be modified or, preferably, replaced by a performance measure.

The role of task variables needs more systematic consideration if their effects are to be clarified. *A priori* evaluations of one such characteristic, intrinsic feedback, proved useful as a means of predicting differential performance. An empirical evaluation of this characteristic as well as its effect upon performance independent of reinforcers is needed. Similarly, it may be possible to identify and evaluate other task characteristics which may influence performance.

Individual perceptions of tasks seem to merit more systematic study. Techniques of measuring these perceptions with increased sophistication may produce more information concerning the role such perceptions play in performance. If tasks are to be employed for certain qualitative reasons (such as interest), the present study certainly indicates the importance of obtaining such judgements from Ss, rather than from Es alone.

It has been presumed, here and in other studies, that approval and correctness reinforcers have different effects because of certain differences contained in the meanings of the words used as reinforcers. This assumption can, and should be investigated directly. Exactly what nuances of content Ss are reacting to needs to be considered.

Basic to many of these potential future research efforts is a set of accepted, standardized procedures for comparing and evaluating social reinforcer effects. The criteria for selecting appropriate tasks need to be carefully delineated and, certainly, more than one task should be used to measure a given effect. The score used to measure performance should be comparable between tasks (and between studies) and careful attention must be given to performance time.

Motivational orientation seems to be useful in predicting reinforcement effects on various tasks in terms of at least two reinforcer dimensions: valence (positive-negative) and emphasis (approval-correctness). It appears that as relevant task characteristics are more clearly identified, this effect will be more precisely delineated.

Individual differences, long a term whose connotation was restricted to the cognitive domain, must be considered in broader terms. Motivational and personality differences may contribute to learning and performance to as great an extent. This needs to be recognized not only in the experimental laboratory but in classroom and clinical practice.

Chapter VI

Summary

The present study sought to relate individual differences in a personality variable (locus of control) to differential effects of social reinforcers on performance in selected tasks. It was suggested that tasks themselves, as well as reinforcers, provide some kind of information to the individual concerning his behavior. Intrinsic feedback from the task and correctness reinforcers are thought to focus upon the quality of the behavior, while approval reinforcers represent an interpersonal affective communication. LC was used to characterize the information to which an individual is most receptive. Ss who are predominantly ELC were expected to be most affected by cues which focus upon interpersonal evaluations, while ILC Ss were expected to be most influenced by cues which contain information concerning the adequacy of a response.

It was also thought that the LC dimension would be related to the effects of positive and negative reinforcement upon task performance. ELC orientations would be associated with performance which is enhanced by positive reinforcement and debilitated by negative reinforcement. However, it was expected that ILC Ss would react rather differently, finding positive reinforcement an interference with performance while reacting to negative reinforcement in a manner which led to better performance.

The study also considered the possible role that Ss perceptions of tasks might play in determining performance, as well as the effects of performance in various reinforcement conditions upon these perceptions. It was thought that ELC Ss' judgements would be more strongly affected by the reinforcement condition in which a task was experienced than ILC Ss' judgements; in other words, ILC would be associated with a relative independence of reinforcement conditions insofar as rating tasks as more or less interesting is concerned. ILC Ss' ratings were also expected to show a correlation between perceptions of interest and difficulty of various tasks.

One hundred ninety-two adolescent educable mentally retarded males were asked to perform each of four tasks (marble dropping, serial learning, mirror drawing and object naming) in four different reinforcement conditions (approval-positive, approval-negative, correctness- positive, correctness-negative). The tasks were selected to provide a range of intrinsic feedback. Prior to performance, the Bialer-Cromwell LC scale was administered to each S, who was also asked to rank each task in terms of perceived difficulty and perceived interest. This ranking was repeated after the

S had performed all four tasks. In addition, two non-reinforced base rate periods of marble dropping were obtained, one prior to all tasks and one just before performing the marble dropping task. The scores on these two base periods were found to be quite stable; there were no significant differences due to any of several experimental variables.

Partial correlations between LC and correct rate scores indicated that the approval-correctness reinforcer dimension was useful in predicting performance only on the marble dropping task. For the three remaining tasks, only those predictions based on the positive-negative reinforcer dimension were supported.

Further analyses, based upon percent correct scores, revealed similar results. These analyses indicated, in addition, that (1) scores tended to increase progressively over time; (2) differences between reinforcement effects were more likely to be significant in later than in initial time blocks, and (3) reinforcement effects were more often apparent when a task was the first of a series of four than when it was the last of a series.

The results were interpreted as generally supporting the theoretical position advanced here. It appears that LC scores may serve as predictors of performance in various tasks when reinforcer dimensions and task feedback are considered. Furthermore, Ss perceptions of tasks may be measured and these are stable in some respects. One unexpected finding was that marble dropping, usually considered to be a very dull task, was seen as highly interesting by these Ss.

It was suggested that further research consider better measures of LC, improved means of evaluating intrinsic feedback of tasks, and more precise measures of Ss perceptions of tasks. In addition, it was recommended that an attempt be made to analyze more precisely the differences between words classified as approval and correctness reinforcers. Implications were drawn for the use of reinforcement in the classroom, the role of task interest in curriculum design and the need to consider individual differences in motivational orientation when selecting instructional materials and methods.

Bibliography

Abel, L.B. "The effects of shift in motivation upon the learning of a sensori-motor task," Arch. Psychol., 1936, 29, No. 205.

Allen, S. "The effects of verbal reinforcement on children's performance as a function of type of task." J. Exp. ch. Psych., 1966, 3, 57-73.

Baron, R.M. "Social reinforcement effects as a function of social reinforcement history." Psychol. Review, 1966, 73, 527-539.

Baumeister, A. "A comparison of normals and retardates with respect to incidental and intentional learning." Amer. J. ment. Defic., 1963, 68, 404-408.

Baumeister A. & Ward, L.C. "Effect of reward upon reaction time of mental defectives." Amer. J. ment. Defic., 1967, 71, 801-805.

Bialer, I. "Conceptualization of success and failure in mentally retarded and normal children." J. Pers., 1961, 29, 303-320.

Bialer, I. & Cromwell, R. "Failure as motivation with mentally retarded children." Amer. J. ment. Defic., 1965, 69, 680-684.

Bijou, S.W. & Oblinger, B. "Responses of normal and retarded children as a function of the experimental situation." Psychol. Rep., 1960, 6, 447-454.

Black, A. H. & Thomas, L. D. "Differntial effectiveness of primary, secondary and social reinforcement in discrimination learning of mongoloids." Perceptual-Motor Skills, 1966, 23, 585-586.

Blank, J. P. "The effect of magnitude of incentive on acquisition and extinction in mentally retarded children." Dissertation Abstracts, 1958, 19, 1443.

Butterfield, E. C. "Serial learning and the stimulus trace theory of mental retardation." Amer. J. ment. Defic., 1968, 72, 778-787.

Butterfield, E. C. & Zigler, E. "The effects of success and failure on the discrimination learning of normal and retarded children." J. abnorm. Psychol., 1965, 70, 25-31.

Butterfield, E. C. & Zigler E. "The influence of differing institutional social climates on the effectiveness of social reinforcement in the mentally retarded." Amer. J. ment. Defic., 1965, 70, 48-57.

Cairns, R. B. "Child rearing antecedents of social reinforcers." United States Public Health Study. Project Number M-4373 (A), 1964.

Cantor, G. N. & Hottel, J.V. "Discrimination learning in mental defectives as a function of magnitude of reward and intelligence level." Amer. J. ment. Defic., 1955, 60, 380-384.

Coleman, J. S. & Staff. Equality of Educational Opportunity. U.S. Department of Health, Education and Welfare, Washington, D.C.: U.S. Government Printing Office, 1966.

Cromwell, R. "Social Learning approach to mental retardation," In N. R. Ellis (ed.), Handbook of Mental Deficiency. New York: McGraw-Hill, 1963, pp. 41-91.

Cromwell, R. "Comments on the theoretical formulation of success-striving versus failure-avoiding in children." Unpublished paper, George Peabody College, 1964.

Cromwell, R. L. & Moss, J. W. "The influence of reward value on stated expectancies of mentally retarded patients." Amer. J. ment. Defic., 1959, 63, 657-661.

Denny, M. R. "Research in learning and performance." In Z. A. Stevens and R. Heber (eds.), Mental Retardation. Chicago: University of Chicago Press, 1964, pp. 100-142.

Doubros, S. G. "An investigation of verbal conditioning in level II adolescent retardates." Amer. J. ment. Defic., 1967, 71, 806-810.

Dunn, L. M. Peabody Picture Vocabulary Test. Minneapolis: American Guidance Service, 1959.

Ellis, N. R. "Amount of reward and operant behavior in mental defectives." Amer. J. ment. Defic., 1962, 64, 486-490.

Ellis,N. R. (ed.) Handbook of Mental Deficiency. New York: McGraw-Hill, 1963.

Ellis, N. R. (ed.) International review of research in mental retardation, vol. 1, New York: Academic Press, 1966.

Ellis, N. R. (ed.) <u>International review of research in mental retardation</u>, vol. 2, New York: Academic Press, 1966.

Ellis, N. R. (ed.) <u>International review of research in mental retardation</u>, vol. 3, New York: Academic Press, 1968.

Ellis, N. R., Barnett, C. D. & Pryer, M. W. "Performance of mental defectives on the mirror drawing task." <u>Percept. Motor Skills</u>, 1957, <u>7</u>, 271-274.

Ellis, N. R. & Distefano, M. K. "Effects of verbal urging and praise upon rotary pursuit performance in mental defectives." <u>Amer. J. ment. Defic</u>., 1959, <u>64</u>, 486-490.

Ellis, N. R. & Pryer, M. W. "Primary versus secondary reinforcement in simple discrimination learning of mental defectives." <u>Psychol. Rep.</u>, 1958, <u>4</u>, 67-70.

Farnsworth, P. R. (ed.) <u>Annual Review of Psychology</u>, vol. 18, Palo Alto, California: Annual Reviews, 1967.

Gardner, W. I. & Brandl, C. "Reinforcement conditions and incidental learning in mentally retarded adolescents." <u>Amer. J. Ment. Defic.</u>, 1967, <u>72</u>, 215-219.

Gardner, W. I. "Use of punishment procedures with the severely retarded: a review." <u>Amer. J. ment. Defic</u>., 1969, <u>74</u>, 86-104.

Garmezy, N. & Harris, J. G. "Motor performance of cerebal palsied children as a function of their success and failure in achieving material rewards." <u>Child Develpm</u>., 1953, <u>24</u>, 287-300.

Gewirtz, J. L. "Three determinants of attention-seeking in young children." <u>Monogr. soc. res. Child Developm</u>., 1954, No. 2 (Series No. 59).

Gimon, A. "Risk taking under intrinsic and extrinsic reinforcement as related to need for achievement and locus of control." Paper read at Northeast Amer. Ass'n. on Ment. Defic. Convention, Kiamesha, New York, October 16, 1967.

Gordon, S., O'Connor, N. & Tizard, J. "Some effects of incentives on the performance of imbeciles." Brit. J. Psychol., 1954, 45, 277-287.

Gordon, S., O'Connor N. & Tizard, J. "Some effects of incentives on the performance of imbeciles on a repetitive task." Amer. J. ment. Defic., 1955, 60, 371-377.

Goulet, L. R. "Verbal learning and memory research with retardates." In N. R. Ellis (ed.), International Review of research in mental retardation, vol. 3. New York: Academic Press, 1968.

Gozali, J. & Bialer, I. "Children's locus of control scale: independence from response set bias among retardates." Amer. J. ment. Defic., 1968, 72, 622-625.

Gurin, P., Gurin, G., Lao, R.C. & Beattie, M. "Internal-external control in the motivational dynamics of Negro youth." J. Soc. Issues, 1969, 25, 29-53.

Hartup, W. W. "Friendship status and the effectiveness of peers as reinforcing agents." J. exp. child Psychol., 1964, 1, 154-162.

Haywood, H.C. & Weaver, S.J. "Differential effects of motivational orientation and incentive conditions on motor performance in institutionalized retardates." Amer. J. ment. Defic., 1967, 72, 459-467.

Headrick, M. W. "Effects of instructions and initial reinforcers on fixed-interval behavior in retardates." Amer. J. ment. Defic., 1963, 68, 425-432.

Heathington, E. M., Ross, L. E. & Pick, H. L. "Delay of reward and learning in mentally retarded and normal children." Child Develpm., 1964, 35, 653-659.

Heber, R. "Motor task performance of high grade mentally retarded males as a function of the magnitude of incentive." Amer. J. ment. Defic., 1959, 63, 667-671.

Heber, R. "Personality." In H. A. Stevens & R. Heber (eds.), Mental Retardation. Chicago: Chicago University Press, 1964, pp. 143-174.

Hersch, P. D. & Scheibe. "Reliability and Validity of internal-external control as a personality dimension." J. consult. Psychol., 1967, 31, 609-613.

Hill, K. T. & Moely, B. "Social reinforcement as a function of task instructions, sex of S, age of S, and baseline performance." J. Exptl. Child Psychol., 1969, 7, 153-165.

Hoats, D. L., Miller, M. B. & Spitz, H.H. "Experiments on perceptual curiosity in mental retardates." Amer. J. ment. Defic., 1963, 68, 386-395.

Hollis, J. "Effects of reinforcement shifts on bent wire performance of severely retarded children." Amer. J. ment. Defic., 1965, 69, 531-535.

Hunt, D. E. & Hardt, R. H. "The effect of upward bound programs on the attitudes, motivation and academic achievement of Negro students." J. Soc. Issues, 1969, 25, 117-129.

Insalco, C. "Effects of verbal and consumable reinforcement combinations on concept learning in the mentally retarded." Amer. J. ment. Defic., 1970, 74, 709-710.

Kahn, H. & Burdett, A.D. "Interaction of practice and rewards on motor performance of adolescent mental retardates." Amer. J. ment. Defic., 1967, 72, 422-427.

Katz, I. "A critique of personality approaches to Negro performance with research suggestions." J. Soc. Issues, 1969, 25, 13-27.

Lefcourt, H.M. "Internal versus external control of reinforcement: a review." Psychol. Bull., 1966, 65, 206-220.

Lindquist, E. F. Design and analysis of experiments. Boston: Houghton Mifflin, 1953.

Lingren, R. H. "Anxiety, praise and reproof: their effects upon learning and recall of mentally retarded boys." Amer. J. ment. Defic., 1967, 72, 468-472.

Lipman, R.S. "Some test correlations of behavioral aggression in institutionalized retardates with particular reference to the Rosenzweig Picture-Frustration Study." Amer. J. ment. Defic., 1959, 63, 1038-1045.

Lipsitt, L. P. & Spiker, C.C. (eds.) Advances in child development and behavior, vol. 2. New York: Academic Press, 1965.

McConnell, O.L. "Personality correlates of responsiveness to social reinforcement in mentally retarded subjects." Amer. J. ment. Defic., 1967, 72, 45-49.

McConnell, T.J. Locus of Control, examiner presence and source and type of reinforcement as factors in visual discrimination learning with mental retardates. Ann Arbor, Michigan: University Microfilms, 1965.

McGrade, B. "Effectiveness of verbal reinforcers in relation to age and social class. J. Pers. soc. Psychol., 1966, 4, 555-560.

McGunigle, D.F. "The effects of social and candy reinforcers on the discrimination learning of mentally retardates." Unpublished doctoral dissertation, Claremont Graduate School. 1968.

McManis, O. L. "Pursuit-rotor performance of normal and retarded children in four verbal-oncentive conditions." Child Develpm., 1965, 36, 667-683.

McManis, O.L. "Marble-sorting persistence in mixed verbal-incentive and performance-level pairings." Amer. J. ment. Defic., 1967, 71, 811-817.

McNemar, Quinn. Psychological Statistics. (3rd ed.) New York: John Wiley & Sons, 1962.

Meyer, W. I. & Offenback, S. J. "Effectiveness of reward and punishment as a function of task complexity." J. comp. physiol. Psych., 1962, 55, 532-534.

Miller, M. B. Locus of control, learning climate and climate shift in serial learning with mental retardates. Ann Arbor, Michigan: University Microfilm, 1961.

Miller, M. B. "Curiosity behavior in educable mentally retarded adolescents." Final Report, Yeshiva University, 1970.

Miller, M. B. & Bialer, I. "Intellectual deviancy." In Haywood, H.C. (ed.) Psychometric Intelligence. New York: Appleton-Century-Crofts, 1970, in press.

Morgan, S. B. "Responsiveness to stimulus novelty and complexity in mild, moderate and severe retardates. Amer. J. ment. Defic., 1969, 74, 32-38.

Noonan, J. R. & Barry, J. R. "Differential effects of incentives among the retarded." J. educ. Res., 1967, 61, 108-111.

O'Connor N. & Claridge, G. "The effect of goal-setting and encouragement on the performance of imbecile men." Quart. J. exp. Psychol., 1955, 7, 37-45.

O'Connor, N. & Claridge, G. "A 'Crespi' effect in male imbeciles." Brit. J. Psychol., 1958, 49, 42-48.

Parton, D. A. & Ross, A. O. "Social reinforcement of children's motor behavior: a review. Psychol. Bull., 1965, 64, 65-73.

Patterson, G. R. & Anderson, D. "Peers as social stimuli." Child Develpm., 1965, 36, 951-960.

Patterson, G. R., Littman, R. A. & Hinsey, C. "Parents as social stimuli." Child Develpm., 1963, 34, 121-35.

Perry, S. L. & Stotsky, B. A. "Type of reward, incentive and incentive sequence as factors in the motor performance of mentally retarded, physically handicapped and college students." J. Psychol., 1965, 60, 55-65.

Postman, L. "Rewards and punishments in human learning." In L. Postman (ed.) Psychology in the making. New York: Alfred Knopf, 1962, pp. 331-402.

Reynolds, W. F. & Stacey, C. L. "A comparison of normals and subnormals in mirror drawing." J. Genet. Psychol., 1949, 87, 301-308.

Riese, R. R. & Lobb, H. "Discrimination learning in retarded children: reward and non-reward." Amer. J. ment. Defic., 1967, 77, 536-542.

Rosenhan, D. L. "Effects of social class and race on responsiveness to approval and disapproval." J. Pers. soc. Psychol., 1966, 4, 253-259.

Rosenhan, D. & Greenwald, J. "The effects of age, sex and socioeconomic class on responsiveness to two classes of verbal reinforcement." J. Pers., 1965, 33, 180-199.

Rotter, J. B. Social learning and clinical psychology. New York: Prentic Hall, 1954.

Rotter, J. B. "Generalized expectancies for internal versus external control of reinforcement." Psychol. Monogr., 1966, 80 (1).

Schoelkopf, A. M. & Orlando, R. "Delayed versus immediate reinforcement in simultaneous discrimination problems with mentally retarded children." Psychol. Rec., 1965, 15, 15-23.

Semler, I. J. "Selective learning in severly retarded children as a function of differential reaction to non-reward." Child Develpm., 1965, 36, 143-152.

Sidowski, J. B. (ed.) Experimental Methods and Instrumentation in Psychology. New York: McGraw-Hill, 1966.

Siegal, P. S. "Incentive motivation in the mentally retarded." In Ellis, N. (ed.) International Review of Research in Mental Retardation, Vol. 3. New York: Academic Press, 1968. pp. 1-30.

Siegal, P.S., Forman, G. E. & Williams, J. "An exploratory study of incentive motivation in the retarded." Amer. J. ment. Defic., 1967, 71, 977-984.

Spence, J. T. "Verbal-discrimination performance as a function of instructions and verbal-reinforcement combinations in normal and retarded children." Child Develpm., 1966, 37, 264-281.

Stevens, H. A. & Heber, R. Mental Retardation. Chicago: Chicago University Press, 1964.

Stevenson, H. W. "Social reinforcement of children's behavior." In L. P. Lipsitt and C. C. Spiker (eds.), Advances in child Development and behavior, vol. 2, New York: Academic Press, 1965, pp. 97-126.

Stevenson H. W. "Developmental psychology." In P. R. Farnsworth (ed.), Annual Review of Psychology, vol. 18. Palo Alto, California: Annual Reviews, 1967, pp. 87-128.

Stevenson, H. W. & Hill, K. T. "Use of rate as a measure of response in studies of social reinforcement." Psychol. Bull., 1966, 66, 321-326.

Stevenson, H. W., Keen, R. & Knights, R. M. "Parents and strangers as reinforcing agents ofr children's performance." J. abnorm. soc. Psychol., 1963, 65, 429-431.

Stevenson, H. W. & Knights, R. M. "The effect of visual reinforcement on the performance of normal and retarded children." J. Pers., 1961, 13, 119-126.

Stevenson, H. W. & Knights, R. M. "Social reinforcement with normal and retarded children as a function of pretraining, sex of E and sex of S." Amer. J. ment. Defic., 1962, 66, 866-871.

Stevenson, H. W. & Snyder, L. C. "Performance as a function of the interaction of incentive conditions." J. Pers., 1960, 28, 1-11.

Stevenson, H. W. & Wright, J. C. "Child Psychology," in Sidanski, J. B. (ed.) Experimental Methods and Instrumentation in Psychology. New York: McGraw-Hill, 1966, pp. 577-605.

Teasdale, R. & Joynt, D. "Some effects of incentives on the behavior of adolescent retardates." Amer. J. ment. Defic., 1967, 71, 925-930.

Terrell, C. & Stevenson, H. W. "The effectiveness of normal and retarded peers as reinforcing agents." Amer. J. ment. Defic., 1965, 70, 373-381.

Terrell, D. J. & Witryol, S. L. "Incentive scaling in mental retardates by the method of pair-comparisons." Amer. J. ment. Defic., 1963, 68, 225-227.

Van de Riet, N. "Effects of praise and reproof on paired-associate learning." Ann Arbor, Michigan, University Microfilms, 1963.

Walton, D. & Begg, T. L. "The effects of incentives on the performance of defective imbeciles." Brit. J. Psychol., 1958.

Watson, L. S. & Lawson, R. "Instrumental learning in mental retardates." Ment. Retard. Abstr., 1966, 3, 1-21.

Watson, L. S., Lawson, R. & Sanders, C. "Generalized or token reinforcement with severely and profoundly retarded children." Paper presented at meeting of American Association on Mental Deficiency, Miami, Florida, 1965.

Winschel, J. F. Performance of normal and mentally retarded children on selected motor and intellectual tasks as a function of incentive condition. Ann Arbor, Michigan: University of Microfilms, 1965.

Wolfensberger, W. "Differential rewards as motivating factors in mental deficiency research." Amer. J. ment. Defic., 1960, 64, 902-906.

Zigler, E. "Social reinforcement, environmental conditions and the child." Amer. J. Orthopsych., 1963, 33, 614-623.

Zigler, E. "Research on personality structure in the retardate." In N. R. Ellis (ed.) International Review of research in mental retardation, vol. 1, New York: Academic Press, 1965, pp. 77-108.

Zigler, E. "Motivational determinants in the performance of retarded children." Amer. J. Orthopsychiat., 1966, 36, 848-856.

Zigler, E., Balla, D. & Butterfield, E. C. " A longitudinal investigation between preinstitutional social deprivation and social motivation in institutionalized retardates." J. Pers. Soc. Psychol., 1968, 10, 437-445.

Zigler, E., Hodgden, L. & Stevenson, H. W. "The effect of support and non-support on the performance of normal and feebleminded children." J. Pers., 1958, 26, 106-122.

Zigler, E. & Kanzer, P. "The effectiveness of two classes of verbal reinforcers on the performance of middle- and lower-class children." J. Pers., 1962, 30, 157-163.

APPENDIX A

Bialer-Cromwell Children's Locus of Control Scale

(Bialer, 1961)

Instructions

This is not a test. I am just trying to find out how kids your age think about certain things. I am going to ask you some questions to see how you feel about these things. There are no right or wrong answers to these questions. Some kids say "Yes" and some say "No". When I ask the question, if you think your answer should be yes, or mostly yes, say "Yes." If you think the answer should be no, or mostly no, say "No." Remember, different children give different answers, and there is no right or wrong answer. Just say "Yes" or"No," depending on how you think the question should be answered. If you want me to repeat a question, ask me. Do you understand? All right, listen carefully, and answer "Yes" or "No."

1p. When somebody gets mad at you, do you usually feel there is nothing you can do about it?

2f. Do you really believe a kid can be whatever he wants to be?

3f. When people are mean to you, could it be because you did something to make them be mean?

4f. Do you usually make up your mind about something without asking someone first?

5f. Can you do anything about what is going to happen tomorrow?

6f. When people are good to you, is it usually because you did something to make them be good?

7f. Can you ever make other people do things you want them to do?

8f. Do you ever think that kids your age can change things that are happening in the world?

9f. If another child was going to hit you, could you do anything about it?

10f. Can a child your age ever have his own way?

11p. Is it hard for you to know why some people do certain things?

12f. When someone is nice to you, is it because you did the right things?

13f. Can you ever try to be friends with another kid even if he doesn't want to?

14f. Does it ever help any to think about what you will be when you grow up?

15f. When someone gets mad at you, can you usually do something to make him your friend again?

16f. Can kids your age ever have anything to say about where they are going to live?

17f. When you get in an argument, is it sometimes your fault?

18p. When nice things happen to you, is it only good luck?

19p. Do you often feel you get punished when you don't deserve it?

20f. Will people usually do things for you if you ask them?

21f. Do you believe a kid can usually be whatever he wants to be when he grows up?

22p. When bad things happen to you,is it usually someone else's fault?

23f. Can you ever know for sure why some people do certain things?

Note: The letter "f" following item number indicates that an answer of "Yes" is scored as internal control. The letter "p" signifies that an answer of "No" is scored as internal control.

Appendix B

Items Used in the Object Naming Task

One hundred fifty pictures of singular nouns were selected from the Peabody Picture Vocabulary Test (Dunn, 1959) and reproduced on 35mm slides with the permission of the publisher. Items are listed below, followed by an identification number. The first number refers to the plate number and the second locates the item on the plate.

Alligator 29-3	Bell 9-1	Can 9-4
Ambulance 32-2	Bicycle 32-1	Candelabra 113-4
Anchor 59-2	Binoculars 50-4	Canteen 72-1
Anvil 62-2	Bird 97-4	Car 1-4
Arrow 28-3	Boat 7-3	Carriage 39-4
Ax 19-2	Broom 4-1	Casserole 71-2
Badge 35-1	Brush 1-1	Caster 105-3
Ball 5-1	Bulb 101-4	Chair B-1
Banana B-2	Bus 2-4	Clamp 62-1
Basin 57-4	Butterfly C-3	Claw 119-4
Bat 20-2	Caboose 32-4	Cone 25-2
Bear 10-1	Calipers 101-2	Cornucopia 102-3
Bee 21-4	Camel 21-2	Cow 2-3

Crib A-1
Dial 46-2
Dog 4-3
Drum 16-1
Duck 6-2
Ear 106-2
Earring 115-1
Envelope 33-1
Fan 12-2
Feather 28-2
Fence 19-1
Finger 106-3
Fireplace 57-2
Fish B-4
Flag 7-4
Frankfurter 49-2
Funnel 62-4
Gear 56-3
Girraffe 43-4
Goat 29-4
Globe 59-1
Goblet 113-31
Goggles 36-3
Goose 21-3
Grapefruit 25-3
Guitar 81-4

Hassock 92-2
Hinge 46-4
Hippopotamus 118-4
Hook 35-2
Horse 3-2
Hut 81-2
Hydrant 49-3
Iron 72-3
Jacket 14-2
Kangaroo 29-2
Kayak 81-3
Kite 28-1
Knife 2-1
Ladder 20-3
Ladle 92-3
Lamb 54-3
Lamp 12-1
Leaf 17-3
Lobster 37-1
Microscope 115-3
Mitten 14-3
Monkey 60-1
Mop 12-3
Mug 5-2
Nail 17-1
Net 41-4

Pail 41-2
Parachute 39-3
Peacock 100-4
Pear 17-2
Pencil C-2
Penquin 70-4
Pie 9-2
Pin 5-3
Pistol 6-1
Pitcher 33-4
Projector 53-3
Propellor 31-2
Purse 16-3
Rat 29-1
Reel 53-4
Ring 16-2
Rooster 10-2
Saddle 40-4
Safe 41-1
Saw 33-3
Sextant 108-1
Shears 62-3
Shoe 5-4
Shovel 35-4
Sink 57-4
Skirt 14-1

Sling 130-2

Snake 21-1

Soap 2-2

Sock C-1

Spider 43-1

Spoon A-4

Spring 80-2

Store 7-1

Submarine 51-4

Tank 32-3

Tassel 59-4

Thermometer 41-3

Thermos 52-4

Thread 17-4

Tire 19-3

Tree 3-4

Truck 4-4

Trunk 33-2

Turtle 10-4

Tweezers 36-1

Umbrella 9-3

Vase 36-4

Vest 72-2

Waffle 46-1

Wagon 3-3

Walrus 60-3

Watch 30-1

Web 46-3

Well 101-1

Whale 43-2

Wheel 52-3

Whip 40-1

Appendix C

Pilot Study: Use of Two Experimenters

In order to minimize the possibility of unintentional experimenter "cueing" of Ss, it was suggested that the "double blind" methodology be used in the main study. That is, two Es, each of whom was essentially uninformed of the nature of the study, would be used to collect the data. To truly minimize the amount of information available to each E, it was decided one of them would administer the LC questionnaire to each S and the first marble dropping base rate period. The second E would administer all other tasks to Ss, including the second marble dropping base rate period. He would not know of the selection process or anything about the criterion and means of S selection and group assignment (that is, LC scores).

However, in order to employ this procedure, it was necessary to establish the stability of the marble dropping scores when the task is administered by two different Es. The present study was done in order to examine the stability of marble dropping scores in two 3-minute non-reinforced periods with two Es.

Method

Subjects

There were 30 male EMR adolescents who served as Ss for this study. Ss ranged in age from 14-3 to 18-0, with a mean age of 16-1. IQ's ranged from 50 to 75, with a mean of 63.

Apparatus

The marble dropping box as described (Chapter III, Sec. B 3d) was used. Two identical sets were built, one for each E. Es worked in separate rooms.

Experimenters

E-A was the author. He administered the first task to every S. E-B was a male college student who administered the second base periods. E-B did not know the nature of the study, except that Ss were being administered the task twice.

Procedure

Each S was conducted to the room of E-A and seated opposite him at a desk. In front of him was the marble dropping apparatus. S was told:

> We're going to play a game called marble-in-the-hole. Pick up one marble at a time and drop it in one of the holes. You can use either hand, but just one hand at a time. You can drop the marble into either hole. Try to do your best. Remember, pick up just one marble at a time.

S was allowed to continue for three minutes. At the end of this time he was stopped, thanked and conducted to the second room.

E-B gave Ss the same instructions. At the completion of the second 3-minute period, Ss were thanked and told they had done well. During the performance periods, Es attempted to maintain a relatively neutral atmosphere in order to keep conditions as uniform as possible.

Results

The total number of marbles dropped into either hole was recorded for each S for each 3-minute period. The results are summarized in Table A. Mean number of marbles dropped on Trial 1 was 95.8 and the mean on Trial 2 was 105.3. A t-test for correlated samples was not significant. ($t=0.3$, $df=29$). The correlation between scores on the two trials was .88 (p .01, $df=29$).

Discussion

The results indicated that performance on the two 3-minute non-reinforced periods was very similar with either of the two Es. Of course, there was a confounding of E and trials, so we cannot account for the slight increase of scores on the second trial. However, as indicated in the analysis, this seems to have had little, if any, effect on the overall stability of the scores over two trials.

Table A

Performance on Two 3-min Trials of Non-reinforced Marble Dropping of 30 Male Adolescent EMRs

	Range	$\bar{X}$	S.D.
Trial 1 (E-A)	64 to 216	95.8	35.8
Trial 2 (E-B)	52 to 197	105.3	34.8
Difference(Trial 2- Trial 1)	-26 to 39	9.4	

While the literature did not report on the reliability of marble dropping scores in terms of administration by two Es, there were a few discussions of test-retest reliability. Most of these, however, deal with performance during reinforced trials. However, Parton and Ross (1965) discuss a study which reported a .75 correlation for a performance measure when testing sessions were a week apart. They raise a few methodological issues and indicate that the use of two base periods might provide a better index of the stability of this type of performance, which is the procedure proposed here.

Stevenson and Knights (1962) correlated a base rate of response (1-min periods) for institutionalized Ss with base rates obtained 12, 18 and 30 weeks later. Correlations were .74, .86 and .66.

Thus, it seems that this performance measure is stable enough to allow the use of two base rate periods administered by two Es.

References

Parton, D.A. & Ross, A.O. "Social reinforcement of children's motor behavior: a review." Psychol. Bull., 1965, 64, 65-73.

Stevenson, H.W. & Knights, R.M. "The effectiveness of social reinforcement after brief and extended institutionalization." Amer. J. ment. Defic., 1962, 66, 589-594.

Appendix D

Correct Rate Scores

Correct rate scores (total correct responses divided by time on) were used to analyze the relationships between performance and locus of control. Unlike the percent correct score, the correct rate score is a measure of both performance and persistance. In this sense, it is a biased score. However, since this score provides the only opportunity to analyze effects of tasks, reinforcement conditions, task order and experimenters in a single design, an additional analysis was computed. This analysis tested the following specific hypotheses:

1. In a task with high intrinsic feedback (serial learning) ILC Ss will obtain higher scores in conditions of negative reinforcement than in conditions of positive reinforcement.

2. In a task with little intrinsic feedback (marble dropping) ILC Ss will obtain higher scores in conditions of correctness reinforcement than in conditions of approval reinforcement.

3. In a task with low intrinsic feedback (marble dropping, object naming), ILC Ss will obtain higher scores in conditions of negative reinforcement than in conditions of positive reinforcement.

4. No significant differences are expected to be related to experimenter differences.

Correct rate scores are summarized in Table B. These scores were subjected to a modified Lindquist Type IV ANOVA (Table C). Task order and experimenters were between effects and tasks and reinforcement conditions were within effects. The analysis is summarized in Table C. All effects were non-significant except for the reinforcement condition by task order interaction (BC). In order to interpret this interaction, attention was focused on two tasks: marble dropping and serial learning.

These tasks were selected because there was most data available to compare with other studies. Marble dropping is the task most frequently used and most often recommended for social reinforcement studies (Stevenson, 1965). Serial learning has been found useful in studies where reinforcement conditions vary (Miller, 1961). The correlations discussed in the results chapter also seemed to indicate that effects obtained were most distinct in these two tasks. Also, in designing the experiment, these had been chosen for placement in first and last position of the task orders. Since an order effect was obtained, it seemed likely that it could best be studied in connection with tasks which occupied the extremes of the sequences.

A set of factorial analyses was performed to investigate the interaction. The first pair (Table D) considered each task separately. The experimental factors were approval-correctness, positive-negative reinforcement, and first-last (task order). The second set of analyses (Table E) considered the factors task (marble dropping, serial learning), approval-correctness and positive-negative, separately for the first and last task. These analyses indicated that there were no significant effects when comparing last tasks, but there was a significant triple interaction (task by approval-correctness by positive-negative) when comparing first tasks. It appears that the initial differences in reinforcer effectivenss evens out after all Ss have been exposed to the same (total) reinforcement history. Cell means for these analyses are reported in Table F.

Data from first tasks were used to further investigate the effects of the reinforcers upon each task (Tables G and H). These results indicated that positive reinforcement lead to more correct responses than negative reinforcement except in regard to correctness reinforcers in the serial learning task. With one exception, there were no significant differences in the effectness of approval or correctness reinforcers. The exception is: significantly more corrent responses were made under the condition of positive approval than positive correctness in serial learning. However, all differences in these scores were in the direction of approval being more effective than correctness. As predicted, there were no significant differences related to experimenters. No other hypotheses were supported.

Table B

Mean Correct Rate Scores

Treatment Cell	Object Naming		Mirror Drawing		Serial Learning		Marble Dropping	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1	53.3	12.7	46.8	12.1	55.8	12.2	44.3	14.7
2	45.0	15.6	53.5	18.5	58.0	9.7	57.0	14.7
3	50.9	14.0	42.2	11.9	45.7	19.0	45.8	10.9
4	56.5	8.6	50.2	15.0	52.0	13.7	50.0	17.1
5	50.8	12.2	55.1	13.7	52.2	15.4	52.0	16.7
6	48.7	11.1	43.4	14.1	41.2	22.8	51.2	17.7
7	49.4	19.1	45.3	11.7	56.2	14.9	57.0	13.1
8	54.0	12.4	50.9	15.8	46.2	15.1	56.1	12.0
9	53.7	12.0	52.8	11.6	47.3	11.5	38.6	13.8
10	51.3	8.8	51.3	17.0	46.2	16.9	46.7	14.2
11	44.3	14.4	47.1	11.9	47.4	14.6	39.7	12.6
12	43.7	21.7	52.1	15.6	53.1	11.5	50.1	13.9
13	48.9	10.2	49.6	18.9	56.2	14.0	53.7	13.6
14	56.9	16.8	52.6	15.0	47.4	17.0	52.3	15.6
15	55.8	15.3	56.2	19.4	48.6	11.2	51.7	15.5
16	37.0	21.4	51.0	16.5	46.4	12.9	53.8	15.6

Note.--N per cell = 12; Total N = 192

Table C

ANOVA of Correct Rate Scores

Source	df	ss	ms	F
Betweens Ss	191	42,401.3		
C (task order)	1	145.1	145.1	<1
D (experimenter)	1	23.4	23.4	<1
CD	3	150.5	50.2	<1
AB(b)	3	1,255.4	418.5	1.94
ABC(b)	3	881.6	293.8	1.35
ABD(b)	3	1,003.3	334.4	1.54
ABC(b)	3	858.2	286.1	1.32
error(b)	176	38,083.8	216.4	
Within Ss	576	130,755.7		
A (tasks)	3	0.03	0.01	<1
B (reinforcement conditions)	3	1,298.5	432.8	1.94
AB(w)	6	1,918.5	319.7	1.43
AC	3	259.9	86.6	<1
BC	3	1,747.4	582.5	2.63*
AD	3	1,359.4	453.1	2.03
BD	3	536.8	178.9	<1
ACD	3	343.7	114.4	<1
BCD	3	559.2	186.4	<1
ABC(w)	6	831.0	138.5	<1
ABD(w)	6	2,166.7	361.2	1.61
ABCD(w)	6	2,148.2	358.0	1.60
error(w)	528	117,864.0	223.2	
Total	767	173,157.0		

*$p < .05$

Table D

Analysis of

B (Reinforcement Condition) X C (Task Order) Interaction

I: For Marble Dropping

Source	df	ss	ms	F
A	1	225.4	225.4	1.03
B	1	2,324.1	2,324.1	10.7**
C	1	50.0	50.0	<1
AB	1	540.0	540.0	2.49
AC	1	310.1	310.1	1.42
BC	1	80.1	80.1	<1
ABC	1	3,529.7	3,529.7	16.3**
Within Ss	184	39,828.8	216.5	
Total	191	43,358.5		

II: For Serial Learning

Source	df	ss	ms	F
A	1	163.2	163.2	<1
B	1	89.4	89.4	1
C	1	55.0	55.0	<1
AB	1	312.6	312.6	1.39
AC	1	22.2	22.2	<1
BC	1	69.1	69.1	<1
ABC	1	1,265.7	1,265.7	5.63*
Within Ss	184	41,314.8	224.5	
Total	191	43,292.0		

Note. --A=Approval vs Correctness; B=Positive vs Negative; C=First vs Last.

**$p < .01$

*$p < .05$

Table E
Analysis of

B (Reinforcement Condition) X C (Task Order) Interaction

I: For First Task

Source	df	ss	ms	F
A	1	0.0	0.0	1
B	1	55.3	55.3	1
C	1	1,403.0	1,403.0	6.39*
AB	1	100.7	100.7	1
AC	1	388.2	388.2	1.77
BC	1	223.1	223.1	1.01
ABC	1	1,468.5	1,468.5	6.69*
Within Ss	184	40,364.3	219.4	
Total	191	44,003.1		

II: For Last Task

Source	df	ss	ms	F
A	1	0.0	0.0	1
B	1	414.2	414.2	1.86
C	1	408.3	408.3	1.83
AB	1	150.5	150.5	1
AC	1	363.0	363.0	1.63
BC	1	420.1	420.1	1.89
ABC	1	6.8	6.8	1
Within Ss	184	40,779.3	221.6	
Total	191	42,542.2		

Note. --A= Marble Dropping vs Serial Learning; B= Approval vs Correctness; C= Positive vs Negative

*p .05

Table F

Mean Correct Rate Scores for Serial Learning

and Marble Dropping

First Task			Last Task			
Cell	N	X̄	Cell	N	X	Reinforcement Condition
3,4	24	47.7	1,2	24	51.6	A+
7,8	24	56.5	5,6	24	42.6	A-
11,12	24	44.9	9,10	24	53.0	C+
15,16	24	52.8	13,14	24	50.5	C-
Overall	96	50.5	Overall	96	49.4	

Serial Learning

First Task			Last Task			
Cell	N	X	Cell	N	X	Reinforcement Condition
1,2	24	56.9	3,4	24	48.8	A+
5,6	24	46.7	7,8	24	50.3	A-
9,10	24	46.7	11,12	24	51.3	C+
13,14	24	51.8	15,16	24	47.5	C-
Overall	96	50.5	Overall	96	49.5	

Table G

Analysis of Data of First Tasks:

Marble Dropping as First Task

Source	df	ss	ms	F
A (App.-Corr.)	1	3.4	3.4	<1
B (Pos.-Neg.)	1	1,633.5	1,633.5	13.0**a
AB	1	273.4	273.4	2.18
Within	92	11,518.4	125.2	
Total	95	13,431.2		

Note. --N = 24 per cell
**p .01
[a]Means for above

	Approval	Correctness	
Positive	52.8	56.5	54.7[b]
Negative	47.7	44.9	46.3[b]
	50.3	50.7	

[b]t=3.7 (df=23. p < .05)

Table H

Analysis of Data of First Tasks:

Serial Learning as First Task

Source	df	ss	ms	F
A (App.-Corr.)	1	152.5	152.5	<1
B (Pos.-Neg.)	1	157.6	157.6	1
AB	1	1,418.3	1,418.3	5.87*[a]
Within	92	22,199.6	241.3	
Total	95	23,923.7		

Note. --N= 24 per cell
*p .05
[a]Means for Above

	Approval	Correctness	
Positive	56.9	46.7	51.6
Negative	46.7	51.8	49.3
	51.6	49.3	

$\bar{X}$ Differences

	2	3	4
1	10.2*	12.9*	5.1
2		0.0	5.1
3			5.1

*p .05