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An Examination of the Effects of Increased Response Requirement and Delay on Reinforcer Selection.

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AN EXAMINATION OF THE EFFECTS OF INCREASED RESPONSE REQUIREMENT AND DELAY ON REINFORCER SELECTION

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Psychology

by

Teresa Lynne George
B. S., The University of California, Davis, 1991
M. A., Louisiana State University, 1994
December 1996
DEDICATION

This is dedicated to the memory of my late grandfather, Elmer H. Feltz. His boundless support and encouragement instilled in me the knowledge that I could achieve any goal. His love provided a foundation upon which I had the courage to try. His warmth and understanding allowed me to share with him both my successes and failures. I am grateful for many things, but most of all to have been loved by such a wonderful person.
ACKNOWLEDGMENTS

I am indebted to my husband, Clifford George, whose love has given me the strength to make this possible. I cannot adequately express my gratitude for his unending patience and understanding, as well as, his excellent technical assistance and editing. I share this honor and achievement with him.

I wish to thank my parents, Jack and Patricia Sirard, for their love and support over the years. I would also like to express my gratitude to the many family members who have encouraged me at every step along the way.

My appreciation is also extended to my mentor and advisor, Dr. John Northup. He numerous contributions to this project have been invaluable. His expert guidance throughout my graduate career has helped me to develop both my research and clinical skills.

I would like to thank the numerous graduate and undergraduate students who have assisted me with data collection. I could have never done this without your help. I owe an enormous debt of gratitude to Iantha Fusilier. Her endless hours of data collection, meticulous recording, and ability to accomplish an endless number of tasks in one day is truly appreciated.

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ABSTRACT

This study examined the effect that increased response requirement, or effort, (Study 1) and delay to reinforcement (Study 2) have on reinforcer selection and response allocation. A reinforcer assessment using a token system was conducted within the classroom setting to determine high and low preference stimuli. The independent variable (effort or delay) was systematically manipulated for high preference stimuli. The results for eight participants indicated that increased levels of effort and delay independently influenced reinforcer preference and response allocation. The results revealed highly idiosyncratic responding to the different levels of the independent variables. The findings for increased response requirement are also discussed in behavioral economic terms.
INTRODUCTION

The identification of potent reinforcers is an integral part of the development of any reinforcement-based intervention. Numerous assessment methods have been constructed to accurately determine reinforcers. An underlying assumption of the assessment process is that once a stimulus is identified as a reinforcer, it will remain so, despite changes in related variables. However, several factors have been identified which influence reinforcement effects. This study will provide an examination of the effect that two variables, increased response requirement and delay to reinforcement, have on reinforcer selection. The variables of effort and delay were chosen, as they are critical for the development of behavioral interventions for children, and are likely to vary substantially in children's natural environments.

When a reinforcement-based intervention is initially developed, a behavioral criteria for reinforcement must be determined. Additionally, as the intervention is carried out and is found to be successful, the teacher may want to raise the criteria for reward. Determining appropriate initial and future criteria can be critical to intervention success. Study 1 will examine the effects of various levels of response requirement on response allocation and reinforcer selection.

In Study 1, a reinforcer assessment will first be conducted in which reinforcing categories of stimuli (e.g., edibles, tangibles) are identified for each participant. Next, an alternating treatments design will be utilized in which three levels of the independent variable (response requirement or effort) are randomly altered. The relationship between effort and reinforcer choice will be examined in order to
determine an optimum response requirement for each child. It is hypothesized that the response requirement which optimizes reinforcement will be determined for each individual and that reinforcer preference will be affected by changes in the response requirement.

When an intervention is designed for use in the classroom, one common question is, "When should the reinforcer be delivered?" It is often inconvenient for a teacher to provide immediate rewards. Frequently the teacher wants to provide the reward outside of classtime, so as to minimize classroom disturbance and attention to the individual student. The second study will examine the effect of various levels of delay to reinforcement on reinforcer selection and response allocation.

Study 2 will be conducted similarly to Study 1. First, a reinforcer assessment will be conducted to determine reinforcing categories. Then, an alternating treatments design in which three levels of delay are randomly alternated will be utilized to examine the relationship between delay and reinforcer selection. It is hypothesized that an optimal delay period will be determined for each child and that reinforcer preference will be affected by changes in the delay to reinforcement.

In general, the effect of delay to reinforcement and effort on reinforcer preference is hypothesized to affect reinforcer preference in one of three ways: First, the response rate for high preference coupons will increase with each increase in response requirement or delay and response rate for low preference categories will remain unchanged. Second, it is hypothesized that the response rate for high preference coupons will decrease at some level of increased effort or delay and the
response rate will simultaneously increase for low preference coupons. Finally, the third hypothesis is that the response rate for the high preference coupons will decrease at some level of increased effort or delay, but the response rate for low preference coupons will remain unchanged. In general, it is hypothesized that each of the above outcomes will occur for one or more participants.
Behavioral interventions have been shown to be highly effective in altering a wide variety of behaviors across numerous populations and settings. Reinforcement procedures have been an integral part of many child-centered behavioral interventions (Sulzer-Azaroff & Mayer, 1977). Teachers frequently implement classroom interventions utilizing positive reinforcement, and rate them as highly acceptable (Fantuzzo, Rohrbeck, Hightower, & Work, 1991; Kazdin, 1980; Martens, Peterson, Witt, & Cirone, 1986).

Reinforcement based procedures often rely on the use of conditioned or secondary reinforcers. Conditioned reinforcers develop only after being paired with primary reinforcers. Primary reinforcers are stimuli which are considered to be inherently reinforcing (Bijou & Baer, 1978). Cooper, Heron and Heward (1987) defined conditioned reinforcers developing "as a result of each person's unique experience with her(sic) environment." Therefore, conditioned reinforcers are specific to an individual and are highly variable. Although primary reinforcers are presumably effective for all individuals, conditioned reinforcers function differentially across individuals. Determination of potent conditioned reinforcers for an individual will contribute to the success of the intervention. Accurate identification of reinforcing stimuli requires systematic assessment.

The following review examines the major theories of reinforcement and their application to systematic methods of reinforcer assessment. Additionally, those
variables or factors which affect conditions of reinforcement and reinforcement preferences will be discussed as integral to assessment.

Theories of Reinforcer Assessment

The study of reinforcement has a long history. One of the primary goals of behavioral psychology has been to determine logical and comprehensive rules for determining the conditions of reinforcement that would allow for accurate predictions of future behavior. One of the first attempts to develop such a set of rules was Thorndike's (1911) law of effect which states that, when a stimulus-response sequence results in a satisfying change in the environment, the sequence is more likely to occur in the future. One of the primary difficulties cited with this law was its circularity and its failure to explain many behavioral phenomena (Timberlake & Allison, 1974). An additional criticism of the law of effect was that it was subjective and mentalistic. Skinner (1938) extended the law of effect by defining reinforcement empirically and objectively. He proposed that positive reinforcement occurs when a stimulus presented immediately following a behavior, increases the likelihood that the behavior will occur in the future. This approach specifies reinforcement as both observable and measurable.

Transituational Approach

Meehl (1950) provided one of the earliest approaches to identifying stimuli which serve as reinforcers or punishers. That is, stimuli which have served as reinforcers or punishers in the past can be assumed to affect behavior similarly in other situations. These stimuli were described as transituational reinforcers. Meehl's (1950) theory was
based on three assumptions. First, stimuli are independent in function. Thus, a transitional reinforcer cannot simultaneously function as a reinforcer and as a punisher. For example, if a stimulus is identified as a punisher for an individual, it cannot also be reinforcing for that individual. Second, temporal contiguity between the paired response and stimulus results in reinforcement. Finally, access to the reinforcer must be limited for reinforcement to occur. These assumptions have been questioned by later research (Timberlake & Farmer-Dougan, 1991). In addition to the lack of empirical support for this approach, is the drawback that reinforcers must be determined post hoc (Timberlake & Farmer-Dougan, 1991).

Premack Principle

Premack (1959) presented a more systematic method of identifying reinforcing events a priori by examining behavior levels in a free operant situation. The Premack principle, or probability differential hypothesis, states that reinforcement occurs by making access to a high probability behavior contingent on a lower probability behavior. Premack (1965) defined a systematic method of reinforcer assessment. Two responses must be chosen and then a structured observation conducted during baseline in which the duration of each response is systematically measured. Once the relative probabilities of each behavior are established, a condition can be designed in which the higher probability behavior (or, contingent behavior) serves to reinforce the lower probability behavior (or, instrumental behavior). The application of the Premack principle for identifying reinforcers has been examined across a variety of
settings and populations (Bateman, 1975; Hosie, Gentile, & Carroll, 1974; Mitchell, & Staffelmayer, 1973).

Hosie et al. (1974) assessed the validity of the Premack principle with humans as well as its utility in the classroom setting. In study one, the independent response rates of report writing, modeling clay, painting, and other activities were determined for 14 sixth grade students. Preference was determined by measuring the total amount of time spent on each activity. During the final session, half of the students who preferred modeling received modeling contingent on report writing, and the other half received painting. The same division was made for students identified as preferring painting. The results revealed that the amount of time taken to complete the reports was significantly lower for those students who received their preferred activity than for those who received their nonpreferred activity. In study two, the experiment was replicated two years later with a greater number of students, including both fifth and sixth grade students. The results were consistent with study one. Hosie et al. (1974) were able to demonstrate the utility of the Premack principle for identifying student preferences in the classroom setting.

Konarski, Johnson, Crowell, and Whitman (1981) summarized several fundamental concerns that limit the practical utility of the Premack principle. Baseline observations of many behaviors are difficult, if not impossible, to obtain. Therefore, applied research studies often fail to conduct systematic baseline observations and instead rely on information obtained from measures such as self-report. Second, reinforcement necessarily involves an increase in instrumental
responding, as well as, a decrease in the level of the contingent behavior below baseline. Thus, for reinforcement to occur, the level of the low probability behavior must increase and the level of the high probability behavior decreases. However, researchers have failed to adequately account for, or examine the latter requisite. Third, a number of studies have demonstrated the use of low probability behaviors to reinforce performance of higher probability behaviors (Konarski, Johnson, Crowell, and Whitman, 1980; Timberlake and Allison, 1974). Finally, applied studies seldom control for the collateral effects of imposing a new schedule on ongoing behavior. By limiting the opportunity to engage in contingent behavior, the frequency of instrumental behavior may increase due primarily to its availability, not because of a reinforcement effect. Konarski et al. (1981) conclude that adoption of the Premack principle in the applied setting as the driving theory behind reinforcer selection is premature.

Response Deprivation Hypothesis

Timberlake and Allison (1974) presented an approach to identifying reinforcing events termed the "response deprivation hypothesis". This approach attempts to address one limitation of the Premack principle: A reinforcer can be only a high probability behavior. The response deprivation model alters response probabilities through changes in the schedule of reinforcement for both high and low probability behaviors. First, baseline levels of contingent and instrumental responding are determined. The hypothesis proposes that a response deficit occurs when a schedule is imposed such that performance of the instrumental behavior at a level at or below
baseline results in restricted access to the contingent response at a level below baseline. Reinforcement occurs because the level of instrumental responding must be increased in order to bring the contingent response back to baseline levels. Response deprivation schedules result not only in facilitation of the instrumental response but also in suppression of the contingent response.

Similarly, punishment is defined as a condition of response excess, in which performance of the instrumental response at a baseline level results in an increase in contingent responding. In order to maintain equilibrium, one must decrease the level of instrumental responding (Timberlake et al., 1991). According to the response deprivation approach, reinforcement and punishment are determined not by response quality or relative probability, but rather by the schedule requirement (Konarski et al., 1981).

An advantage of this hypothesis is its ability to account for several of the concerns raised by the Premack principle. For example, Konarski et al. (1981) suggest that studies in which a low probability response was shown to reinforce a high probability response, also include a decrease in the level of contingent responding below baseline (i.e., response deprivation). Therefore, these results do not negate the Premack principle, but rather the Premack effect is considered a "special case" and provide further support for the response deprivation hypothesis. Additionally, this approach is not limited to the use of duration as the sole unit of measurement. Responding can be measured through a variety of means, providing that the unit of measurement remains constant (Timberlake et al., 1991).
Preliminary studies have examined the utility of this approach in determining conditions of reinforcement in the classroom. Konarski et al. (1980) first determined the baseline rates of on-task math and coloring (Experiment 1) and on-task math and reading (Experiment 2) in first grade children. In Experiment 1, a condition of response deprivation was created such that the lower probability response (math) was demonstrated to effectively reinforce performance of the higher probability response (coloring). These results contradict the basic premise of the Premack principle. In Experiment 2, the high probability response was provided contingent on performance of the low probability response, in conditions with and without response deprivation. The results indicated that response deprivation was necessary for reinforcement to occur. Although the response deprivation hypothesis appears to be a promising theory, it currently lacks application to more complex applied settings.

Behavioral Economics

Hursch (1984) presented a unique way of analyzing reinforcement by applying the principles of economics to the applied behavior analysis literature. This resulted in the concept of "behavioral economics". Although this is not considered to be a new theory or law, it does provide a novel way of conceptualizing reinforcement that is consistent with many common experiences. Behavioral economics refers to reinforcement as an exchange between reinforcers and responses. "Price" is defined as the number of responses required to earn one unit of the reinforcer. "Pay rate" refers to the number of reinforcers earned per unit of responding. "Demand elasticity" is determined by the degree to which consumption (response rate) is
affected by changes in price (schedule requirements). Thus, demand is described as inelastic if the consumption rate remains stable despite increases in price (Green and Freed, 1993). The availability of stimuli which function as substitutes influences elasticity (Allison, 1986). Two stimuli are considered to be substitutes if the decreased availability of one stimuli is paralleled by increased consumption of the other stimuli. Rachlin (1989) proposed the substitutability of reinforcers was determined by the qualitative similarity of the two stimuli. Although two stimuli are similar in numerous aspects, the function of an item may designate it as substitutable in one situation but not in another (Baumol, 1972). For example, although water and soda are substitutable for drinking, only water is suitable to water a plant. Two stimuli can also be complementary. Two stimuli are complements if, as the availability and consumption of one stimulus increases, a parallel increase is observed in the consumption of the other stimulus.

This dynamic approach to reinforcer assessment utilizes the demand curve in examining how changes in a schedule of reinforcement affect the rate of reinforcement and in determining the elasticity and intensity of demand (Hursch, 1984). Preference can be measured by examining the reinforcer-demand function in which the rate of reinforcement is plotted against the schedule requirements. If, as the schedule increases, the reinforcement rate decreases, a negative slope results. Thus, the flatter the demand curve, the more preferred the reinforcer and the less elastic the demand (Tustin, 1994).
Tustin (1994) demonstrated the potential utility of behavioral economics in determining relative preference and substitutability of various reinforcers in three case studies. A behavioral economics approach to data analysis was used to demonstrate the effect of varying schedule requirements on (a) the constancy of stimulus preference, (b) the substitutability of reinforcers, and (c) changes in reinforcer preferences. The results indicated that economic demand curves can be used to examine the effects of increased schedule requirements on individual preferences.

Allison (1993) applied economic principles to the response deprivation approach. Price was defined as the number of instrumental responses required to earn access to the contingent response. Therefore, response deprivation occurred as a result of increasing price. As the price, or schedule requirement, continued to be increased, the consumption either remained stable or declined. If consumption declined, then demand was considered to be elastic. However, if consumption remained stable, demand was described as inelastic.

**Matching Law**

The matching law differs from the previously discussed theories in that it does not predict what stimuli will serve as reinforcers or what conditions will facilitate reinforcement. Rather, the matching law predicts performance once a reinforcer has been determined. The matching law states that when presented with two concurrent choices, the rate of responding on one choice will be proportional to the reinforcement provided by that choice (Herrnstein, 1970). In a two-choice situation

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individuals typically respond such that reinforcement is maximized, thus conforming
to the matching law (Mullins & Rincover, 1985). The matching principle has been
applied to determinations of reinforcer preference when the two reinforcers are
qualitatively similar (Neef, Mace, Shea, and Shade, 1992; Green & Freed 1993).
However, one assumption of the matching law is that reinforcers are highly
substitutable (Green and Freed, 1993).

Several studies have demonstrated the ability of the matching law to predict the
allocation of human behavior (Baum, 1975; Conger & Killeen, 1974; Martens,
Halperin, Rummel, & Kilpatrick, 1990; Neef et al., 1992). Martens, Lochner, and
Kelly (1992) consecutively presented four variable interval schedules of social
attention contingent on academic engagement to two fourth grade students. The data
supported the ability of Herrnstein's (1970) mathematical equivalent of the matching
law to account for a significant amount of the variance in engagement. In a study by
Mace, Neef, Shade, and Mauro (1994), three adolescent, special education students
were presented with two sets of math problems. Each student could choose to
complete problems from either set with nickels provided contingent on correct
answers. A different schedule of reinforcement was used for each set. During each
phase of the study, a different pair of concurrent variable-interval/variable-interval
schedules of reinforcement was examined. The participants allocated significantly
more time to the problem set with the richer schedule, however, undermatching was
observed across all adolescents. Undermatching occurs when responding allocated to
the alternative with the richer schedule is below the level predicted by the matching
law. Mace et al. (1994) stated that undermatching is common in studies involving human subjects. The results provided further evidence for the application of the matching theory to socially meaningful human behavior.

Mullins and Rincover (1985) compared the response allocations of developmentally normal and autistic children when presented with concurrent schedules of reinforcement. While the normal children were able to maximize reinforcement, the autistic children did not. The authors suggested that the disparate results between the two groups may be due to a failure by some autistic subjects to adequately sample all choices. The primary reason appeared to be an inability to discriminate among the schedules.

Horne and Lowe (1993) also studied the application of the matching law to human behavior. Subjects were presented with two keys which when pressed, delivered points to be later exchanged for money. A different variable-interval schedule of reinforcement was used for each key. Contrary to the results of previous studies, the subjects' performance did not conform to the matching law, but rather to the subjects' own verbal description of the task (Mace et al., 1994; Martens et al., 1992). Horne and Lowe (1993) suggested several possibilities for the failure of these findings to conform to the existing literature. First, numerous procedural differences existed between the studies. Second, many studies supporting the matching law involved nonhuman subjects. It is well documented that performance between human and nonhuman subjects differ on schedules of reinforcement. This may be due in part to the verbal rule-governed behavior of humans. In conclusion, inconsistent research
findings and the matching law's failure to accurately predict the complexities of human behavior suggests that additional variables may need to be accounted for in applied settings (Shull & Fuqua, 1993).

**Summary**

A variety of theories and approaches have been developed for the common purpose of determining a systematic way of determining conditions of reinforcement and describing the reinforcement process. As discussed previously, many theories have not held up to the scrutiny of empirical research and/or are not practical in applied settings. The response deprivation hypothesis appears to provide the most complete explanation of reinforcement and choice allocation in a concurrent operants paradigm. However, this theory fails to provide a systematic method for determining reinforcers in the applied setting. Additionally, the theory is complex and difficult to understand, making its use in applied settings impractical.

The limitations common to all current theories of reinforcement are their complexity and lack of applicability. They do not provide a method for efficiently identifying reinforcers ahead of time and thus, fail to address the needs of the practitioner. Although not generally based in theory, numerous methods of assessing reinforcers have been developed. The following section will provide a review some of the commonly utilized methods of reinforcer assessment.

**Reinforcer Assessment**

The effectiveness of many behavioral interventions hinges on the use of potent reinforcers. Although the reinforcer assessment literature has consistently validated
the utility of systematic reinforcer assessment methods, they are not widely used (Mason, McGee, Farmer-Dougan, & Risely, 1989). Also, the majority of research in the area of reinforcer assessment has focused on developing methods for use with developmentally disabled persons. This population provides a special challenge due to limited sensory and motor capabilities (Egel, 1981). These individuals are frequently nonverbal, and therefore, traditional methods of reinforcer assessment (e.g., nomination) must be abandoned. However, the commonly held assumption that verbal individuals can accurately identify preferences has somewhat inhibited the development of innovative means of reinforcer assessment for other populations.

Often stimuli are selected on the basis of having been successfully used as a reinforcer with similar individuals (e.g., verbal praise is often used to reinforce appropriate behavior in children). That is, reinforcers are selected on the basis of what was previously described as a "transituational" approach (Meehl, 1950). However, it has been repeatedly demonstrated that specific reinforcers are unique to particular individuals. For example, Ferrari and Harris (1981) stated that food is frequently used as a reinforcer with autistic individuals. They assessed reinforcer preferences of four autistic children across edible and social and sensory stimulation. The results indicated distinctive patterns of responding for each child across the various stimuli. Ferrari and Harris provided just one example of the need for systematic assessment methods based on objective data rather than past experience.

Additionally, preferences among children are highly variable across time and environments. This accentuates the need for systematic assessment procedures which
are accurate and time efficient (Farmer-Dougan & Dyer, 1987 as cited in Mason et al., 1989). Timberlake and Farmer-Dougan (1991) put forth three criteria for valid and useful reinforcer assessment procedures. First, the assessment should consist of procedures which are brief, efficient, nonintrusive, and useful in a variety of settings. Second, the assessment of the conditions, under which reinforcement occurs, should also identify critical variables whose effects can be manipulated and measured. Finally, the identified reinforcement conditions, if modified, should be useful across various circumstances.

Numerous methods of assessment have been developed and a variety of dependent measures have been used. However, few meet the above criteria and each has its own limitations. The major categories of reinforcer assessment, nomination, observation, task completion, approach method, forced-choice stimulus preference assessment, survey, and computerized assessment will be discussed below.

Nomination

A commonly held assumption concerning verbal individuals is that they are able to accurately identify and name reinforcer preferences. Consequently, one of the most frequently and widely used methods of reinforcer assessment is client nomination (e.g., "What do you like?"). The primary advantage of this method is that the information can be obtained quickly and easily. Additionally, including child participation in the selection of rewards often results in increased cooperation with the intervention (Kelley, 1990).
Nominations of reinforcers are sometimes obtained from persons other than the client. Baer, Tishelman, Degler, Osnes, and Stokes (1992) compared the effectiveness of child-selected rewards to experimenter-selected rewards in improving academic and social behavior of two preschool aged boys. The results indicated that experimenter-selected rewards more effectively altered their behavior. The authors hypothesized that this may have been due to the fact that the children's preference for the stimuli was not examined or that the act of receiving a surprise reward from the experimenter was reinforcing. In the second phase of the study, Baer and colleagues used a preference assessment in which the child rank ordered 10 stimuli once a day for four days and the results were averaged. Five stimuli with equivalent ratings were retained. Both the child and the experimenter selected rewards from the final five stimuli. No significant differences were found between child and experimenter selected rewards in altering behavior when all stimuli were equivalent in degree of preference.

Reinforcer selection for individuals with severe disabilities is often accomplished through caregiver opinion (Green et al., 1988). Several studies have examined the validity of child nomination when compared to nomination by others and to alternative assessment methods (Green et al., 1988; Green, Reid, Canipe, & Gardner, 1991). Green et al. (1988) compared caregiver opinion of reinforcer preferences to a systematic preference assessment for five profoundly handicapped adults. The assessment method measured client approach to various stimulus items. Stimuli identified by the preference assessment as preferred did not match results from the
caregiver opinion method. Also, the systematic method of reinforcer assessment was found to be superior to caregiver opinion in selecting stimuli which functioned as reinforcers.

In a preliminary study, Northup, Jones, Broussard, and George (1995) compared the treatment utility of three methods of reinforcer assessment: direct observation, nomination, and a verbal forced-choice questionnaire. Each of the three assessment methods were conducted for ten children meeting the diagnostic criteria for ADHD. This was followed by a session in which each toy identified as preferred by an assessment method was available concurrently contingent on academic work. The results revealed that: (a) Agreement between the assessment methods was low, (b) nomination demonstrated limited treatment utility, and (c) the forced-choice questionnaire may enhance reinforcer assessment accuracy. Northup, George, Jones, Broussard and Vollmer (1996) replicated these results with a more rigorous experimental design.

One explanation for the unreliability of the nomination method may be that verbal statements of preference often fail to accurately predict behavior (Lockhart, 1979). In general, correspondence between children's verbal statements and subsequent behavior is often poor and highly variable across children (Baer, Williams, Osnes, & Stokes, 1985; Guevremont, Osnes, & Stokes, 1986; Risley & Hart, 1968). Witt, Cavell, Heffer, Carey, and Martens (1988) suggest that the accuracy with which children respond to preference assessments also may be affected by the complexity of the question. Each child's cognitive and developmental level
must be considered when determining the format of the question and the expected response.

**Observation**

An additional method of reinforcer selection is based on observing what an individual does. The assumption is that if an individual frequently engages in an activity, it must be reinforcing. Potential reinforcers can be determined by examining what activities are engaged in most frequently and for the greatest period of time (Cooper et al., 1987; Quilitch, Christophersen, & Risley, 1977). This approach to reinforcer assessment is based on the previously described Premack principle (Premack, 1965). For example, one of the earliest methods of toy preference or "appeal" was conducted by Quilitch et al. (1977). Children were presented with twenty-five toys simultaneously and allowed to play with any one toy at a time. Preference was determined by recording the number of intervals a child played with each toy. Toys played with during a greater number of intervals were considered to have higher "appeal."

**Survey**

Like nomination, surveys also appear to based on a transitiuational approach to reinforcer selection. One of the earliest reinforcer surveys was developed by Cautela and Kastenbaum (1967). The survey was termed the Reinforcement Survey Schedule (RSS) and was designed for use with adults. Statistical analyses found the RSS to be reliable (Keehn, Bloomfield & Hug, 1970). Alternate versions of the RSS have been developed for other populations such as juvenile offenders (Cautela & Wisocki,
1969) and adolescents (Cautela, 1981). The Children's Reinforcement Survey Schedule (CRSS) was also created based on the RSS (Cautela & Brion-Meisels, 1979). The CRSS examined children's preferences for stimuli from the following categories: food, beverages, toys, games, art, crafts, music, reading, sports, extracurricular school activities and privileges, academic subjects, television, holidays, going out, animals, other people, recognition, and protection. Two versions of the scale were created: one for early elementary (two forms available) and one for upper elementary (one form available). Individual items within the categories were chosen based on age-appropriateness and were rated by the child on a three-point Likert type scale. The scale was designed to be administered either individually or in groups.

Fantuzzo et al. (1991) developed the Child Reinforcement Survey (CRS) in order to provide a systematic assessment of reinforcer preference. The survey consists of 36 stimuli from four categories of reinforcers, edibles, tangibles, activities, and social attention. Specific items were selected from texts on behavior analysis and teacher nomination. The items were presented to each child in an interview format with the child indicating if the item was liked "a little" or "a lot." The CRS was administered to 98 children in the 2nd through 5th grades. Data analysis revealed that stimuli preference varied greatly across categories. No significant differences in preference related to grade or sex were found.

Northup et al. (1996) compared three methods of preference assessment, a reinforcer survey, a verbal stimulus-choice questionnaire, and a behavioral stimulus-choice questionnaire. The survey was a modified versions of the CRS (Fantuzzo et
al., 1991) including the categories of tangibles, edibles, social attention, escape, and activities. The verbal stimulus-choice questionnaire required the child to verbally state a preference for one of two categories presented verbally in pairs (i.e., "Would you rather get things to eat or things to have?"). The behavioral stimulus-choice questionnaire was administered similarly to the verbal questionnaire except that the child indicated preference by physically choosing a coupon representing the specific category. The accuracy with which the methods identified preferred categories of reinforcers was examined with four children. The results revealed that both the verbal and behavioral stimulus-choice assessments accurately identified high and low preference categories. However, the survey often rated multiple categories as high preference and rarely identified low preference categories.

Reinforcement surveys have been developed for use with a variety of populations. Some of the advantages of surveys are that they are easy to administer, can provide a numerical rating or ranking, and many are psychometrically validated. However, their ability to accurately identify reinforcers, and consequently, their treatment utility, has not been borne out by the literature.

**Computerized Assessment**

Due to the difficulty in determining reinforcer preference in individuals with limited behavioral repertoires, several investigators have used specialized equipment to assist in assessment (e.g., microswitches) (Dattilo, 1986). Wacker, Berg, Wiggins, Muldoon, and Cavanaugh (1985) developed a preference assessment procedure utilizing microswitches. Five students with profound and multiple handicaps were
taught to activate microswitches by performing a specified motoric response.

Activation of the microswitch provided contingent sensory stimulation from one of several toys and devices. This assessment method resulted in the demonstration of consistent preferences among stimuli.

Dattilo (1986) used a computer program to interpret the results of a preference assessment using microswitches. Three students with severe handicaps were taught to activate microswitches in order to produce sensory stimulation. Two microswitches, each of which activated one type of stimulus (e.g., visual, auditory, or tactile), were available simultaneously. The participant was able to choose between the two microswitches. Individual reinforcer preferences were revealed for each child.

The primary limitation of this method of reinforcer assessment is that it has only been utilized with developmentally disabled individuals. However, it provides a future direction for use with other populations. Computerized assessment could allow for more rapid measurement and demonstration of preferences.

**Task Completion Method**

Fox, Rotatori, Macklin, and Green (1983) described a reinforcer assessment method used with four severe behaviorally disordered children. Multiple three minute assessment sessions were presented in which a reinforcer was delivered contingent on the correct completion of a specific task (e.g., builds tower of 2 cubes). Each session involved one of four tasks and one of three reinforcers. The three reinforcer categories were: (a) Social - verbal or physical praise), (b) Primary - edibles, and (c) Both - a combination of social and primary reinforcers. An observer recorded the
percentage of correct responses and attending behavior in order to determine which category served as a reinforcer. Results were equivocal across all categories for all children. Although this method of reinforcer assessment appears to be relatively time efficient and easy to administer, its ability to discriminate among reinforcers has not been demonstrated.

**Approach Method**

Pace, Ivancic, Edwards, Iwata & Page (1985) focussed on developing an efficient reinforcer assessment for persons with severe to profound mental retardation. Their procedure consisted of presenting various stimuli to the participant systematically and having observers record client approach. Individual preferences for various stimuli were found for each participant based on the percentage of trials during which approach was observed. This method was found to be more accurate than caregiver nomination in determining reinforcer preference (Green et al., 1991). However, the ability of each preferred stimulus to serve as a reinforcer varied among stimuli (Green et al., 1988). This procedure also has been demonstrated as useful for the development of effective behavioral interventions (e.g., Steege, Wacker, Berg, Cigrand & Cooper (1989).

**Forced-Choice Stimulus Preference Assessment**

An examination of the durability of the approach method revealed relatively consistent preferences. However, there were several instances of variability across assessments (Green et al., 1991). Mason et al. (1989) modified the Pace et al. (1985) procedure by including a daily assessment in which stimuli identified as preferred by
the Pace et al. (1985) procedure were presented in a forced-choice format. The forced-choice assessment involved presenting two stimuli simultaneously and access was given to the first stimulus approached. Each stimulus was presented only once. This assessment method was designed to be time efficient and thus able to be administered on a daily basis.

Fisher et al. (1992) compared the use of a forced-choice stimulus preference assessment to the Pace et al. (1985) procedure. Results indicated a moderate degree of correspondence between the two assessment methods in terms of selecting highly preferred stimuli. The forced-choice method was found to be slightly more accurate in identifying high preference items. Also, a concurrent operants paradigm was used in which access to stimuli identified by only one of the assessment procedures or both as high preference was made contingent on a target response. The forced-choice assessment more accurately predicted which stimuli functioned as reinforcers.

Summary

A variety of reinforcer assessment methods have been presented for verbal children. Three of the most commonly utilized methods in the applied setting are nomination, observation and survey, due to the ease of administration and time efficiency. The disadvantage to these methods is the lack of support for the reliability and validity of the results. Consequently, they lack utility in accurately identifying reinforcers. The ability of these measures of preference to predict potent reinforcers has not been supported by the literature. Recent studies support the use of systematic methods of assessment (e.g., approach method, forced-choice stimulus preference.
assessments) to accurately identify reinforcers. Also, preference assessment methods which utilize choice formats may provide a more valid measure of preference (Northup et al., 1996; Paclawskyj & Vollmer, 1995).

Factors Affecting Reinforcement

The majority of the literature pertaining to reinforcement has focussed on theories of reinforcement and reinforcer assessment methods. Future research must be directed toward examining the application of these theories and methods to applied settings, and toward exploring those variables which may alter the effects of known reinforcers. A number of factors have been identified which influence reinforcement effects, including, reinforcer variation, quality, delay, and response requirement or effort.

Variation

Most teachers and parents have learned from experience that using the same reward consistently often results in decreased responding over time. Conceptually, this is not surprising and would be expected due to satiation. Providing variation of reinforcement presentation is related to increased and sustained responding. Egel (1981) examined the differential effects of constant and varied reinforcer presentation on the behavior of three autistic children. Target behaviors were learning tasks selected from the child's curriculum. Three edible reinforcers were identified for each participant based on past success with the stimulus item as a reinforcer. During the varied reinforcer conditions, one of the three stimuli was randomly chosen and delivered contingent on a correct response. During the constant reinforcer condition,
the same stimulus item was consistently presented contingently. Decreasing trends, suggesting satiation, were observed during the constant presentation conditions. Significant increases in on-task behavior and correct responding were observed during the varied reinforcer conditions.

Quality

In the natural setting, multiple sources of reinforcement are typically available and reinforcers frequently differ qualitatively. Differences in quality refers to two stimuli which serve the same function, but differ on other characteristics (i.e., are topographically dissimilar). For example, a peer saying "Good job!" and a peer patting you on the back are qualitatively different. Neef et al. (1992) examined the relationship of reinforcer quality to rate of reinforcement within an applied setting. Three special education students were presented with two sets of math problems on concurrent variable-interval schedules of reinforcement. During one condition, the quality of the reinforcer was held constant but the schedules differed. In another condition the quality of the reinforcer differed between the two sets; nickels were provided as a high quality reinforcer on the leaner schedule and "program money" (tokens) was provided as a low quality reinforcer on the richer schedule. The distribution of behavior during the constant quality condition supported the predictive power of the matching law. However, when the quality of reinforcers was varied, the allocation of responses was highly variable and failed to conform to the matching law. Two of the three participants consistently allocated more time to the higher quality reinforcer (i.e., nickels) yet leaner schedule.
Delay

Within applied settings, immediate reinforcement is not always possible or practical. Many behavioral interventions include a reinforcement component in which the time between earning reinforcement and reinforcer delivery is delayed. For example, Schwarz and Hawkins (1970) utilized delayed reinforcement to alter a developmentally normal, 12 year old girl's maladaptive behaviors within the classroom setting. Token chips and social reinforcement were provided to the girl contingent on a specified handwriting size, the absence of face touching, correct posture, or appropriate voice volume. Behavior was recorded on video during two twenty minute periods at school. One behavior was targeted at a time until a criterion was met, then the next behavior was targeted. However, the delivery of chips and social reinforcement (i.e., praise and attention by the experimenter) was delayed until after school while the recording was viewed. Generalization of the behaviors was observed to occur across academic subjects.

One of the earliest discussions of the effect of reinforcement delay on response acquisition was by Renner (1964). Renner stated that delayed reinforcement resulted in a shortage of response trials which then impeded acquisition. However, reinforcement delay improved response resistance to extinction. The majority of studies examining delay have involved nonhuman subjects (e.g., rats, pigeons). When pigeons were presented with two response keys, each corresponding to a different delay to edible reinforcement, response frequency was directly related to the immediacy of reinforcement (Chung & Herrnstein, 1967). Studies involving human
subjects have demonstrated that response allocation between delayed and immediate reinforcers is biased by reinforcer size (Logue, Pena-Correal, Rodriguez, & Kabela, 1986). In other words, individuals will choose a larger reward that is delayed, over a smaller, immediate reward; this phenomenon is also known as self-control (Neef, Mace, & Shade, 1993).

The effects of various levels of delayed reinforcement in the classroom was examined by Fowler and Baer (1981). Sessions were conducted in which positive reinforcement was provided to preschool children contingent on performance of target behaviors. The delivery of reinforcement occurred either immediately following the session or at the end of the school day. Performance of the target behaviors was then observed during a later session (within the same day) in which no reinforcement was provided contingent on the behaviors. The results indicated that generalization of the behavior to the session with no experimental contingencies occurred on days when reinforcement was delayed. Fowler and Baer suggest that delayed reinforcement may be effective in promoting generalization of behavior.

Reinforcer delay has been demonstrated to influence allocation of responses in a concurrent choice paradigm (Neef et al., 1993). Neef et al. (1993) examined responding between two concurrently available sets of math problems with two special education students. In study one, each set was associated with a specific rate of reinforcement which was provided either immediately or after a delay. Both students responded primarily to the schedule providing immediate reinforcement. In study two, reinforcer quality was varied, along with, rate of reinforcement and
amount of delay. Low quality reinforcers were available immediately on a lean schedule and high quality reinforcers were available at a later time on a richer schedule. Neither student demonstrated response distribution proportional to the amount of reinforcement available from each alternative. One participant consistently responded to the alternative which provided high quality reinforcement and the other student responded to the alternative providing immediate reinforcement. The results of this study taken together indicated that the matching law was moderated by dimensions of reinforcement (such as, reinforcer delay, quality and effort) that may have important applied implications.

**Effort**

The previously discussed factors are those which are considered to be parameters of reinforcement. However, effort is generally described as a parameter of responding, and as such can be defined in several ways (Friman & Poling, 1995; Hunter & Davison, 1982). Neef, Shade, and Miller (1994) defined effort qualitatively as "problem difficulty." Difficulty was based on the classroom teacher's report of accuracy levels for particular problems. As with the other dimensions of reinforcement, few studies examining the effect of effort on choice have been completed. Neef et al. (1994) examined the influence of effort within the context of an examination of the interaction between the following dimensions: rate, quality, delay and effort. Effort, as well as the other variables, was found to significantly affect distribution of responding among two response alternatives.
The effects of effort on preference have also been examined in nonhuman studies. Hunter and Davison (1982) defined effort as the force required to press a response key. Pigeons were presented with two keys which varied in terms of required force and reinforcement rates. Results indicated that response allocation was not related to force requirement. This approach to the study of effort has not been extended to research with humans.

Effort can also be defined quantitatively (i.e., number of required responses). Increases in effort, or response requirement, correspond directly to changes in the schedule requirement. Thus, this definition of effort is related to a parameter of reinforcement, type of schedule. Tustin (1994) examined the effect of increasing schedule requirements (or, effort) on reinforcer preference and substitutability. Each of three intellectually disabled adults were presented with two concurrently available buttons. Each of the buttons accessed one of five contingent stimuli (i.e., visual stimuli, auditory stimuli, complex sensory stimuli, constant color or social attention). The schedule requirements for each subject were varied individually. For Subject 1, preferences for stimuli remained stable despite increases in the schedule requirements. The results obtained from Subject 2 indicated that as the schedule for one stimulus increased, the substitutability of the other stimulus (schedule held constant) also increased. Finally, for Subject 3, as the schedule increased for two stimuli simultaneously, the relative preferences switched.

Friman and Poling (1995) stated that increases in response effort typically result in potent and lasting reductions of responding. These findings may have significant
implications for determining behavioral criteria when designing an intervention. Increased response effort has been utilized as an effective response-reduction procedure in applied settings (Jacobsen, Bushell, & Risley, 1969; Van Houten, 1993). Friman and Poling contend that further examination of the application of response effort as an intervention strategy is necessary.

Conclusion

The preceding literature review has examined three major areas in the field of reinforcement: theory, assessment and parametric factors. Several major theories have been developed in an attempt to describe and explain conditions of reinforcement. However, current theories are limited by their complexity and lack of applied utility. Some theories have provided a basis for the development of systematic methods of assessment. However, the most commonly utilized assessment methods rely on questionable theoretical assumptions (e.g., nomination is based on the Meehl's (1950) transituational reinforcer approach). Consequently, these methods lack accuracy and treatment utility. Several assessment methods have been recently developed and are supported by empirical research. The research with these assessment methods has not examined the relationship of other factors to reinforcer selection. Several variables have been identified which influence reinforcement effects (e.g., delay, response requirement). The following study will propose to extend the current research by examining the independent effects of delay and effort on reinforcer selection.
STUDY 1 - INCREASED RESPONSE REQUIREMENT

The purpose of Study 1 was to evaluate the effect of the systematic manipulation of increased response requirement on reinforcer selection and response allocation.

Method

Participants

Participants in this study were four elementary school aged children who exhibited behavior problems as reported by parent or teacher. Criteria for inclusion in this study were: (a) The child was between the ages of five and twelve, (b) the child was developmentally normal, and (c) the child was referred by a parent/guardian or teacher for assistance with behavior problems exhibited at school. Written consent was obtained from the parent or guardian of each participant (see Appendix A). Written consent was also requested from the child's teacher, if the sessions were conducted within the child's natural classroom (see Appendix B).

Brad

Brad was a nine year old Caucasian male who was referred by his parents to a summer program for children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). Brad's parents reported his primary behavioral difficulties were in the areas of social skills, impulsivity, inattention, and work completion.

Brad had been diagnosed with ADHD and was prescribed Ritalin (20mg, t.i.d.) by the family physician due to disruptive behavior in the classroom and inattention to classwork. Brad remained on his prescribed dose of medication throughout the course of this study.
On the Conners Parent Rating Scale (CPRS) (Conners, 1985), parent ratings indicated significant elevations on the learning problems factor and the hyperactivity index. Also, on the Achenbach Child Behavior Checklist (CBCL) (Achenbach & Edelbrock, 1983), parent ratings identified withdrawn behavior, social problems, attention problems and delinquent behavior as significant problem domains.

**Greg**

Greg was a 10 year old Caucasian male who was referred by his parents to a summer program for children diagnosed with ADHD. Greg's parents reported behavior problems at home and school in the areas of social skills, anger control, impulsivity and excessive talking. He had been diagnosed with ADHD and was taking Ritalin (40 mg SR; 20 mg), Zoloft (50 mg), and Buspar (10 mg) at the time of the study.

Parent ratings on the CPRS were significant for the domains of learning problems, impulsive/hyperactive behavior, and the hyperactivity index. Parent ratings on the CBCL were significant for the domains of social problems, thought problems, attention problems and aggressive behavior.

**Alan**

Alan was a 9 year old Caucasian male who was referred by his parents to a summer program for children diagnosed with ADHD. Alan's parents were concerned about inattention, hyperactivity and noncompliance.
Alan had been diagnosed with ADHD by the family physician and was taking Ritalin at the time of the study. Significant scores were obtained on a dimension of attention or hyperactivity problems on either the CPRS or CBCL.

Josh

Josh was a nine year old African American male in the third grade who was referred by his mother to a community-based mental health center due to impulsive behavior and aggressive behavior toward peers at home and school. No problem areas were rated as significant by Josh's mother on the CBCL and only the psychosomatic complaints domain was significant on the CPRS. During the school year Josh had received several office referrals and was suspended due to fighting with peers.

Setting and Materials

Three of the four participants (Brad, Greg and Alan) attended a summer program for children diagnosed with ADHD. The program was conducted in a classroom at a University Laboratory School each weekday morning from 8:30 a.m. to 11:30 a.m. for three weeks. The fourth participant, Josh, attended a primary school in a small rural parish. Each session was conducted either at a back table in the child's classroom or in a nearby classroom.

Task materials for each session were mastery level multi-skill math worksheets. Each worksheet consisted of approximately 30 problems. Curriculum Based Assessment probes in math (Gickling & Thompson, 1985) were conducted to determine each child's mastery level. Each child's math level was determined through
the administration of multi-skill math probes at the child's grade level. Mastery level was defined as those tasks at which the child was observed to achieve at least 90% correct. Mastery level materials were used in order to ensure that the child was able to complete each problem with a high degree of accuracy.

Additional materials were laminated token coupons of various colors. Each color corresponded to one of six categories of reinforcers (e.g., tangible, activity). A symbol representing each category (e.g., a fork, spoon and cup represented edibles) was placed on each coupon.

**Response Definitions and Measurement**

**Independent Variable**

The independent variable for Study 1 was the response requirement, or effort. Effort was defined as the number of math problems required to be completed before a reinforcer was delivered. First, a criterion number was calculated from the average number of problems completed per minute during baseline sessions. Three levels of response requirement were determined by multiplying the baseline criterion by 1, 1.5 and 2.

Accurate completion of the math problems was not required for reinforcement, however, accuracy rates were calculated by two independent observers on a random sample of 25% of all math worksheets as a procedural integrity measure. Accuracy level was monitored throughout the study for each child. The average accuracy rates for each participant for each phase are presented in Appendix C. The level of
accuracy remained constant and above 90% for all participants across all phases. Accuracy was not significantly affected by changes in the session requirements.

**Dependent Variable**

The dependent variable was the number of math problems completed in order to earn a specific type of token coupon. The number of math problems were recorded by an experimenter for each session. An independent experimenter calculated the number of problems completed for at least 25% of all sessions. Interobserver agreement was calculated each session by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100% (Kazdin, 1982). The mean interobserver agreement for problem completion was 98.2% (range, 95.8% to 100%).

**Procedures**

**General Procedures**

**Parent interview.** The parent or guardian of each participant was interviewed to explain the details of the study, to provide a written description of the study, and to obtain informed consent. Parents were interviewed to determine what behavior problems their child was currently exhibiting.

**Behavior rating scales.** Each parent or guardian was asked to complete the Conners Parent Rating Scale (CPRS) (Conners, 1985). The CPRS is a widely used scale for assessing behavior problems in children aged 3-17. Parental ratings of the child's specific behaviors are computed to determine T-scores based on a standardization sample of same-age, same-sex children. Factor analysis of the CPRS
was performed to delineate several reliable factors. A T-score is obtained for each of the factors. The average T-score is 50 and the standard deviation is 10, thus a T-score greater than 70 indicates the 98th percentile in the standardization sample and is considered to indicate a problem area.

Parents or guardians were also be requested to complete the Achenbach Child Behavior Checklist (CBCL) (Achenbach & Edelbrock, 1983). The CBCL is a 138-item scale designed to examine behavior problems and competencies of children ages 4 to 16. Parent ratings of scale items on a 3-point scale are computed to T-scores and percentile ranks. Norms are provided for three age groups: 4 to 5, 6 to 11, and 12 to 16, by sex. T-scores and percentile ranks are determined for two broad band factors and for nine narrow band factors determined from factor analytic studies. Numerous studies have demonstrated the reliability and validity of the CBCL.

Some teachers were also asked to complete the Conners Teacher Rating Scale (CTRS) (Conners, 1985). The CTRS is a 28-item scale designed to identify behavior problems in children between the ages of 4 and 12. The CTRS assesses four domains of problem behaviors: conduct problems, hyperactivity, inattentive/passive, and hyperactivity index. Similar to the CPRS, T-scores can be obtained for each domain.

Preference Assessment

General instructions and reinforcer sampling. Prior to administration of a reinforcement survey, each child participated in a session in which they were exposed to each of the stimulus items on the survey. The purpose of the session was to ensure that each child was adequately familiarized with the stimulus items. At the
same time, the token coupon system was introduced to each participant. An experimenter described what a token coupon was, the method for exchanging coupons, and what category each coupon represented.

Survey. A Reinforcer Preference Survey (RPS) was presented to each child (see Appendix D). The survey was based on a modified version of the Child Reinforcement Survey (CRS, Fantuzzo et al., 1991). The stimulus items on the CRS were selected from a compilation of potential reinforcers in behavior analysis textbooks (e.g., Sulzer-Azaroff & Mayer, 1977) and subsequent ratings by teachers of the appropriateness of these items (Fantuzzo et al., 1991). The RPS consisted of the original three categories: edibles, tangibles, and activities, and three additional categories. The original category of social attention was separated into two new categories of peer attention and teacher attention. Finally, a category of negative reinforcement (escape, or "get out of...") was added. Each category consisted of seven stimulus items. Stimulus items which were not feasible given the particular setting (e.g., field trips) were deleted and alternative items were added (e.g., computer games) based on accessibility.

The modified child reinforcement survey was administered to each participant with the verbal instructions:

Boys and girls like to get good things. I am going to name things that kids sometimes get in school. I want to know how much you like each of these things. After I name each thing, you tell me if you like it "not at all", "a little", or "a lot". For example, if I say "Going to the supermarket" you might say you like it "not at all", but if I say "Going to your favorite movie", you might say you like it "a lot." (Fantuzzo et al., 1991).
Each of the 42 stimuli were presented to the child verbally and the child's ratings were recorded for each stimulus item. Each rating was given a numerical value of either "not at all"=0, "a little"=1, or "a lot"=2; for a total possible score of 14 per category. A percentage score for each category was calculated by dividing the participant's score for the category by the total possible score and multiplying by 100%. A percentage score of 75 or greater was considered high preference and below 75, low preference.

**Token Coupon System**

Seven 2 x 5 in. coupons of different colors were created to represent each of the six categories of potential reinforcers and a control category. A symbol representing each category was placed on the corresponding coupon (e.g., two stick figures holding hands represented peer attention). For each child, three back-up reinforcers were chosen for each coupon. The items were randomly selected from those items rated "a lot" on the RPS. Fewer than three stimulus items were chosen when the child rated less than three items as "a lot." A control coupon was also included for a total of seven coupons. The stimulus items for the control coupon consisted of one randomly chosen item rated "not at all" from each category.

Token coupons were required to be exchanged during a brief period immediately proceeding the coupon earning session. All coupons had to be exchanged during this period so that reinforcer delivery was not delayed for selected categories (e.g., escape). Following the cash-in period, each child was seated for a fifteen minute work session in which the child performed a variety of academic tasks (e.g.,
language skills, additional math skills, etc.). Academic materials were placed in front of the child with the instruction to begin working. The purpose of the work session was to provide an opportunity for each child to use earned escape coupons. All coupons were required to be exchanged on the same day in which they were earned.

Edible, tangible, and attention (peer and teacher) coupons were exchanged on a one to one ratio. In other words, one coupon could be cashed in for one tangible item, one edible, or one statement or gesture of attention. Activity, escape and selected items on the attention coupons were time-based and hence, each coupon was exchanged for one minute of the item.

**Reinforcer Assessment Procedures**

**Baseline.** During baseline, the child was seated at a table across from an experimenter with a stack of mastery level math worksheets in front of the child. The child was given the following instructions: "You can do as much as you want, as little as you want or none at all. We will stop if you don't do any for 1 min." The session continued until the child stopped working for 1 min, or for a maximum of 5 min.

**Reinforcer assessment.** During the reinforcer assessment phase each of the seven coupons were made available simultaneously, contingent on completion of math problems. The participant was seated at a table across from the experimenter. A stack of math sheets was placed in front of the student with the verbal instructions:

You can earn coupons for doing math problems. For every 'x' problems you complete, you will earn one coupon. You can choose any one of the seven types of coupons. You can work for a total of fifteen coupons. You can do as much as
you want, as little as you want or none at all. If you stop working for 1 min we will stop.

A criterion number of math problems necessary to earn each token coupon was based on the average of the number of math problems completed per minute across all baseline sessions. However, if the student completed no math problems during any of the baseline sessions, a criterion of five math problems was chosen. The number of math problems required to earn each coupon was marked on each worksheet. A maximum of 15 total coupons could be earned. A stack of 15 of each of the coupon types was placed in front of the math sheets. After completing the criterion number of problems, the child was prompted to take one coupon. Prompting occurred only when the child forgot to choose a coupon. The session was discontinued if the child stopped working for 1 min or indicated verbally that he or she wanted to stop.

The child kept all coupons that were earned and exchanged them during a cash-in period immediately following the session. The experimenter recorded all transactions (i.e., type of coupon exchanged and back-up reinforcer chosen).

Before beginning the reinforcer assessment phase, the token coupon system was reviewed with each child. The examiner asked the child to name which category each coupon represented and which backup reinforcers could be earned with the coupon. The coupon system was reviewed with the child until the child could correctly name the category and stimulus items associated with the given coupon. To aid the child in recall of the available stimulus items, a key was provided. The key provided a color
picture of each coupon and a list of the corresponding stimulus items on a 4 x 6 inch card.

**Increased Response Requirement**

Visual analysis of the reinforcer assessment results was conducted in order to identify the coupon type(s) associated with the most substantial increase in number of problems completed. This coupon(s) was termed "high preference."

The purpose of the increased effort sessions was to examine what effect increasing the response requirement for the high preference coupon(s) had on coupon selection. Two levels of increased effort were examined. The response requirement for the high preference coupon(s) was increased parametrically by 1.5x and 2.0x the criterion number. (For example, if the criterion was 12, then the response requirement for the high preference coupon(s) was 18 for some sessions and 24 during other sessions.) However, the response requirement for all other coupons (low preference and control) remained the same.

The increased effort sessions (i.e., 1.5x and 2.0x) were randomly alternated with sessions in which the response requirement for all coupon types was equal to the initial reinforcer assessment sessions (i.e., 1.0x), and with baseline sessions. Sessions were conducted until the data was judged stable through visual analysis and a minimum of three of each session type (i.e., 1.0x, 1.5x and 2.0x) had been completed. These sessions were conducted in a manner similar to the reinforcer assessment sessions. Each of the seven coupons were made available simultaneously, contingent on completion of math problems. The participant was seated at a table.
across from the experimenter. During sessions in which response requirements for high preference coupons were altered, two separate stacks of math sheets were placed in front of the child. One set of math sheets was marked with the original criterion and the corresponding coupons were placed above the math sheets. The other stack of math sheets were marked with the increased criterion number (i.e., 1.5x or 2.0x the criterion number) and the high preference coupon(s) were placed above the math sheets. Only one stack of math sheets was used for sessions in which the criterion was equivalent for all coupon types. The following instructions were given verbally:

You can earn coupons for doing math problems. You will have the opportunity to earn each type of coupon. For every 'x' problems you complete, you will earn one of these coupons (point to the low preference coupons). To earn these coupon(s) (point to the high preference coupon(s)), you will have to complete 'z' problems. You can work for a total of 15 coupons. You can do as much as you want, as little as you want or none at all. If you stop working for 1 min we will stop or you can say "I'm done."

**Design**

A reinforcer assessment, including a preference assessment, was conducted using a method similar to Northup et al. (1996). Assessment sessions involved the delivery of token coupons contingent upon work completion. Seven types of coupons were made available concurrently in a multi-element design (Sidman, 1960). Each coupon represented, and could be exchanged for, a specific category of reinforcers (e.g., edibles, tangibles). The reinforcer assessment sessions were conducted until: (a) A minimum of three sessions were completed, and (b) a clear reinforcement effect was determined for one or more reinforcers. Evaluation of the reinforcement effect was conducted through visual inspection of the data.
Following the reinforcer assessment phase, an alternating treatments design was utilized in which baseline sessions and sessions varying the level of the independent variable (effort) were randomly alternated. Three levels of the independent variable were presented. This design provided a rapid demonstration of the relationship between the independent variable (effort) and reinforcer choice.

Results

Figures 1, 3, 5 and 7 show the results of the baseline and reinforcer assessment sessions. The results are presented as the number of math problems completed in each session. For the reinforcer assessment sessions, the total number of problems completed for all high preference coupons, low preference coupons, and control coupons are presented separately.

Brad

Preference Assessment

The percentage scores obtained from Brad's ratings on the RPS were edible (100%), peer attention (92.9%), activity (78.6%), tangible (92.9%), teacher attention (85.7%) and escape (71.4%). Thus, Brad initially identified the edible, peer attention, activity, tangible and teacher attention categories as high preference. Backup reinforcers for each category were randomly chosen from ratings on the RPS (see Table 1). Only two items were selected for the control coupon as Brad rated only items from the activities and escape categories as "not at all" on the RPS.
**Reinforcer Assessment**

Brad worked for 5 min during each of the baseline sessions. He completed an average of 45 problems per session during the baseline phase. The criteria to earn each coupon was nine problems.

**TABLE 1**

Backup Reinforcers for Brad

<table>
<thead>
<tr>
<th>Edible</th>
<th>Candy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cookies</td>
</tr>
<tr>
<td></td>
<td>Pretzels</td>
</tr>
<tr>
<td>Peer Attention</td>
<td>Spend time with a friend</td>
</tr>
<tr>
<td></td>
<td>Play a game with a friend</td>
</tr>
<tr>
<td></td>
<td>Friend pats you on the back/hugs you</td>
</tr>
<tr>
<td>Activities</td>
<td>Run/jump/dance</td>
</tr>
<tr>
<td></td>
<td>Play a computer game</td>
</tr>
<tr>
<td></td>
<td>Play with toys</td>
</tr>
<tr>
<td>Tangible</td>
<td>Erasers</td>
</tr>
<tr>
<td></td>
<td>Pens or pencils</td>
</tr>
<tr>
<td></td>
<td>File folders, pocket folder</td>
</tr>
<tr>
<td>Teacher Attention</td>
<td>Teacher says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher says &quot;That's right, that's correct&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher pats you on the back/hugs you</td>
</tr>
<tr>
<td>Escape</td>
<td>Put your feet up and relax</td>
</tr>
<tr>
<td></td>
<td>Get out of sitting in your seat</td>
</tr>
<tr>
<td></td>
<td>Get out of the classroom</td>
</tr>
<tr>
<td>Control</td>
<td>Art projects</td>
</tr>
<tr>
<td></td>
<td>Get out of snacktime</td>
</tr>
</tbody>
</table>
Results from Brad's reinforcer assessment sessions revealed a clear reinforcement effect for the tangible, activity and peer categories. Figure 1 shows that for the high preference coupons of tangible, activity and peer, Brad consistently completed more problems than for low preference coupons or control coupons. A total of 612 problems were completed to earn high preference coupons, 63 for low preference coupons, and none for control coupons.

Brad completed a total of 225 problems for coupons for tangible items, 225 problems for coupons for activities, and 162 problems for coupons for peer attention. Edibles were associated with a small increase in problem completion (18 total problems completed) for only two sessions. Brad completed 45 problems for escape coupons during the first session, however, he did not complete problems to earn these coupons during any other sessions. Brad completed no problems for teacher attention or control coupons.

Increased Response Requirement

During the increased response requirement sessions the criterion number of problems for the high preference coupons, tangible, activity and peer, was increased to 13 and 18 problems. Figure 2 shows that despite increases in the response requirement, Brad continued to select only high preference coupons. He completed zero problems for low preference coupons, regardless of the response requirement. He selected five of each high preference coupons during all sessions. Brad completed 45 problems for tangible, activity and peer coupons (135 total) during each
Results of the Baseline and Reinforcer Assessment for Brad
High Preference = Tangible, Activity and Peer; Low Preference = Edible, Escape and Teacher
FIGURE 2

Results of the Reinforcer Assessment and Increased Effort Sessions for Brad

High Preference = Tangible, Activity and Peer;
Low Preference = Edible, Escape and Teacher
Equal Effort-9 session. He completed 65 problems for each preferred coupon (195 total) during each Increased Effort-13 session and 90 problems for each preferred coupons (270 total) during each Increased Effort-18 session.

The total number of problems completed during baseline sessions conducted during this phase increased when compared to the baseline phase. During the initial baseline phase, Brad completed an average of 45 problems per session, however, during the increased response requirement phase, baseline sessions averaged 97 problems.

Overall, Brad increased the number of problems completed with each increase in effort and obtained the same amount of high preference coupons. In addition, the number of problems completed for all low preference coupons and control coupons remained at zero.

**Greg**

Preference Assessment

Greg's percentage ratings on the RPS were edible (42.9%), peer attention (78.6%), activity (64.3%), tangible (28.6%), teacher attention (71.4%) and escape (100%). Thus, Greg initially identified the peer attention and escape categories as preferred. Backup reinforcers for each category are presented in Table 2. Greg rated only two items as "a lot" for both the edible and tangible categories. Thus only two backup reinforcers were selected for the edible and tangible coupons. Four items
were selected for the control coupon because Greg did not rate any items from the peer attention or escape categories as "not at all."

### TABLE 2

Backup Reinforcers for Greg

<table>
<thead>
<tr>
<th>Category</th>
<th>Reinforcers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edible</td>
<td>Juice, drinks, Candy</td>
</tr>
<tr>
<td>Peer Attention</td>
<td>Play a game with a friend, Help a friend with schoolwork, Friend says &quot;Good job, I like that.&quot;</td>
</tr>
<tr>
<td>Activities</td>
<td>Play with toys, Help the teacher, Read a story, book</td>
</tr>
<tr>
<td>Tangible</td>
<td>Pennies, Certificates, awards</td>
</tr>
<tr>
<td>Teacher Attention</td>
<td>Teacher says &quot;You're really paying attention,&quot; Teacher says &quot;That's right, that's correct,&quot; Teacher helps you with your work</td>
</tr>
<tr>
<td>Escape</td>
<td>Put your feet up and relax, Get out of math, Get out of the classroom</td>
</tr>
<tr>
<td>Control</td>
<td>Nuts, Stickers, stars, Teacher pats you on the back/hugs you, Free time in library</td>
</tr>
</tbody>
</table>
Reinforcer Assessment

Greg completed no problems during the baseline sessions. The criteria to earn each coupon was five problems.

Results from Greg's reinforcer assessment sessions revealed a clear reinforcement effect for the edible and peer attention categories. Figure 3 shows that for the high preference coupons of edible and peer attention, Greg completed more problems than for the low preference coupons or control coupons. A total of 255 problems were completed to earn high preference coupons, 185 for low preference coupons, and 0 for control coupons.

Greg completed a total of 145 problems for coupons for peer attention coupons, 110 problems for coupons for edible coupons, 105 for activity coupons, 70 for escape coupons, 10 for tangible coupons and none for attention or control coupons. Greg's rate of problem completion for activity and escape coupons was high during the several sessions, but the number gradually deceased during this phase.

Increased Response Requirement

During the increased response requirement sessions the criterion number of problems for the high preference coupons, edible and peer, was increased to 7 and 10 problems. Figure 4 shows that Greg's coupon selection was affected at both levels of increased effort. During the Equal Effort-5 sessions he continued to select primarily high preference coupons, with the exception of the final session. However, during the last session, Greg selected a majority of low preference coupons. When the response
FIGURE 3

Results of the Baseline and Reinforcer Assessment for Greg
High Preference = Edible and Peer; Low Preference = Tangible, Activity, Escape and Teacher
Results of the Reinforcer Assessment and Increased Effort Sessions for Greg
High Preference = Edible and Peer;
Low Preference = Tangible, Activity, Escape and Teacher
requirement was increased to seven, Greg discontinued completing problems to earn high preference coupons. He completed zero problems for high preference coupons across all five sessions. Greg earned an increased number of low preference coupons and control coupons across all sessions. At Increased Effort-10, Greg continued to earn no high preference coupons and earned only one control coupon (five problems) during the first session. Greg completed 55 and 75 problems during the first and third sessions for low preference coupons but did not earn any coupons during the second session. Greg continued to complete zero math problems during baseline sessions conducted in this phase.

Overall, Greg earned primarily high preference coupons when the criteria remained equal for all coupons types. However, when the criteria was increased to 7 and 10, Greg discontinued completing problems for high preference coupons. At Increased Effort-7, Greg increased the number of problems completed to earn low preference and control coupons. When the level was increased further to Increased Effort-10, Greg discontinued working for control coupons and earned primarily low preference coupons.

Alan

Preference Assessment

The percentage scores obtained from Alan's ratings on the RPS were edible (64.3%), peer attention (50%), activity (50%), tangible (57.1%), teacher attention (42.9%) and escape (64.3%). From the results of the RPS it appears that Alan did not
Initially identify any categories as preferred. Backup reinforcers for each category are presented in Table 3. Only one item was selected for the peer coupon and two items for the escape coupon because Alan did not rate at least three items as "a lot."

**TABLE 3**

Backup Reinforcers for Alan

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edible</td>
<td>Candy, Cookies, Juice, drinks</td>
</tr>
<tr>
<td>Peer Attention</td>
<td>Play a game with a friend</td>
</tr>
<tr>
<td>Activities</td>
<td>Run/jump/dance, Play a computer game, Play with toys</td>
</tr>
<tr>
<td>Tangible</td>
<td>Certificates, awards, Pens, pencils, POGS, bottle caps</td>
</tr>
<tr>
<td>Teacher Attention</td>
<td>Teacher says &quot;Good job, I like that&quot;, Teacher helps you with your work, Teacher pats you on the back/hugs you</td>
</tr>
<tr>
<td>Escape</td>
<td>Get out of sitting in your seat, Get out of school activity</td>
</tr>
<tr>
<td>Control</td>
<td>Art projects, Get out of math, Nuts, Friend says &quot;You're really doing a good job&quot;, Time with favorite teacher at school, Stickers, stars</td>
</tr>
</tbody>
</table>
Reinforcer Assessment

Alan did not complete any math problems during the five baseline sessions. The criteria to earn each coupon was five problems.

Results from Alan's reinforcer assessment sessions revealed a clear reinforcement effect for the edible, tangible, and activity categories. Figure 5 shows that for the high-preference coupons of edible, tangible and activity, Alan consistently completed more problems than for low preference coupons or control coupons. A total of 355 problems were completed to earn high preference coupons, 20 for low preference coupons, and none for control coupons.

Alan completed a total of 120 problems for coupons for edible items, 120 problems for coupons for tangible items, and 115 problems for coupons for access to preferred activities. Peer attention and escape coupons were associated with a small increase in problem completion for only one session, 5 and 15 problems, respectively. Alan did not work any problems to earn teacher attention or control coupons.

Increased Response Requirement

During the increased response requirement sessions the criterion number of problems for the high preference coupons, edible, tangible, and activity, was increased to 7 and 10 problems. Figure 6 shows that despite increases in the response requirement to seven problems, Alan continued to work for five of each preferred coupon. Alan completed 35 problems for edible, tangible, and activity coupons (105
Results of the Baseline and Reinforcer Assessment for Alan
High Preference = Edible, Tangible and Activity; Low Preference = Peer, Escape and Teacher
Results of the Reinforcer Assessment and Increased Effort Sessions for Alan
High Preference = Edible, Tangible, and Activity;
Low Preference = Peer, Escape and Teacher

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total) during each of the Increased Effort-7 sessions. Alan did not choose to work for nonpreferred coupons or control coupons during these sessions. Alan continued to complete 25 problems for high preference coupons (75 total) during each of the Equal Effort-5 sessions.

Once the criterion was increased to 10, Alan's problem completion decreased to zero for high preference coupons. During the first Increased Effort-10 session Alan completed 10 problems to earn one tangible coupon. In the second session, Alan completed 110 total problems, working for 11 preferred coupons. However, he refused to complete any math problems for high preference coupons during the subsequent three sessions. Alan completed 25 problems to earn five peer coupons during the final Increased Effort-10 session. He earned no control coupons during the Increased Effort-10 sessions. Alan continued to complete no math problems during the baseline sessions in this phase.

In summary, Alan increased the number of problems completed to earn high preference coupons when the level of effort was increased to a criteria of seven. The number of problems completed for all low preference coupons and control coupons remained at zero during these sessions. However, when the criteria was increased to 10, Alan's rate of problem completion decreased to near zero.
Josh

Preference Assessment

Josh's ratings on the RPS were edible (100%), peer attention (78.6%), activity (85.7%), tangible (92.9%), teacher attention (92.9%) and escape (42.9%). Thus, Josh initially identified the edible, peer attention, activity, tangible and teacher attention categories as preferred. Josh's backup reinforcers for each category are shown in Table 4. Only three items were selected for the control coupon as Josh only rated items from the edible, peer attention, and escape categories as "not at all."

Reinforcer Assessment

Josh worked for a full 5 min throughout each of the baseline sessions. He completed an average of 135 problems per session during the baseline phase. The criteria to earn each coupon was 27 problems.

Results from Josh's reinforcer assessment sessions indicated a clear reinforcement effect for the edible and peer categories. Figure 7 shows that for the high preference coupons of edible and peer attention, Josh consistently completed more problems than for low preference coupons or control coupons. A total of 2241 problems were completed to earn high preference coupons, 567 for low preference coupons, and 540 for control coupons.

Josh completed a total of 1188 problems for coupons for edible items and 1053 problems for coupons for peer attention. Small increases in problem completion were
<table>
<thead>
<tr>
<th></th>
<th>Edible</th>
<th>Peer Attention</th>
<th>Activities</th>
<th>Tangible</th>
<th>Teacher Attention</th>
<th>Escape</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Candy</td>
<td>Friend says &quot;Good job, I like that&quot;</td>
<td>Run/jump/dance</td>
<td>Stickers, stars</td>
<td>Teacher says &quot;Good job, I like that&quot;</td>
<td>Get out of sitting in your seat</td>
<td>Nuts</td>
</tr>
<tr>
<td></td>
<td>Chips</td>
<td>Play a game with a friend</td>
<td>Play a computer game</td>
<td>Pens or pencils</td>
<td>Teacher says &quot;You're really paying attention&quot;</td>
<td>Get out of the classroom</td>
<td>Get out of math</td>
</tr>
<tr>
<td></td>
<td>Gum</td>
<td>Friend pats you on the back/hugs you</td>
<td>Art projects</td>
<td>Erasers</td>
<td>Teacher pats you on the back/hugs you</td>
<td>Get out of reading</td>
<td>Spend time with a friend at school</td>
</tr>
</tbody>
</table>

TABLE 4
Backup Reinforcers for Josh

associated with all other coupons, including the control coupon. The total number of problems completed across all reinforcer assessment sessions were: control - 540, tangible - 378, escape - 135, activity - 27, and teacher attention - 27.
Results of the Baseline and Reinforcer Assessment for Josh
High Preference = Edible and Peer; Low Preference = Tangible, Activity, Escape and Teacher
Results of the Reinforcer Assessment and Increased Effort Sessions for Josh

High Preference = Edible and Peer;
Low Preference = Tangible, Activity, Escape and Teacher
Increased Response Requirement

During the increased response requirement sessions the criterion number of problems for the high preference coupons, edible and peer, was increased to 41 and 54 problems. Figure 8 shows that despite increases in the response requirement, Josh continued to select primarily high preference coupons. Josh completed a total of 1026 problems for high preference coupons and 189 for low preference coupons during the Equal Effort-27 sessions. He completed a total of 1517 problems for high preference coupons and 216 problems for low preference coupons during the Increased Effort-41 sessions. Finally, he completed a total of 1728 for high preference coupons and 351 problems for low preference coupons during the Increased Effort-54 sessions.

The total number of problems completed during baseline sessions conducted during this phase decreased when compared to the baseline phase. During the initial baseline phase, Josh completed an average of 135 problems per session, however, during the increased response requirement phase, baseline sessions averaged 110 problems.

Overall, Josh increased the number of problems completed with each increase in effort. A greater number of high preference coupons than low preference or control coupons were earned during each increased effort session.

Behavioral Economics

As discussed previously, behavioral economics refers to reinforcement as an exchange between reinforcers and responses. "Price" is defined as the number of
responses required to earn one unit of the reinforcer. "Demand elasticity" is determined by the degree to which "consumption" (response rate) is affected by changes in price (schedule requirements). If the consumption rate remains stable despite increases in price the demand is described as inelastic (Green and Freed, 1993). The availability of stimuli which function as substitutes influences elasticity (Allison, 1986). Two stimuli are considered to be substitutes if the decreased availability of one stimuli is paralleled by increased consumption of the other stimuli. Also, two stimuli are complements if, as the availability and consumption of one stimuli increases, a parallel increase is observed in the consumption of the other stimuli.

This approach to reinforcer assessment utilizes the demand curve in examining how changes in the response requirement affect the rate of reinforcement and the elasticity of demand (Hursch, 1984). Preference can be measured by examining the reinforcer-demand function in which the rate of reinforcement is plotted against the schedule requirements. If, as the schedule increases, the reinforcement rate decreases, a negative slope results. Thus, the flatter the demand curve, the more preferred the reinforcer and the more inelastic the demand (Tustin, 1994).

Figure 9 presents the data from Study 1 graphed as demand functions. The obtained number of coupons are plotted against the response requirement (price) for each participant. For Brad, the demand curve for high preference reinforcers is flat, indicating that the coupons were highly preferred and that demand was inelastic. Also, the other coupons, low preference and control, were not observed to be
FIGURE 9

Demand Curve Represented by the Average Number of Coupons Earned at Each Level of Response Requirement (Price)
substitutable for the high preference coupons despite changes in response requirement (price).

The results for Alan indicate a negative slope of the demand curve for the high preference coupons suggesting that these coupons were less preferred as the level of effort increased and that the demand was moderately elastic. The slope of the demand curve for low preference and control coupons was close to zero with an intercept of zero. Thus, the low preference and control coupons were not highly preferred, nor were they substitutable for high preference coupons.

Josh's results were similar to those obtained for Alan. The demand curve slope for high preference coupons was negative. This indicates that these coupons were less valued as the level of effort increased and that demand was somewhat elastic. Also, the slope of the demand curve for the low preference and control coupons was near zero. Neither coupon type was observed to be substitutable for the high preference coupons.

The results obtained for Greg indicate that the slope of the demand curve for high preference coupons was negative, suggesting that the coupons were less preferred as effort increased and that demand was elastic. The demand curve for low preference and control coupons was positive at first and then negative. This indicates that both coupon types were more preferred at the criteria=7 level, but preference decreased as the criteria was increased to 10. These coupons were substitutable for the high preference coupons at the criteria=7 level but not at criteria=10.
STUDY 2 - DELAY TO REINFORCEMENT

The purpose of Study 2 was to evaluate the effect of the systematic manipulation of delay to reinforcement on reinforcer selection and response allocation using procedures identical to those in Study 1.

Method

Participants, Setting and Materials

Four participants were recruited from a local elementary school by teacher referral. All procedures and materials were identical to Study 1. The average accuracy rates for each participant are presented in Appendix D for each phase. The level of accuracy remained constant and above 90% for all participants across all phases. Also, interobserver agreement was calculated for 25% of all sessions. The mean interobserver agreement for problem completion was 98.3% (range, 97.9% to 98.8%).

Mary

Mary was a seven year old African American female in the first grade who was referred by her teacher to a community-based mental health center. Mary's teacher reported that she was inattentive in class and had difficulty completing school work independently. Mary's mother reported few behavior problems at home but indicated that Mary frequently switched from one activity to another.
On the CPRS and CBCL, parent ratings indicated no significant problem domains. Teacher ratings on the CTRS were significantly elevated on the conduct problem, hyperactivity, and impulsive/passive factors and the hyperactivity index.

**Matt**

Matt was a seven year old African American male in the first grade who was referred by his teacher to a community-based mental health center. Matt's teacher reported that he constantly fidgeted in class, was easily distracted by his peers and was inattentive. Matt's mother reported that he was somewhat restless at home. She was primarily concerned about Matt's behavior in the classroom.

On the CPRS and CBCL, parent ratings indicated no significant problem domains. However, teacher ratings on the CTRS indicated the domains of conduct problem, hyperactivity and the hyperactivity index as significant problem areas.

**Jeff**

Jeff was a seven year old African American male in the first grade who was referred by his teacher to a community-based mental health center. She reported that Jeff had difficulty staying on task, fidgeted constantly, was frequently out of his seat and was easily distracted. Jeff's mother also reported that Jeff was "always on the go" and that no activities held his attention for long. Jeff had been diagnosed with ADHD by a psychiatrist and had been prescribed with Ritalin. He was not taking Ritalin at the time of this study.
On the CBCL, parent ratings indicated the domains of withdrawn and attention problems as significant problem areas. Parent ratings on the CPRS identified learning problems, impulsive/hyperactive, anxiety and hyperactivity as problem areas. Teacher ratings on the CTRS indicated the domains of conduct problem and the hyperactivity index as significant problem areas.

Carl

Carl was a seven year old Caucasian male in the first grade who was referred by his teacher to a community-based mental health center. She reported that Carl had difficulty staying on task, blurted out, fidgeted constantly, and was easily distracted. Carl's mother also reported that Carl was extremely active and impulsive. Parent ratings on the CPRS identified impulsive/hyperactive factor and the hyperactivity index as significant problem areas. On the CBCL parent ratings indicated no significant problem domains.

Response Definitions and Measurement

All response definitions and methods of measurement were identical to those used in Study 1 with the exception of the independent variable.

Independent Variable

The independent variable for Study 2 was the amount of time (minutes) elapsed or delay between obtaining the token coupon and the delivery of the backup.
reinforcer. Delays of 0 min (i.e., delivery of the reinforcer immediately following the session), 60 min, 300 min and 24 hr were utilized.

**Procedures**

All procedures were identical to Study 1 with the exception of the delay to reinforcement sessions which were conducted in the place of the increased effort sessions.

**Delay to Reinforcement**

As in the increased effort sessions, visual analysis of the reinforcer assessment results was utilized to identify the "high preference" coupon types. Several levels of delay to reinforcement were investigated. The high preference coupon(s) were exchanged at one of three designated periods: immediately following the session, 60 minutes (1.0x hour) following the session or 300 minutes (5.0x hour) following the session. The 60 min and 300 min delays were chosen to coincide with the child's recess period and the end of the school day, respectively. For two participants a delay of 24 hr was compared to no delay in an ABA reversal design. Only the high preference coupon(s) were associated with each of the delay periods, all other coupon types could be cashed in immediately following the session. The criterion number of completed problems remained constant across all sessions and was based on the average number of problems completed during baseline sessions.

All of the seven coupons were made available simultaneously, contingent on completion of math problems. The participant was seated at a table across from the
experimenter. Two stacks of math sheets were placed in front of the child for sessions in which a delay period was designated for high preference coupons. The high preference coupon(s) were placed above one set of math sheets and all other coupons were placed above the other set. Both sets of math sheets were marked with the same criterion number. The following instructions were given verbally:

You can earn coupons for doing math problems. You will have the opportunity to earn each type of coupon. For every 'x' problems you complete, you will earn one coupon. If you earn one of these coupon(s) (point to the high preference coupon(s)) you will be able to cash it in at 'n' 0'clock. If you earn one of these coupon(s) (point to the other coupons) you will be able to cash them in immediately following the session. You can work for a total of 15 coupons. You can do as much as you want, as little as you want or none at all. If you stop working for 1 min we will stop or you can say "I'm done."

Design

The design for Study 2 was the same as in Study 1, except during the alternating treatments design three levels of delay to reinforcement were randomly alternated (no delay, 60 min delay, and 300 min delay). This design provided a rapid demonstration of the relationship between the independent variable (delay) and reinforcer choice. For two participants a reversal design was also added to investigate the effect of an additional level of delay (24 hr delay) based on the initial results for delays of 60 min and 300 min.
Results

Figures 10, 13, 16, and 18 show the results of the baseline and reinforcer assessment sessions. The results are presented as the number of math problems completed in each session. For the reinforcer assessment sessions, the total number of problems completed for all high preference coupons, low preference coupons, and control coupons are presented separately.

Mary

Preference Assessment

The percentage scores obtained from Mary's ratings on the RPS were edible (92.9%), peer attention (92.9%), activity (78.6%), tangible (85.7%), teacher attention (85.7%) and escape (42.9%). Mary's ratings on the RPS identified the edible, peer, activity, tangible and teacher attention categories as preferred. Backup reinforcers for each category are shown in Table 5. Only one item was chosen for the control coupon, as Mary rated only items in the escape category as "not at all."

Reinforcer Assessment

Mary worked for an average of 2 min per baseline session before stopping. She worked continuously for 5 min during the 2nd and 5th baseline sessions. She completed an average of 10 problems per session during the baseline phase. The criteria to earn each coupon was two problems.
TABLE 5
Backup Reinforcers for Mary

<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edible</td>
<td>Juice, drinks</td>
</tr>
<tr>
<td></td>
<td>Candy</td>
</tr>
<tr>
<td></td>
<td>Cookies</td>
</tr>
<tr>
<td>Peer Attention</td>
<td>Friend says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Play a game with a friend</td>
</tr>
<tr>
<td></td>
<td>Friend pats you on the back/hugs you</td>
</tr>
<tr>
<td>Activities</td>
<td>Art projects</td>
</tr>
<tr>
<td></td>
<td>Read a book</td>
</tr>
<tr>
<td></td>
<td>Play with toys</td>
</tr>
<tr>
<td>Tangible</td>
<td>Certificates, awards</td>
</tr>
<tr>
<td></td>
<td>Pens or pencils</td>
</tr>
<tr>
<td></td>
<td>Stickers, stars</td>
</tr>
<tr>
<td>Teacher</td>
<td>Teacher says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td>Attention</td>
<td>Teacher says &quot;You're really paying attention&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher says &quot;That's right, that's correct&quot;</td>
</tr>
<tr>
<td>Escape</td>
<td>Put your feet up and relax</td>
</tr>
<tr>
<td></td>
<td>Get out of reading</td>
</tr>
<tr>
<td></td>
<td>Get out of the classroom</td>
</tr>
<tr>
<td>Control</td>
<td>Get out of sitting in your seat</td>
</tr>
</tbody>
</table>

Results from Mary's reinforcer assessment sessions revealed a clear reinforcement effect for the edible, tangible, activity and peer categories. Figure 10 shows that Mary consistently completed more problems for the high preference coupons of edible, tangible, activity, and peer, than for low preference coupons or control.
FIGURE 10

Results of the Baseline and Reinforcer Assessment for Mary
High Preference = Edible, Tangible, Activity and Peer; Low Preference = Escape and Teacher
coupons. A total of 376 problems were completed to earn high preference coupons, 38 for low preference coupons, and none for control coupons.

Mary completed a total of 116 problems for coupons for tangible items, 108 problems for coupons for activities, 104 problems for coupons for edible items, and 48 problems for coupons for peer attention. Escape, teacher attention and control coupons were associated with a small increase in problem completion, a total of 14, 24, and 0, respectively. Mary discontinued selecting escape coupons after the first four reinforcer assessment sessions and teacher attention coupons after the first seven sessions.

**Delay to Reinforcement**

During the delay sessions, the high preference coupons (edible, tangible, activity and peer) were exchanged following a 60 min or 300 min delay. Figure 11 shows that despite increases in delay to reinforcement by 60 and 300 minutes, Mary continued to select primarily high preference coupons. During three 300 min delay sessions Mary selected several low preference, teacher attention coupons and control coupons, which were exchanged immediately following the session. However, the majority of coupons selected during this 300 min delay sessions were high preference coupons.

The average number of problems completed across baseline sessions conducted during the delay phases increased when compared to the baseline phase. During the baseline phase, Mary completed an average of 10 problems per session,
FIGURE 11

Results of the Reinforcer Assessment and Delay Sessions for Mary
High Preference = Edible, Tangible, Activity and Peer;
Low Preference = Escape and Teacher
FIGURE 12

Delay Sessions for Mary Examining the Effect of 24 hr Delay
however, during the delay phases her average was 34 problems. Also, the average amount of time Mary worked increased from 2 min to 4 min, 50 s.

The results indicated that the types of coupons Mary worked for were not substantially affected by a 60 min or 300 min delay to reinforcement. Thus, a longer delay of 24 hr was examined by comparing it to the no delay sessions in an ABA design (Figure 12). The results revealed that during the 24 hr delay sessions Mary completed more problems to earn low preference and control coupons than was observed in previous conditions. These results were observed during both 24 hr delay phases. Mary continued to work primarily for high preference coupons during the no delay sessions and 24 hr delay sessions.

In summary, coupon selection was not largely affected by a 60 min or 300 min delay to reinforcement. When the delay was increased to 24 hr, Mary consistently selected more low preference and control coupons than was observed in other conditions. These coupons could be exchanged immediately following the session. However, during the 24 hr delay sessions Mary continued to earn a majority of high preference coupons.

Matt

Preference Assessment

Matt's ratings on the RPS were edible (35.7%), peer attention (64.3%), activity (92.9%), tangible (28.6%), teacher attention (85.7%) and escape (7.1%). Matt's ratings on the RPS identified the activity and teacher attention categories as
preferred. The backup reinforcers for each category are shown in Table 6. Fewer than three items were selected for the edible, escape, and tangible categories because Matt did not rate three items as "a lot" in these categories.

**TABLE 6**

Backup Reinforcers for Matt

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Edible</strong></td>
<td>Juice, drinks</td>
</tr>
<tr>
<td><strong>Peer Attention</strong></td>
<td>Help a friend with schoolwork</td>
</tr>
<tr>
<td></td>
<td>Play a game with a friend</td>
</tr>
<tr>
<td></td>
<td>Friend pats you on the back/hugs you</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>Read a book</td>
</tr>
<tr>
<td></td>
<td>Play with toys</td>
</tr>
<tr>
<td></td>
<td>Help the teacher</td>
</tr>
<tr>
<td><strong>Tangible</strong></td>
<td>Stickers, stars</td>
</tr>
<tr>
<td></td>
<td>File folder / pocket folder</td>
</tr>
<tr>
<td><strong>Teacher Attention</strong></td>
<td>Teacher says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher says &quot;You're really paying attention&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher pats you on the back/hugs you</td>
</tr>
<tr>
<td><strong>Escape</strong></td>
<td>Get out of school activity</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>Get out of math</td>
</tr>
<tr>
<td></td>
<td>Certificates, awards</td>
</tr>
<tr>
<td></td>
<td>Time with favorite teacher</td>
</tr>
<tr>
<td></td>
<td>Nuts</td>
</tr>
<tr>
<td></td>
<td>Friend says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Run/jump/dance</td>
</tr>
</tbody>
</table>
Reinforcer Assessment

Matt worked for 5 min throughout each baseline session, completing an average of 30 problems per session. The criteria to earn each coupon was six problems.

Results from Matt's reinforcer assessment sessions revealed a clear reinforcement effect for the edible, tangible, activity and peer categories. Figure 13 shows that for the high preference coupons of edible, tangible, activity and peer, Matt consistently completed more problems than for low preference coupons or control coupons. A total of 744 problems were completed to earn high preference coupons, 42 for low preference coupons, and 12 for control coupons.

Matt completed a total of 264 problems for coupons for edible items, 222 problems for coupons for activities, 156 problems for coupons for tangible items, and 102 problems for coupons for peer attention. Escape, teacher attention and control coupons were associated with a small increase in problem completion (a total of 30, 12, and 12, respectively). Matt discontinued selecting teacher attention coupons after the first reinforcer assessment session and only selected control and escape coupons during two sessions each.

Delay to Reinforcement

During the delay sessions, the high preference coupons (edible, tangible, activity and peer) were exchanged following a 60 min or 300 min delay. Figure 14 shows that despite increases in delay to reinforcement by 60 and 300 minutes, Matt
FIGURE 13

Results of Baseline and Reinforcer Assessment for Matt
High Preference = Edible, Tangible, Activity, and Peer; Low Preference = Escape and Teacher
FIGURE 14

Results of the Reinforcer Assessment and Delay Sessions for Matt
High Preference = Edible, Tangible, Activity and Peer;
Low Preference = Escape and Teacher

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continued to select primarily high preference coupons. During two 60 min delay sessions Matt completed about half of the math problems to earn control coupons, however this trend was not stable.

The average number of problems completed across baseline sessions conducted during the delay phases decreased when compared to the baseline phase. During the baseline phase, Matt completed an average of 30 problems per session, however, during the delay phases his average was 15 problems. Also, the average amount of time Matt work decreased to 1 min, 20 s.

The results indicated that despite a 60 min or 300 min delay to reinforcement, the types of coupons Matt worked for were similar to those during the no delay sessions. A longer delay of 24 hr was examined by comparing it to the no delay sessions in an ABA design (Figure 15). The results indicated that during the 24 hr delay sessions Matt completed more problems to earn control coupons than was observed in previous conditions. These results were observed during both 24 hr delay phases. During the no delay phase, Matt selected all high preference coupons and did not earn any control or low preference coupons. During the first 24 hr delay phase Matt earned an average of 8.2 control coupons per session and an average of 5 during the second phase. He also continued to work for high preference coupons during all but one of the sessions in these phases.

In summary, coupon selection was not largely affected by a 60 min or 300 min delay to reinforcement. When the delay was increased to 24 hr, Matt
FIGURE 15

Delay Sessions for Matt Examining the Effect of 24 hr Delay
consistently selected more control coupons than was observed in other conditions. These coupons could be exchanged immediately following the session. However, during the 24 hr delay sessions Matt continued to earn a majority of high preference coupons.

Jeff

Preference Assessment

The percentage scores obtained from Jeff's ratings on the RPS were edible (85.7%), peer attention (100%), activity (100%), tangible (92.9%), teacher attention (100%) and escape (14.3%). Jeff's ratings on the RPS identified the edible, peer attention, activity, tangible, and teacher attention categories as preferred. Backup reinforcers for each category were randomly chosen from the RPS (see Table 7). Fewer than three items were selected for the escape and control coupons because Jeff did not rate three items as "a lot" in these categories.

Reinforcer Assessment

Jeff worked for 5 min during the first three baseline sessions and the sixth session, however his problem completion rate gradually decreased to zero. Jeff chose not to complete any problems during the final three baseline sessions. Jeff completed an average of 45 problems per session. The criteria to earn each coupon was nine problems.

Results from Jeff's reinforcer assessment sessions revealed a clear reinforcement effect for the edible, tangible and activity categories. Figure 16 shows
TABLE 7

Backup Reinforcers for Jeff

<table>
<thead>
<tr>
<th>Edible</th>
<th>Nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cookies</td>
</tr>
<tr>
<td></td>
<td>Candy</td>
</tr>
<tr>
<td>Peer Attention</td>
<td>Friend says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Play a game with a friend</td>
</tr>
<tr>
<td></td>
<td>Friend pats you on the back/hugs you</td>
</tr>
<tr>
<td>Activities</td>
<td>Art projects</td>
</tr>
<tr>
<td></td>
<td>Run/jump/dance</td>
</tr>
<tr>
<td></td>
<td>Play with toys</td>
</tr>
<tr>
<td>Tangible</td>
<td>Stickers, stars</td>
</tr>
<tr>
<td></td>
<td>Pens or pencils</td>
</tr>
<tr>
<td></td>
<td>Erasers</td>
</tr>
<tr>
<td>Teacher Attention</td>
<td>Teacher helps you with your work</td>
</tr>
<tr>
<td></td>
<td>Teacher says &quot;You're really paying attention&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher pats you on the back/hugs you</td>
</tr>
<tr>
<td>Escape</td>
<td>Get out of the classroom</td>
</tr>
<tr>
<td></td>
<td>Get out of recess</td>
</tr>
<tr>
<td>Control</td>
<td>Gum</td>
</tr>
<tr>
<td></td>
<td>Put your feet up and relax</td>
</tr>
</tbody>
</table>

that for the high preference coupons of edible, tangible, and activity, Jeff consistently completed more problems than for low preference coupons or control coupons. A total of 549 problems were completed to earn high preference coupons, 63 for low preference coupons, and none for control coupons.

Jeff completed a total of 234 problems for coupons for activities, 198 problems for coupons for edible items, and 117 problems for coupons for tangible
Results of Baseline and Reinforcer Assessment for Jeff
High Preference = Edible, Tangible, and Activity; Low Preference = Peer, Escape and Teacher
items. Peer attention, escape, and teacher attention coupons were associated with a small increase in problem completion (a total of 36, 9, and 18, respectively). Jeff did not complete any problems to earn control coupons.

Delay to Reinforcement

During the delay sessions, the high preference coupons (edible, tangible, and activity) were exchanged following a 60 min or 300 min delay. Figure 17 shows that Jeff continued to earn primarily high preference coupons during the no delay sessions. During the first two 60 min delay sessions, Jeff initially worked for both high preference and low preference coupons. He earned a few low preference coupons and discontinued working for high preference coupons during the final three 60 min delay sessions. During the first 300 min delay session Jeff earned a majority of high preference coupons and a few low preference coupons. He discontinued working for any coupons in the last two 300 min delay sessions.

Jeff decreased the number of problems completed during the baseline sessions in this phase. He completed 81 problems in the first session, 18 in the second, and zero in the third.

Overall, Jeff decreased the number of problems completed during both delay conditions. Given a 60 min delay to reinforcement, Jeff discontinued working for high preference coupons and continued to earn several low preference coupons. A 300 min delay resulted in Jeff choosing not to complete any problems and consequently earning zero coupons.
FIGURE 17

Results of the Reinforcer Assessment and Delay Sessions for Jeff
High Preference = Edible, Tangible and Activity;
Low Preference = Peer, Escape and Teacher

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Carl

Preference Assessment

The percentage scores obtained from Carl's ratings on the RPS were edible (100%), peer attention (100%), activity (100%), tangible (100%), teacher attention (100%) and escape (0%). Carl's ratings on the RPS identified the edible, peer attention, activity, tangible, and teacher attention categories as preferred. Backup reinforcers for each category were randomly chosen from the RPS (see Table 8). Only one item was randomly selected for the escape and control categories because Carl rated all items in the escape category as "not at all."

Reinforcer Assessment

Carl worked for 5 min during the first baseline session and his problem completion rate gradually decreased to zero. Carl chose not to complete any problems during two of the final three baseline sessions. Carl completed an average of 45 problems per 5 min session. The criteria to earn each coupon was 7 problems.

Results from Carl's reinforcer assessment sessions revealed a clear reinforcement effect for the tangible category. Figure 18 shows that for the high preference coupon (tangible), Carl consistently completed more problems than for low preference coupons or control coupons. A total of 455 problems were completed to earn the high preference coupon, 140 for low preference coupons, and 7 for control coupons.
TABLE 8
Backup Reinforcers for Carl

<table>
<thead>
<tr>
<th>Edible</th>
<th>Gum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cookies</td>
</tr>
<tr>
<td></td>
<td>Candy</td>
</tr>
<tr>
<td>Peer Attention</td>
<td>Friend says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Play a game with a friend</td>
</tr>
<tr>
<td></td>
<td>Talk with a friend at school</td>
</tr>
<tr>
<td>Activities</td>
<td>Art projects</td>
</tr>
<tr>
<td></td>
<td>Run/jump/dance</td>
</tr>
<tr>
<td></td>
<td>Play with toys</td>
</tr>
<tr>
<td>Tangible</td>
<td>Stickers, stars</td>
</tr>
<tr>
<td></td>
<td>Pens or pencils</td>
</tr>
<tr>
<td></td>
<td>Folders</td>
</tr>
<tr>
<td>Teacher Attention</td>
<td>Teacher helps you with your work</td>
</tr>
<tr>
<td></td>
<td>Teacher says &quot;Good job, I like that&quot;</td>
</tr>
<tr>
<td></td>
<td>Teacher pats you on the back/hugs you</td>
</tr>
<tr>
<td>Escape</td>
<td>Get out of the classroom</td>
</tr>
<tr>
<td>Control</td>
<td>Get out of recess</td>
</tr>
</tbody>
</table>

Carl completed a total of 455 problems for coupons for tangible items.

Edible, activity, peer attention, escape, and teacher attention coupons were associated with a small increase in problem completion (a total of 28, 63, 21, 14, and 14, respectively). Carl completed a total of seven problems to earn control coupons.

Delay to Reinforcement

During the delay sessions, the high preference coupons (tangible) were exchanged following a 60 min or 300 min delay. Figure 19 shows that Carl
FIGURE 18

Results of Baseline and Reinforcer Assessment for Carl
High Preference = Tangible; Low Preference = Edible, Activity, Peer, Escape and Teacher
FIGURE 19

Results of the Reinforcer Assessment and Delay Sessions for Carl
High Preference = Tangible;
Low Preference = Edible, Activity, Peer, Escape and Teacher

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continued to earn primarily high preference coupons during the no delay sessions. During the 60 min delay sessions, Carl's problem completion for high preference coupons decreased to zero across sessions. However, the number of problems completed to earn low preference coupons gradually increased across sessions. During the final 60 min delay session, Carl completed more problems to earn low preference coupons (56 total) than high preference or control coupons, 0 and 7, respectively.

When the delay to reinforcement was increased to 300 min, Carl selected a greater number of low preference coupons than high preference coupons for the first two sessions. However, the total number of high preference coupons earned increased and the number of low preference coupons earned decreased across sessions. During the final session, Cari earned more high preference coupons than low preference coupons.

The number of problems completed during the baseline sessions in this phase remained low. He completed 12 problems in the first session, 2 in the second, and 12 in the third.

Overall, Carl's reinforcer selection appeared to be influenced by both levels of delay. Given a 60 min delay to reinforcement, Carl discontinued working for high preference coupons and increased the number of low preference coupons selected. A 300 min delay resulted in a decrease in the number of low preference coupons earned and an increase in the number of high preference coupons earned.
DISCUSSION

The identification of variables which affect reinforcer selection and effectiveness is critical when developing a reinforcement based intervention. The purpose of this study was to examine the effects of two variables, increased response requirement and delay to reinforcement, on response allocation and reinforcer selection. The primary research question for both studies was: Does reinforcer selection and response allocation vary, given different levels of response requirement and delay that naturally occur for reinforcement based programs in school settings?

Research examining reinforcer assessment and the role of reinforcers in applied settings has typically viewed reinforcers as fixed entities. However, the reinforcing property of any stimuli is dependent on the context of the environment. Recent studies have examined shifts in preference and response allocation associated with corresponding changes in various dimensions of reinforcement (e.g., effort, delay, quality) (Neef et al., 1992, 1993, 1994; Tustin, 1994). The current studies attempted to further explore the relationship between the dimensions of effort and delay to reinforcement and preference.

In Studies 1 and 2 the relationship between effort and reinforcer choice, and delay and reinforcer choice, respectively, was examined. It was hypothesized that reinforcer preference would change as related to the level of response requirement or delay in one of three ways: First, the response rate for high preference coupons would increase with each increase in response requirement or delay and response rate
for low preference categories would remain unchanged. This pattern would indicate a potent reinforcer for which the other coupons were not substitutable. In behavioral economic terms, this outcome would also suggest that the demand was "inelastic".

Second, it was hypothesized that the response rate for high preference coupons would decrease at some level of increased effort or delay and the response rate would simultaneously increase for low preference coupons. This result would indicate that relative preference between two reinforcers may be directly related to the response requirement associated with each coupon. Also, this would suggest that the low preference coupons were somewhat substitutable for the high preference coupons.

Finally, the third hypothesis was that the response rate for the high preference coupons would decrease at some level of increased effort or delay, but the response rate for low preference coupons would remain unchanged. This pattern would call into question the potency and durability of the high preference coupons and indicate that other coupons were not substitutable. Again, in behavioral economic terms, the decrease in the response rate associated with high preference coupons would suggest "demand elasticity" (Hursh, 1980, 1984; Tustin, 1994). Overall, it was hypothesized that each of the above outcomes would occur for one or more children. Also, the response requirement or delay that optimizes reinforcement would be different for individual students.

Several of the above hypotheses were supported by the results of this study. The data obtained from Josh and Brad support the first hypothesis. Despite increases in the response requirement, both Josh and Brad continued to select primarily high
preference coupons. Brad selected no low preference or control coupons at any level of effort and Josh select only a few at each level. These results support the potency and durability of the high preference reinforcers and lack of substitutability of other reinforcers.

The results indicate that for these two participants, reinforcer preference was not affected by the chosen levels of increased response requirement. However, consideration should be given to the limited number of levels explored. The current levels were somewhat arbitrary and the difference was often small (e.g., 9 v. 13 problems). The use of higher criterion levels was not utilized as it was infeasible within the classroom setting. The average session length for Josh increased from 19.2 min (1.0x) to 27.2 min (2.0x) and for Brad from 11.8 min (1.0x) to 16.8 min (2.0x). Although, it would be expected that response requirements at higher levels would affect reinforcer selection, the present results demonstrate that reinforcer effectiveness was not affected.

The results from Greg support the second hypothesis. At an increased level of effort (Increased Effort-7), problem completion for high preference coupons decreased and completion for low preference and control coupons increased. The results suggest that the low preference coupons and control coupons were substitutable for the high preference coupons at this level of response requirement. At Increased Effort-10, Greg earned only low preference coupons. This provides further support for the substitutability of the low preference coupons.
The results obtained from Alan support the third hypothesis, as reinforcer selection was influenced by increases in the level of required effort. At the highest level of effort (2.0x) Alan chose not to complete any math problems to earn token coupons. Responding was unaffected at the 1.5x level and Alan continued to select only high preference coupons. Alan consistently selected few low preference or control coupons at all levels of effort. The data suggests that the reinforcers identified for Alan lacked durability and potency at increased levels of effort.

Several of the above hypotheses were also supported by the results of Study 2. Support for the first and second hypotheses are evident in Carl’s data. At the 60 min delay level, responding for high preference coupons rapidly decreased to zero and responding for low preference coupons gradually increased. This indicated substitutability among the coupons. However, at the 300 min delay, responding for the high preference coupons increased and responding for low preference coupons decreased. These results suggest a lower level of substitutability at this level of delay.

The results obtained for Mary support the second hypothesis, that is, as the level of responding decreased for high preference coupons with 24 hr delay, while responding increased for low preference and control coupons. Mary’s reinforcer choices were not affected by the initial levels of delay, 60 min and 300 min. When the delay was increased to 24 hr, her selection of control and low preference coupons increased, however, selection of high preference coupons decreased somewhat. The second hypothesis was also supported by the results obtained for Matt. At all levels...
of delay, Matt continued to work for high preference coupons. At the 24 hr level of delay, Matt consistently chose an increased number of control coupons. Matt's selection of high preference coupons decreased during the 24 hr sessions when compared to no delay sessions.

Support for the third hypothesis is found in Jeff's results. Jeff's problem completion rate decreased to near zero levels for the 60 min sessions and to zero during the 300 min delay sessions. He selected few low preference and control coupons during delay sessions. Jeff continued to earn a high number of preferred coupons during the no delay sessions.

The results for Carl, Mary, Matt and Jeff indicate demand elasticity and the substitutability of low preference and/or control coupons as the level of delay was increased. The results suggest that reinforcer preference is affected by the amount of delay to reinforcement and that the specific values that effect preference may be idiosyncratic.

It was also hypothesized that the response requirement which optimizes reinforcement effects would be different for individual students. The results of Study 1 support this hypothesis. For each participant, the effort levels at which problem completion remained high, were determined. Alan continued to work for high preference coupons at the 1.5x level and both Josh and Brad continued to work at the 2.0x level. However, Greg earned high preference coupons only when the level of effort was equal for all coupons. The findings indicate that reinforcer effectiveness
can be sensitive to naturally occurring variations in response effort and that an optimal level of increased effort can be determined on an individual basis.

The results of Study 2 also support the hypothesis that a level of delay which optimizes reinforcement could be determined for each individual. For each participant the longest level of delay, at which problem completion remained high, was determined. Mary and Matt continued to complete the majority of problems for high preference coupons at all levels of increased delay. Jeff's problem completion level remained high only during the no delay sessions. The results for Carl indicated that high preference coupons were earned at the no delay and 300 min delay levels, but not at the 60 min delay level. The data indicate that an optimal level of delay can be objectively determined for individual students.

In summary, the results of these studies suggest that levels of both effort and delay that might be expected to naturally occur in the classroom can influence reinforcer selection. The obtained results revealed highly idiosyncratic responding to the different levels of the independent variables. Although some participants shared similar ages, gender and referring problems, few commonalities were discovered among individual patterns of responding. It is well known that there are large individual differences in the results of reinforcer assessments, presumably due to individual learning histories. Thus, it may not be unexpected that there would also be individual differences in response to various reinforcement parameters.
These findings provide further support for the necessity of tailoring behavioral interventions to the individual child. Clearly, effort and delay must be considered when designing or modifying an intervention. Individual responses to manipulations of these variables must be monitored in order to maintain the effectiveness of the intervention. The combined results from both studies suggest that some children may be less sensitive to changes in the response requirement or delay than other children. A lack of attention to variables such as effort and delay could contribute to treatment failure.

The results of this study extend previous research in several ways. First, this study further examines the interaction between delay and effort and reinforcer selection. For several participants, the added dimension of increased delay and effort resulted in a shift in reinforcer preference. Specifically, low preference reinforcers were selected more frequently when the level of delay or effort for high preference reinforcers was increased.

Additional evidence of the significant influence delay and effort have on response allocation is also provided. For several participants, at various levels of increased delay or effort, overall responding decreased substantially or ceased completely. Conversely, some participants' level of responding increased as the level of effort was increased.

Both the demonstrated changes in preference and response allocation have serious implications for the development of interventions. Randomly determining
when a reinforcer will be delivered or the criterion level of effort may lead to mediocre results at best. Systematic selection and monitoring of these variables will lead to more effective behavioral programs.

This study extends the research conducted by Northup et al. (1996) by further demonstrating the utility of a token coupon reinforcer assessment within the classroom setting. The reinforcer assessment method consistently identified durable reinforcers with a high degree of accuracy. The accuracy with which the RPS identified high preference categories was only 54.7% as compared to the results of the reinforcer assessment. Students frequently rated multiple categories as high preference and few as low preference. These results are consistent with those obtained by Northup et al.

The division of the social attention category into two new categories, peer attention and teacher attention, should also be noted. Interestingly, the teacher attention category was not identified as a preferred category in either study. However, peer attention was identified by five of the eight participants as a reinforcer. These results appear to support the division of this category.

Study Limitations

There are several limitations to these studies which should be considered. First, the method for varying effort (i.e., increasing the criteria) in Study 1 creates a potential confound between effort and delay. In the increased response requirement sessions, if a child chose to work for preferred coupons, he would have to complete
a greater number of total problems per coupon. The number of problems completed per session was associated with an increase in the session length. For this study, children were allowed to exchange coupons immediately following each session. Thus, completing a greater number of problems resulted in a longer period of time between obtaining the coupon and receiving the backup reinforcer.

Future studies could address this problem in a number of ways. Assessment sessions could be limited by time rather than number of coupons. However, this might limit the quantity of coupons earned during increased response requirement sessions. Another alternative would be to allow students to exchange each coupon immediately after they were earned. A limitation would be that time-based items would be restricted and therefore may not be as reinforcing. Also, the use of a token coupon system in the applied setting generally involves a specified period during which multiple coupons or tokens are exchanged.

Another limitation of this study was the possibility of satiation. Participants often earned large numbers of stimulus items every day. Each coupon was limited to a maximum of three stimulus items each. Given the large number of sessions conducted, a child might become satiated with certain stimulus items and consequently certain coupons. Thus, decreases in the selection of high preference coupons may be due in part to satiation rather than the manipulations of the independent variable. Providing a wider range of stimulus items may help to ameliorate this problem in future studies.
A third limitation of this study exists in the reinforcer assessment procedures. The assessment procedures for this study were changed from those used by Northup et al. (1996). One of the primary differences was that the total number of coupons available each session was limited to fifteen. Also, the attention category was divided into two categories: peer attention and teacher attention. Reinforcer assessment data revealed multiple preferred categories for all participants. The selection of several coupon types resulted in a lower total problem completion for each category. Comparisons of any one preferred coupon to the baseline levels of responding often resulted in the failure to identify a single token coupon as a reinforcer. For example, if a participant consistently selected five edible, tangible, and escape coupons, his completion rate for any one coupon would be equal to the baseline average.

To resolve this problem, high preference coupons were selected by comparing problem completion rates among coupon types. The assessment data was presented by combining the high preference coupons and combining the low preference coupons into two categories. By combining coupons an increase in total problem completion from baseline was more clearly delineated. However, it might be expected that most children (and adults) would be responsive to multiple types of reinforcement. This may be considered as more adaptive than a narrow responsiveness to a single type. Having multiple coupons available might also increase reinforcer effectiveness by adding greater variety.

Several procedural limitations should be discussed. First, the time required to complete the sessions and to provide reinforcers was often highly time consuming.
For several participants, the average session length was between 15 and 20 minutes. The exchanging of coupons and the delivery of reinforcers often lasted an additional 20 minutes. Thus, a student might be involved in the session for a total of 35 to 40 minutes. Following the session the experimenter assisted the student to complete any assignments that were missed.

Another procedural problem that was encountered was determining how to deliver reinforcers in an unobtrusive manner. Coupons were cashed in at a back table and the classroom teacher effectively directed the attention of the students to their work while sessions were being conducted. However, other students in the classroom frequently asked the experimenter if they could earn coupons at a later time. Also, the participant often received a great deal of attention from classmates after earning edible or tangible reinforcers.

Future Directions

This study provides a preliminary examination of the roles of effort and delay on reinforcer selection at levels that are highly likely to occur in many classroom-based reinforcement programs. The results demonstrated that more careful consideration of these variables when developing reinforcement based interventions is necessary. Thus, future research could continue to examine the effects of effort and delay on reinforcer selection and potency. Also, replication of the current studies with additional participants would provide further information on individual responses to manipulations of these two variables.
One area for future research would be to examine the interaction between effort and delay as it affects reinforcer choice. Would a student be willing to work harder if the reward was presented immediately rather than after a period of delay? Neef et al. (1993) provided evidence that response allocation is moderated by a combination of the dimensions of reinforcement, such as, quality, delay, and effort. This study might be extended by examining the interaction between effort and delay within the classroom setting and by utilizing the student's actual curriculum. The design and implementation of classroom based interventions requires examination of all variables that may impact overall effectiveness. Further exploration of the combined effects of these and other potent variables may provide valuable information for the design of interventions.

The students in the preceding two studies were referred by parents or teachers due to behavior problems in the classroom. A variety of behavior problems were reported including, aggression, impulsivity, inattention, and failure to complete assignments. The severity of the inappropriate behaviors also varied significantly between children. Future research may examine whether any commonalities exist in the responding of children with similar behavior problems. For example, delay to reinforcement may greatly influence response allocation for children who lack impulse control. Also, how medication (e.g., Ritalin) might mediate the effects of delay or response requirement would be of considerable interest for many children.

Several studies have examined the influence of other variables on reinforcement, such as variation and quality (Egel, 1981; Neef, 1992). These factors
must also be considered when developing reinforcement-based interventions. It is necessary to determine how these variables affect reinforcer selection and effectiveness. For example, the utility and stability of categories of reinforcement may be examined by varying the stimulus items available within a category. Also, the interaction between reinforcer quality and other factors (e.g., delay, effort) should be further explored.

Finally, there is a need for practical and accurate methods that can account for the most influential factors that mediate reinforcer effects on an individual basis. Currently, it appears that further basic studies are needed to more clearly define the role of mediating factors such as, quality and variation, in applied settings. Ultimately, more efficient methods based on verbal and self-report measures might be developed.
REFERENCES


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APPENDIX A

PARENT CONSENT FORM

Louisiana State University - Baton Rouge Campus

1. Study Title: An examination of the effects of increased response requirement and delay on reinforcer selection.

2. Performance Sites: Primary schools in Assumption Parish: Napoleonville Primary, Labadieville Primary, Belle Rose Primary, Pierre Part Primary, and Bayou L' Ours Primary. Sessions will be conducted within the child's classroom.

3. Investigators: The following investigators are available for questions at the phone numbers listed below.

   Name: Terri George, MA
   Position: School Psychology Intern
   Employer: Assumption General Community Services
   Day Phone: 369-4274
   Ev. Phone: 763-9964

   Name: John Northup, PhD
   Department: Psychology
   Phone: 388-8745

4. Purpose of the Study: To accurately identify potent reinforcers for individual students and to examine the effect of delay and effort on reinforcer choice.
5. **Participant Inclusion:** This study includes students who are exhibiting behavior problems in the classroom.

6. **Participant Exclusion:** Participants will be excluded who are younger than five or older than 12 and who are not enrolled in school.

7. **Description of the Study:** As a participant in this project, you will be asked to complete two questionnaires and participate in an interview. Classroom observations of your child will be conducted while your child completes academic tasks with the experimenter. Sessions will last approximately twenty minutes a day, 1-3 days a week. Your child will have the opportunity to earn a variety of reinforcers (e.g., food, stickers, activity time, etc.) in exchange for completing academic work. Your child's involvement in this project may last up to eight weeks.

8. **Benefits:** Reinforcers will be identified which may be useful in developing strategies to help your child in school. This information will be communicated to the classroom teacher, in order to develop more effective behavior management strategies.

9. **Risks:** The only identified risk to the child is the possibility of being isolated from classmates during the brief sessions. Any scheduled classroom work missed during this period will be completed with the assistance of the experimenter on an individual basis.

10. **Right to Refuse:** Participation in this project is voluntary. Parents or guardians have the right to withdraw their child from this project at any time. They may do so by contacting the experimenters named above.
11. **Privacy:** The results of the study may be published. The privacy of participants will be protected and the identity of participants will not be revealed. Your child's name will not be placed on any materials or records and all information will be coded. All information will be stored in a locked file cabinet.

12. **Release of Information:** Your child's teacher will be provided with information regarding identified reinforcers at your request.

13. **Financial Information:** There will be no cost for participation in this study.

14. **Signatures:**

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to the investigators listed above. I understand that if I have questions about subject rights, or other concerns, I can contact the Vice Chancellor of the LSU Office of Research and Economic Development at 388-5833. I agree with the terms above and acknowledge I have been given a copy of the consent form.

________________________________________
Signature of Custodial Parent/Legal Guardian  Date

________________________________________
Signature of Child  Date

________________________________________
Investigator(s)  Date

________________________________________
Witness  Date

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APPENDIX B

TEACHER CONSENT FORM

Louisiana State University - Baton Rouge Campus

1. Study Title: An examination of the effects of increased response requirement and delay on reinforcer selection.

2. Performance Sites: Primary schools in Assumption Parish: Napoleonville Primary, Labadieville Primary, Belle Rose Primary, Pierre Part Primary, and Bayou L' Ourse Primary. Sessions will be conducted within the child's classroom.

3. Investigators: The following investigators are available for questions at the phone numbers listed below.

   Name: Terri George, MA  
   Position: School Psychology Intern  
   Employer: Assumption General Community Services  
   Day Phone: 369-4274  
   Ev. Phone: 763-9964

   Name: John Northup, PhD  
   Department: Psychology  
   Phone: 388-8745

4. Purpose of the Study: To accurately identify potent reinforcers for individual students and to examine the effect of delay and effort on reinforcer choice.

5. Participant Inclusion: This study includes students who are exhibiting behavior problems in the classroom.

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6. Participant Exclusion: Participants will be excluded who are younger than five or older than 12 and who are not enrolled in school.

7. Description of the Study: As a participant in this project, you will be asked to identify a student(s) who is exhibiting behavior problems in the classroom. Once parental consent is obtained through a parent meeting, you will be asked to provide information as to the feasibility of various reinforcers in your classroom, complete two questionnaires about the identified student, and participate in a meeting with the experimenter. In addition, you will be asked to allow the student to participate in a twenty minute academic session with the experimenter, 3-5 days a week. During these sessions the student can earn a variety of reinforcers (e.g., food, stickers, activity time, etc.) which will be provided by the experimenter. Your student's involvement in this project may last up to eight weeks.

8. Benefits: Reinforcers will be identified which may be useful in developing strategies to help your child in school. This information will be communicated to you, with parental consent, in order to develop more effective behavior management strategies.

9. Risks: The only identified risk to the child is the possibility of being isolated from classmates during the brief sessions. Any scheduled classroom work missed during this period will be completed with the assistance of the experimenter on an individual basis.

10. Right to Refuse: Participation in this project is voluntary. You have the right to withdraw from this project at anytime. Additionally, parents or guardians also have the right to withdraw their child from this
You may do so by contacting the experimenters named above.

11. Privacy: The results of the study may be published. The privacy of participants will be protected and the identity of participants will not be revealed. Your child's name will not be placed on any materials or records and all information will be coded. All information will be stored in a locked file cabinet.

12. Release of Information: You will be provided with information concerning those reinforcers identified for the referred student/participant upon parental request and consent.

13. Financial Information: There will be no cost for participation in this study.

14. Signatures:

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to the investigators listed above. I understand that if I have questions about subject rights, or other concerns, I can contact the Vice Chancellor of the LSU Office of Research and Economic Development at 388-5833. I agree with the terms above and acknowledge I have been given a copy of the consent form.

________________________________________________________________________

Signature of Teacher Date

________________________________________________________________________

Investigator(s) Date

________________________________________________________________________

Witness Date
APPENDIX C

ACCURACY SUMMARY TABLE

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Reinforcer Assessment</th>
<th>Increased Response Requirement / Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brad</td>
<td>95.5%</td>
<td>97.8%</td>
<td>93.8%</td>
</tr>
<tr>
<td>Greg</td>
<td>N/A*</td>
<td>99.3%</td>
<td>99.3%</td>
</tr>
<tr>
<td>Alan</td>
<td>N/A*</td>
<td>100%</td>
<td>99.5%</td>
</tr>
<tr>
<td>Josh</td>
<td>100%</td>
<td>99.2%</td>
<td>99.2%</td>
</tr>
<tr>
<td>Mary</td>
<td>94.5%</td>
<td>90.0%</td>
<td>91.7%</td>
</tr>
<tr>
<td>Matt</td>
<td>91.6%</td>
<td>97.0%</td>
<td>97.3%</td>
</tr>
<tr>
<td>Jeff</td>
<td>98.6%</td>
<td>99.5%</td>
<td>98.4%</td>
</tr>
<tr>
<td>Carl</td>
<td>99.4%</td>
<td>91.6%</td>
<td>90.2%</td>
</tr>
</tbody>
</table>

*No problems were completed during this baseline phase.*
APPENDIX D

REINFORCER PREFERENCE SURVEY

"Boys and girls like to get good things. I am going to name things that kids sometimes get in school. I want to know how much you like each of these things. After I name each thing, you tell me if you like it "not at all", "a little", or "a lot". For example, if I say "Going to the supermarket" you might say you like it "not at all", but if I say "Going to you favorite movie", you might say you like it "a lot."

<table>
<thead>
<tr>
<th>Item</th>
<th>Not at all</th>
<th>Just a little</th>
<th>A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gum</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. Help a friend with schoolwork</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Art projects</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. Certificates, awards</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. Teacher says, &quot;Good job, I like that&quot;</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. Get out of math</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. Nuts</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. Spend time with a friend at school</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9. Help the teacher</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. Stickers, stars</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11. Teacher says, &quot;You're really paying attention&quot;</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12. Put your feet up and relax</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13. Juice, drinks</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14. Friend says, &quot;Good job, I like that&quot;</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15. Read a book</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16. Pencils or pens</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17. Teacher says, &quot;That's right, that's correct&quot;</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18. Get out of classroom</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19. Pretzels, chips</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20. Friend pats you on the back/hugs you</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Run/jump/dance</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>Pennies</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>Teacher says, &quot;I'm going to let your parents</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>know you're doing a great job</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Get out of reading</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>Cookies</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Play a game with a friend</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>Play a computer game</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>Crayons or markers</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>Teacher pats you on the back/hugs you</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>Get out of sitting in your seat</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>Popcorn</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>32</td>
<td>Talk with a friend at school</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>33</td>
<td>Free time in library</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>34</td>
<td>File folder/pocket folder</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>35</td>
<td>Time with favorite teacher at school</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>Get out of snack time</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>Candy (M&amp;M's, Snickers)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>Friend says &quot;You're really doing a good job&quot;</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>Play with toys (legos, dinosaurs, Barbie)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>Erasers</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>Teacher helps you with your work</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>42</td>
<td>Get out of school activity</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Which of these is your favorite?

Is there anything else you would like?

How much do you like that?
SCORING

Edibles (Sum items 1, 7, 13, 19, 25, 31, 37) /14 = %

Peers (Sum items 2, 8, 14, 20, 26, 32, 28) /14 = %

Activities (Sum items 3, 9, 15, 21, 27, 33, 39) /14 = %

Tangibles (Sum items 4, 10, 16, 22, 28, 34, 40) /14 = %

Teacher Attention (Sum items 5, 11, 17, 23, 29, 35, 41) /14 = %

Escape (Sum items 6, 12, 18, 24, 30, 36, 42) /14 = %
Teresa L. George was born in Glendale, California on May 3, 1969. She received a Bachelors of Science in Psychology from the University of California at Davis in 1991. She received her Masters of Arts in Psychology from Louisiana State University. She is currently employed as a school psychologist for West Feliciana Parish, Louisiana and resides in Baton Rouge, Louisiana. Her primary research interests include reinforcer assessment methods, school-wide interventions and behavioral consultation.
DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Teresa Lynne George

Major Field: Psychology

Title of Dissertation: An Examination of the Effects of Increased Response Requirement and Delay on Reinforcer Selection

Approved:

[Signatures]

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination: 10/29/96