THE EFFECTS OF PROGRESSIVELY THINNING HIGH-PREFERENCE STIMULUS DELIVERY ON RESPONDING: AN EMPIRICAL ANALYSIS AND HYPOTHETICAL APPLICATION

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ABSTRACT

The effects of progressively thinning high-preference stimulus delivery on responding: An empirical analysis and hypothetical application

Delivering high preference reinforcers in an organization-wide behavior change program is optimal, but may prove difficult. Depending upon the number of employees participating in the program, there may be many high-preference stimuli; these may make it difficult for managers to track and deliver all of the high preference stimuli. The current investigation examined a systematically thinning high preference delivery model using a modified progressive ratio procedure. Mean responding during the first baseline phase was used to determine response requirements for earning stimuli during intervention phases. During each session in the intervention phases each occurrence of a participant completing the mean number of responses found in baseline resulted in a decreasing opportunity to earn $3 worth of a preferred stimulus (and a corresponding increasing chance of earning a low-preference stimulus). By averaging the percentages reached in all intervention sessions a breaking percentage was calculated for each participant. Results indicated that across five participants the mean breaking percentage was 78.24%. The range of percentages reached during individual intervention sessions was 8% to 100%. The number of stimuli required to account for high preferences in the participant group, as well as separate groups of 5, 10, 25, and 40 participants, suggest that the obtained mean breaking percentage would not maintain responding. From the current data set, the random delivery of high-preference stimuli to a group is not recommended.

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CHAPTER 1

INTRODUCTION

Purpose of the Study

Organizations face many barriers to effective operation. While some of these challenges are external (e.g., market forces, consumer demand) and thus not entirely under the control of the control of the organizations, other challenges (e.g., absenteeism, production) can be addressed directly. The behavior of staff members represents an internal organizational variable and is a vital component of an effective organization.

Human service companies are no different from other organizations in that they must contend with challenges presented by staff member behavior. Given that direct care staff conduct a majority of provided care in human services companies, their behavior is vital to an organization's survival. Employees in these settings are tasked with implementing behavior plans, collecting data, passing medications, and conducting many other difficult duties. Many of these staff members come to these jobs with little or no human service experience and often no formal education beyond high school.

Many human service organizations have now adopted Applied Behavior Analysis (ABA) as their treatment philosophy for the individuals they serve. ABA has also been found to be effective in improving the behavior of staff members. By using the techniques unique to ABA (e.g., isolation of independent variables, inductive orientation) techniques have been created to improve many different aspects of staff performance. However, most of this research has been conducted with small groups of employees, and little research has been conducted that confronts the challenges involved with implementing behavior change procedures with large numbers of employees.

One problem associated with a large number of employees participating in a reinforcement program is the varied number of high preference stimuli that would likely be generated by so many different employees; this may make a performance improvement program prohibitive in terms of time and financial costs. Depending upon the rate at which performance must be increased, varied reinforcer delivery may provide an answer.

Significance of Study

This study yielded the percentage break in a group of five participants. This study represents the continuation of a line of research designed to ease the implementation of reinforcement procedures by assessing how thin high preference delivery can become, relative to the delivery of lower preference stimuli, and continue to maintain responding.

Definitions of Terms

baseline: condition during which there are no programmed stimuli delivered to the participant for engaging in the dependent variable over multiple sessions.

breaking percentage: the percentage at which the delivery of a high preference stimulus becomes too thin relative to the delivery of low preference stimuli that the participant declines to engage in the dependent variable.

independent variable integrity: procedure designed to ensure that the data collected on the independent variable are taken with high fidelity. Independent-variable agreement is generally accomplished by having a second independent observer score the implementation of the independent variable and completing a percentage of agreement between the primary and secondary scores.

inter-observer agreement: procedure designed to ensure the data collected on the dependent variable are taken with high fidelity. Inter-observer agreement is generally accomplished by having a second independent observer score the implementation of the independent variable and completing a percentage of agreement between the primary and secondary scores.

intervention phase: condition during which an independent variable is delivered to the participant contingent upon engaging in the dependent variable over multiple sessions. In the current study, completing the mean number of data sheets completed in baseline resulted in a progressively thinning opportunity to obtain a high-preference stimulus.

generalized conditioned reinforcers: A reinforcer that has been paired with many other reinforcers and thus does not depend on any single motivative operation to be present for the stimulus to function as a reinforcer.

preference assessment: procedure designed to identify preferred and non-preferred stimuli for participants. Preference assessments are typically administered to identify potential reinforcers for use in behavior-change programs.

progressive ratios: A schedule of reinforcement where the response requirements to earn a reinforcer increase during a single observation. The requirements for reinforcer delivery increase after obtaining reinforcement in the observation. Typically, the response requirements reset at the start of each observation.

rule-governed behavior: Instructions that act to specify reinforcement and punishment contingencies that will take place in the future. Behavior controlled by rule-

governance, with future contingencies specified ahead of time, may occur without immediate consequences maintaining the behavior.

withdrawal design: a single-subject experimental design that involves using a single participant as a control by alternating between baseline and intervention conditions. In practice, there are a minimum of two baseline and two intervention conditions.

CHAPTER 2

SELECTED LITERATURE REVIEW

Behavior analysis is an inductive, natural science approach to the study of behavior (Michael, 1993). Behavior analysis assumes that the behavior of organisms is the result of both an inherited endowment and a lifetime of environmental influences. Among the products of an organism's phylogenic endowment is the ability to be influenced by the environment. For many organisms this means, among other things, the opportunity for respondent and operant conditioning to occur. Inductive, single-subject research using animals and involving the manipulation of variables has yielded a wide array of information regarding the effects of the environment on organisms.

The behavior analytic approach to studying behavior by isolating independent variables and manipulating them so that the participant serves as her or his own control has yielded many principles of behavior. Applied researchers have used knowledge of these behavioral principles to develop techniques to change human behavior. A fruitful and mutually beneficial area of applied research has developed in response to challenges faced by individuals with developmental disabilities. Individuals with developmental disabilities may exhibit both delays in acquiring adaptive behavior (e.g., social skills, hygiene skills) and an excess in aberrant behavior**s** that place them and others in danger (e.g., aggression, self-injury, pica).

Behavior analysis has successfully developed strategies to overcome many deficits including, for example, delays in communication (Simic, & Bucher, 1980), and social skills (Gaylord-Ross, Haring, Breen, & Pitts-Conway, 1984). These techniques are derived from basic research that targeted arbitrary behavior of animals for increase. An

example of these procedures includes shaping. Shaping is defined as the process by which one differentially reinforces successive approximations to a terminal behavior (Cooper, Heron, & Heward, 2007). By delivering a reinforcing stimulus following a behavior that is a first-step toward a target behavior, a practitioner can slowly create the target behavior. As the learner reliably engages in each approximation**,** reinforcement is then withheld until the next step occurs. This procedure has proven very effective in teaching novel behavior. Applied practitioners have become adept at shaping and other procedures to teach meaningful behavior to learners.

Aberrant behavior poses a significant challenge for individuals with and without disabilities. Behaviors such as self-injury and aggression present an immediate risk to the individual and others in the environment. Other maladaptive behavior (e.g., tantrums, excesses in self-stimulation) may present risks to the individual such as strained relations with family members, isolation from the community, and decreased learning opportunities.

Perhaps the greatest recent advancement in the treatment of aberrant behavior is functional analysis. Iwata, Dorsey, Slifer, Bauman, & Richman (1994) demonstrated that by controlling for and systematically varying environmental conditions, the variables maintaining aberrant behavior could be identified. This technology allows practitioners to quickly pinpoint maintaining environmental variables for aberrant behavior and then employ specific techniques to decrease the target behavior. Many of these techniques (e.g., extinction, non-contingent reinforcement) were derived directly from the basic literature.

Techniques to predict and control behavior of social significance have been titled Applied Behavior Analysis (ABA). Cooper, Heron, & Heward (2007) defined applied behavior analysis as follows:

> Applied behavior analysis is the science in which procedures derived from the principles of behavior are systematically applied to improve socially significant behavior to a meaningful degree and to demonstrate experimentally that the procedures employed were responsible for the improvement in behavior (p. 14)

This definition sets ABA apart from other helping professions (e.g., social work). ABA has developed techniques to meaningfully improve the lives of individuals while retaining the defining scientific characteristics of behavior analysis such as determinism, empiricism, and parsimony.

ABA has been widely used to help individuals with disabilities to overcome behavioral challenges. There is even some evidence to suggest that ABA has been applied to developmental disabilities to the exclusion of other populations (Axelrod, McElrath, & Wine, in press). However, ABA has been successful in other populations. For example, Austin and Soeda (2008) demonstrated effective strategies to decrease off-task behavior in a classroom of typically developing children. These techniques extend beyond simple application to other populations. As ABA has grown, the field has produced dedicated researchers and practitioners who have created several sub-disciplines.

Organizational Behavior Management

Among the sub-disciplines of ABA, individuals are conducting research in geriatric populations (behavioral gerontology), effects of drugs on behavior (behavioral

pharmacology) and even in business settings. Behavioral researchers have named the practice of ABA in businesses organizational behavior management (OBM). As a sub-discipline of ABA, OBM procedures and philosophy are imbedded in radical behaviorism. The scientific perspective of behavior is used to develop behavior change procedures in employees.

The beginnings of OBM as a unique field of inquiry using behavior analytic principles can be seen in the early OBM literature. OBM began to develop and apply interventions to employee behavior begining in the early 1970's. These interventions focused on small-scale (i.e., departmental level) interventions designed to improve the performance of a small number of employees (Bucklin, Alvero, Dickinson, Austin, & Jackson, 2000). These interventions often included behavior-change procedures designed to manipulate antecedents and consequences to modify socially significant work-related behaviors. Common interventions to improve performance include task-clarification, feedback, and lottery reinforcement systems (Diener, McGee, & Miguel, 2009). The early pioneers of OBM demonstrated the efficacy of behaviorally derived interventions in a multitude of setings (e.g., industrial firms, mining, and airlines) (Dickinson, 2001).

The field continues to retain these procedures for changing individual behavior or the behavior of small groups of employees; these techniques are now commonly referred to as performance management. OBM has also evolved strategies for organization-wide interventions and organizational-wide safety programs. Behavioral Systems Analysis (BSA) views organizations in terms of several components interacting at several different levels (McGee, 2007).

BSA accounts for variables outside of performance of individual employees. Examples of variables accounted for in BSA include manager management, resource deployment, and organizational philosophy (Diener et al., 2009). BSA practitioners have developed tools that allow them to examine all of the organizational components for their relative impact and potential for improvement. An example of one such assessment tool is the Total Performance System Diagram (Brethower, 1982). By examining all components that may influence companies, BSA practitioners may prescribe interventions to best improve organizations; these interventions may or may not include traditional performance management techniques. OBM has developed effective technologies for work-related behavior, including unique procedures to manage safety-related behavior.

Behavior-based safety (BBS) has been developed to address the unique challenges involved with safety behavior. Injuries to any one employee are relatively rare therefore, employee safety behavior is difficult to maintain over time. Researchers have developed techniques to increase safety behavior of employees that decrease the overall number of injuries in organizations (Hermann, Ibarra, & Hopkins, 2010). The contributions of OBM to business have been substantial, and it has not escaped researchers to employ these techniques to improve employee behavior in human services settings.

OBM in Human Services

OBM has impacted human services in many facets, starting with developing technology to assist in better knowledge acquisition in employees. Ivancic, Reid, Iwata, Faw, and Page, (1981) demonstrated a combination in-service and feedback interventions to teach appropriate interactions to direct-care staff members. The intervention package

was effective in teaching new skills, and the results maintained even when the experimenter feedback was decreased from 47% of trials to 19% of trials. Fleming and Sulzer-Azaroff (1992) demonstrated a similar package using peers to deliver the feedback. This procedure included a return to baseline after the initial in-service component. The results of the in-service component indicated that this component alone was not effective in increasing behavior. The peer feedback component that followed the in-service was effective for four of the six participants.

The two aforementioned studies are representative of a larger group of studies that, as characterized by Harchik and Campbell (1998), demonstrated the effectiveness of feedback during on-going performance, the inefficiency of pre-training (in-service) alone, and mixed results with peer feedback. This work has demonstrated effective teaching strategies and calls into question common pre-service only practices.

As important as teaching new skills is to organizations, techniques must also be used to ensure that the skills learned maintain over time. Parsons and Reid (1995) noted the importance of on-going feedback to maintain responding and concluded that supervisors are in position to provide such feedback on an on-going basis. An examination of 10 supervisors indicated a wide degree of variation in teaching and proper feedback techniques. An in-service and continuing feedback intervention was effective in increasing performance of supervisors ability to deliver feedback, which in turn improved performance of direct-care staff members. Green, Rollyson, Passante, and Reid (2002) demonstrated that supervisors benefit from on-going performance feedback as well. A traditional management approach (i.e., distributing policy memos, reviewing papers completed by supervisors, and conducting a weekly observation without feedback) was

compared to an empirically based immediate feedback procedure. The dependent variable in question was supervisors' ability to deliver corrective feedback to direct-care staff members while they were working with consumers. The traditional management program was not effective in maintaining supervisors' performance over time, but the immediate feedback condition maintained high levels of responding over several weeks.

This research demonstrates that even exemplary staff members who are promoted to supervisory positions may need to be trained in how to deliver feedback. Additionally, supervisors are subject to the same principles of behavior as direct-care staff and require feedback to maintain behavior. Effective feedback based upon behavior analytic concepts of consequences (reinforcement for appropriate behavior) and antecedent interventions (corrective prompts for future behavior) have proven effective in teaching and maintaining staff behavior.

While effective teaching and maintenance strategies have been developed for staff and supervisors, OBM has roots in solving problematic behavior of employees. An often-noted problem for organizations is absenteeism. Using a multiple baseline design across six working shifts Reid, Schuh-Wear, & Brannon, 1978 demonstrated that by offering the opportunity to re-arrange shift schedules as a group contingency, absenteeism rates could be reduced across all shifts. Absenteeism represents a deficit of behavior (i.e., arriving to work by a specified time) that can be targeted for increase. OBM has a long history in correcting performance problems that involve both increasing required behavior (Slowiak, Madden, & Mathews, 2005), and decreasing excesses of employee behavior (Berger, & Ludwig, 2007). While the ability for OBM to change behavior is significant, the contributions of OBM to human services extend beyond behavior change.

OBM techniques have allowed for investigations into areas of social significance that have not typically been analyzed in behavior analysis; one such area of investigation is employee satisfaction. Employee satisfaction is a somewhat difficult topic to quantify and study but nevertheless may be of high importance in applied settings. Green, Reid, Passante, and Canipe (2008) demonstrated that by having four supervisors rank various duties involved in their job descriptions**,** the authors could identify low-preference activities. Moreover, by removing elements of the task identified as aversive (i.e., frequent interruptions), and adding pleasant stimuli available during the task (i.e., water, snacks), the supervisors ranked the tasks as more enjoyable. The authors demonstrated an innovative technique to increase the satisfaction of supervisors. Similar research has been conducted with direct care staff.

Reid and Parsons (1996) provided an analysis of intervention satisfaction in employees. The authors compared both immediate and delayed forms of feedback and measured both employee satisfaction and preference for the intervention. While both immediate and delayed performance feedback provided similar levels of behavior change, most employees selected immediate feedback as the more desired form of intervention. This study has implications both for the acceptability of OBM interventions and the job satisfaction of employees. By developing interventions that are both effective and appreciated by staff members, OBM practitioners may improve both performance and job satisfaction of employees. These studies represent effective interventions for various problems encountered in human services. Recent research has begun to investigate more specific aspects of the intervention process.

Identifying Preferred Stimuli

Work in identifying stimuli that function as reinforcers has yielded a large literature base (e.g., Cook & Dixon, 2005; Fisher, Iwata & Mazuleski, 1997; Barton, Brulle, & Repp, 1986). Most of the literature has yielded assessments that do not require vocal responding (i.e., most procedures utilize selection or time spent engaging in task as dependent variables for preference). Few studies have examined adding verbal components to preference assessments. In a series of studies Northup and colleagues demonstrated that children with verbal repertoires were able to identify stimuli that function as reinforcers without the rigorous non-vocal methods found in the developmental disabilities literature (Northup, Jones, Broussard, & George, 1995; Northup, George, Jones, Broussard, & Vollmer, 1996). Among the methods tested by Northup and colleagues was a verbal forced-choice procedure based on the developmental-disabilities literature. This assessment requires participants to select one of two items repeatedly as each item is paired with every other item. The forced-choice procedure was found to be strongly correlated with a more systematic assessment as IQs of participants approached average scores (Cohen-Almeida, Graff, & Ahearn, 2000). Surprisingly, despite a number of non-vocal and vocal options available, only recently has research been conducted to assist in identifying reinforcers for staff members.

Wilder, Therrein, and Wine (2005) examined the degree to which two assessments could predict reinforcers in three administrative-assistant participants. The two assessments were a verbal forced-choice procedure adopted from the clinical literature and a survey method suggested by an OBM textbook (Daniels & Daniels, 2004). After both assessments were delivered to the participants, a reinforcer assessment

consisting of typical office tasks revealed that the survey method was more accurate at predicting the reinforcers than the forced-choice procedure.

Waldvogel and Dixon (2008) compared a multiple stimulus without replacement (MSWO) and a stimulus ranking procedure. The researchers assessed the same stimuli using the different procedures. The two assessments yielded different preference hierarchies; however, there was no follow-up reinforcer assessment to demonstrate which procedure produced the more accurate preference hierarchy.

Wine, Hantula, and Reis (2011) evaluated the ability of several preference assessments found in the OBM literature to predict reinforcers from an array of 9 stimuli. The authors evaluated the stimuli using the survey method found to be effective Wilder, et al. (2005) and an MSWO and ranking procedure used in Waldvogel and Dixon (2008). Participants completed a job task to gain access to the high preference stimuli identified by the assessments. All identified stimuli functioned as reinforcers, but the survey method identified several stimuli as reinforcers that the other assessments failed to nominate. Taken together the OBM literature suggests that the survey method is currently the most accurate reinforcer assessment.

Underscoring the need for reinforcer identification research, Wilder, Rost, and McMahon (2007) examined the degree to which managers could predict what their employees would find valuable. If managers could predict what their employees would want to work for, then preference assessments may not be necessary. A preference assessment was given to managers with the instructions to fill out the surveys for each staff member working under them (i.e., predict what employees would be willing to work for). The employees were then given preference assessments containing the same stimuli

evaluated by their supervisors. Comparisons between the manager generated and employee generated surveys revealed that managers could select the highest ranking stimulus for 15 out of 27 employees, but were far less accurate in predicting the ranks of the other items assessed. In a follow-up study, these results were replicated in a group of 100 employees and 15 managers (Wilder, Harris, Casella, Wine, & Postma, 2011). Correlations between manager predicted preferences and actual employee preferences ranged from -.6 and 1.0 with a mean of .25. These studies suggest that managers have difficulty predicting what their employees will find reinforcing. This research also suggests that the practitioners would do well to consider the use of preference assessments in behavior change plans that include a reinforcer delivery component. Recently, researchers using progressive ratio procedures have more closely examined preference assessment methodology.

Progressive Ratios

Some researchers have demonstrated that stimuli ranked as lower preference may still function as reinforcers (Roscoe et al, 1999). It is possible that some preference assessments may produce false negatives due to high preference reinforcers overshadowing lower preferred, but still reinforcing, stimuli. Progressive ratio procedures, wherein the responding requirements to obtain reinforcers are systematically increased until the participant stops responding, may prove useful in examining the relative reinforcing capabilities of stimuli. The utility of progressive ratios may be realized when high preference stimuli are not practical, appropriate, readily available, or financially feasible. In these occasions delivering lower ranked, but still reinforcing stimuli may be a necessity.

Although derived from the basic operant research progressive ratios have proven useful in human populations. In suggesting the utility of progressive ratios in human populations that typically thrive in open-economies (reinforcement is available outside of experiment sessions), as opposed to animals that are housed in closed-economies (reinforcement is only available during experiment sessions) Hodos and Kalman (1963) found that the final number of responses in progressive ratios was largely unaffected by closed or open economies. Several examples of the utility of low preference stimuli can be found in the literature. Penrod, Wallace, and Dyer (2008) demonstrated that while a high preference stimulus (as identified via formal preference assessments) produced higher break points (defined as the point at which increasing schedules halt responding) than a lower preference stimulus for three of four participants, one participant demonstrated similar break points for both high- and low-preference stimuli.

Francisco, Borrero, and Sy (2008) demonstrated that for two of three participants, low preference stimuli produced a reinforcing effect. In a subsequent experiment using the two participants whose low preference stimuli functioned as reinforcers, a progressive ratio procedure was used to evaluate the low preference stimuli. The researchers demonstrated that the low preference stimuli maintained their reinforcing capacity under increasing schedule requirements.

Progressive ratio procedures have proven to be a useful procedure to elucidate the reinforcing effects of various stimuli. As DeLeon, Frank, Gregory, and Allman (2009) point out, results from independent progressive ratios may transfer to practice more readily than highly sensitive concurrent operants designs. As the authors note, a caregiver rarely offers two tasks simultaneously with each task delivering its own stimulus. As long

as a stimulus is at least somewhat effective as a reinforcer, it may be effective in natural environments that require singular, specific responding (e.g., academic tasks) to gain access to reinforcers. Since the sensitivity of progressive ratios has been demonstrated by several researchers, a modified form of progressive ratio, in this case a progressively thinning rate of high preference reinforcer delivery contingent upon responding, will be used in the current study.

Delivering Preferred Stimuli

While the assessment of preferred stimuli in OBM is beginning to build a research foundation, one other area that has received little attention is the subsequent delivery of stimuli to employees after reinforcer identification. An organization-wide reinforcement program may encounter difficulties when attempting to account for the preferences of, and deliver high preference stimuli to, all employees. This may be especially true in larger organizations with many employees. A possible solution may lie in delivering varied reinforcers.

The utility of varied reinforcer delivery has been demonstrated in clinical populations. Egel (1980) examined the effects of varied versus constant edible stimuli. When reinforcers were varied and presented contingent upon performance, there was a decrease in inter-response time—indicating an increase in rate of responding—greater than that of single constant reinforcer delivery.

While Egel (1980) examined the benefits of varied reinforcement, the dependent variable was an arbitrary task—lever pressing. In a follow-up study Egel (1981) examined variable reinforcer presentation in a classroom setting using children with developmental disabilities as participants and curriculum objectives as dependent

variables. Egel (1981) affirmed the utility of varied reinforcers by demonstrating that three randomly delivered stimuli maintained responding for over 16 trials. When the same three stimuli were presented individually, they lost their reinforcing effect in less than 10 trials. Both Egel (1980) and Egel (1981) suggest that varying stimuli when programming reinforcers prevents satiation and may enhance reinforcement programs. More recent research has expanded this literature by examining the effects of varying low preference stimuli on responding.

Bowman, Piazza, Fisher, Hagopian, and Kogan (1997) investigated the effects of varying several moderately preferred stimuli on responding when compared to the delivery of a single high-preference stimulus. The results indicated that in young children with developmental disabilities four participants maintained responding in the varied lower preference condition similar to that of single high preference delivery. Two participants maintained higher responding in the single delivery high preference condition, and one participant maintained similar levels of responding across both conditions.

Bowman et al. (1997) demonstrated that while varying the delivery of moderate preference stimuli may be effective for most participants, two children still preferred the constant high preference condition. Milo, Mace, and Nevins (2010) found in a similar population, all four participants engaged in higher rates of academic behavior when three preferred stimuli were delivered randomly as opposed to a single delivery format. The researchers also found that when a distracter element—a high preference video—was shown during trials of both constant and varied delivery, the varied

delivery format resulted in higher rates of responding thus proving to be less susceptible to distraction.

Similarly, in an examination of varying stimulus delivery on previously trained and new academic tasks, Najdowski, Wallace, Penrod, & Cleveland (2005) found that randomly delivering three moderately preferred stimuli increased responding comparably to constant delivery of high preference stimuli. Overall, variable stimulus delivery appears to have utility in clinical populations (Egel, 1980; Egel 1982; Milo, Mace, & Nevins, 2010). More research is needed to elucidate variables affecting why a minority of participants prefer constant high-preference stimuli presentation (Bowman, et al, 1997). So far, only one such variable has been identified.

Koehler, Iwata, Roscoe, Rolider, and Cleveland (2005) reported that only one of three participants demonstrated a moderate increase in responding when presented with non-preferred stimuli (stimuli not approached at all in preference assessments). These results suggest that if randomly delivered stimuli are to be used in a reinforcement program, they should have at least some relative reinforcing value. While different methods were used across studies it is possible that the two participants in Bowman et al (1997) may not have preferred to work in the varied low preference conditions because these stimuli were not low preference but rather, possessed no reinforcing potential.

Only one study has thus far examined varied reinforcer delivery in organizational settings. Wine and Wilder (2009) examined the effects of varied reinforcer delivery in two university employees. In a multielement design both participants were first exposed to a baseline condition during which their work—a simulated work task involving

completing checks on a computer program—produced no programmed reinforcement. During the intervention several different conditions were implemented. A control condition was implemented that produced a low value 3x5 card, a low preference condition was implemented that produced an identified low-preference stimulus for work completion; a medium-preference condition was implemented that produced an identified medium preference stimulus for work completion; and a high-preference condition was implemented that produced an identified high preference stimulus for work completion. Lastly, a varied condition was implemented that randomly produced the high, medium, or low preference stimuli for completing work—the participant was informed of the random condition prior to beginning work, but was not informed what she earned until after the completion of the session.

The authors found that the varied condition produced responding similar to that of the constant medium-preference condition. This study suggested that the use of varied reinforcers was effective in increasing performance, albeit below the rate at which work was promoted by the delivery of a high preference stimulus.

The current study extended Wine and Wilder (2009) in two key ways. First, several participants participated in a progressively thinning percentage of high preference reinforcement delivery procedure wherein the ratio of high preference stimulus delivery for work was thinned with other stimuli until participants declined to participate. This procedure allowed for an estimate of how thin the delivery of high preference stimuli can become and still maintain responding.

Secondly, preference assessments were delivered to groups of employees to determine how many high preference stimuli are required to account for high-preferences

for each participant. By assessing preferences of groups of participants a discussion of reinforcement procedures was generated where the desired level of performance and the percentage at which employees declined to complete work can be taken into account.

Research Questions

1) At what point in a progressively thinning ratio of high-preference reinforcement delivery will individual employees cease responding? Specifically, what is the mean percentage across several trials of a progressively thinning high-preference stimulus delivery schedule that an individual employee will cease responding?

2) Given the percentages at which employees cease responding, obtained by answering question 1, how can these results be applied to an employee population of 5, 10, 25, and 40 employees?

CHAPTER 3

METHOD

Participants and Setting

Participants for this study were selected from a pool of direct care supervisory staff members working in an adult-residential setting. These participants ranged in age from 27 to 43. Participants varied considerably in culture, ethnicity, and represent male and female genders (see Appendix C). All participants had a minimum of a high-school education. Several participants have some college experience, and two obtained four-year degrees. All but one participant were direct care staff at the current setting prior to being promoted to supervisor. The primary job description of the participants included scheduling and supervising staff member's performance, conducting meetings, and completing staff evaluations. The secondary job description of the participants involved implementing individual habilitation plans, behavior plans, monitoring of service recipients, cooking meals, transporting service recipients, and passing medications.

All data collection was conducted in an office setting. The office was cleared of all distracting materials and was made as sterile as possible during data collection. Data was collected individually, and during data collection only the primary data collector and the participant were present in the office.

Participants in the current study completed data collection after normal working hours. They received no programmed reinforcement aside from items earned according to the procedures outlined herein.

Materials

informed consent form.

This form was provided to all participants prior to data collection. The form provided a brief introduction of the experimenter, a brief description of the study, an assurance of confidentiality, contact information for the experimenter's supervisor, and a statement that the participant may withdrawal at any time without penalty.

reinforcer survey.

Interviewing five staff supervisors not participating in the study generated a list of nine stimuli to be assessed. The supervisors were asked to generate a list of items they would be willing to work for. They were directed to nominate as many items as possible. The lists generated by the staff members were compared and the nine items that appeared most frequently were incorporated into the preference assessments. At a minimum, an item required two staff members to nominate it before it was included in the preference assessment. These interviews nominated 11 stimuli with similar numbers of nominations. Two stimuli were excluded because they were not generalized conditioned reinforcers.

Stimuli included in the current study were generalized conditioned reinforcers, so as to resist satiation during the experiment (e.g., gift certificates to stores). Additionally, all stimuli to be delivered during the reinforcer assessment were in increments of $3 (e.g., $3 gift certificate). In the reinforcer survey, below each of the eight stimuli were the numbers 0 to 4; the survey will provide instructions for the participants to circle a number such that 0 "do not like at all," 1 "like a little" 2 "like a fair amount" 3 "like much" and 4 "like very much."

scenario data collection.

Central to the job position for the participants is to review data collected on behavioral events (i.e., the transcription of aberrant behavior of service recipients into behavioral code on standardized data sheets). During the experiment the data review was modified from what occurs in the natural working environment in that the behavioral scenarios approximated real events and were presented in a Word® document. The task involved reviewing data sheets and an associated written scenario. All data sheets contained one error. The participants had to find and highlight the error in each data sheet. An analog task was used in the current study due to the unpredictability of naturally occurring opportunities to engage in work behavior. Naturally occurring work behavior is largely conditional on unpredictably occurring antecedent stimuli (e.g., to review data their staff have collected on aberrant behavior, a service recipient must first engage in aberrant behavior). All written behavioral scenarios and data sheets were approximately the same length and complexity, and were modeled after scenarios that are likely to occur in the natural environment (see Appendix E). The scenarios were transcribed on to a standardized form (see Appendix F) using standardized abbreviated codes (see Appendix G).

Experimental Design and Data Collection

phase 1.

The primary data collector first met with each participant individually to provide the informed consent. During the first meeting, the participant was shown the data collection scenarios and the data-collection sheets. The primary data collector explained the procedure and asked the participant to correct one data sheet. This section of the

meeting concluded when the participant completed the correction process once independently. Had the participant failed to complete the process correctly, the experimenter would have provided feedback, explained the procedure again, and presented another opportunity to the participant. All participants completed the sample data sheets correctly on the first trial.

At the conclusion of the first meeting**,** the primary data collector delivered the preference-assessment survey. The primary data collector presented the reinforcer survey and provided instructions to rate each of the listed stimuli. Stimuli ranked as ‘0’ were considered low preference stimuli. Stimuli ranked as ‘1’ or ‘2’ were considered medium preference stimuli. Stimuli ranked ‘3’ or ‘4’ were considered high preference.

inter-observer agreement

Inter-observer agreement (IOA) data was collected to ensure the data collected by the primary data collector were accurate. A second independent observer reviewed and recorded the preferences of stimuli for 3 of 5 (60%) of participants’ preference assessments. Both observers designated each stimulus as low preference, medium preference, or high preference. IOA was calculated by dividing the number of stimulus designation agreements by designation agreements plus disagreements multiplied by 100. Agreement between the two observers was 100%

phase 2.

response measurement

A standardized data sheet found in the natural work environment (see Appendix F) was used to collect data on the scenarios (see Appendix E), using standardized

behavioral codes (see appendix G). A single correct response was a data sheet with the error correctly identified and highlighted according to the scenario.

design

A withdrawal design was used in the current study. Each participant was individually exposed to a baseline condition. Following baseline each participant was individually exposed to an intervention condition. Each participant then returned to baseline condition a second time before ending in a second intervention condition. Data were collected in each condition until each participant established a stable rate of responding. No more than three sessions were conducted per day.

baseline

Data collection was conducted individually with each participant and began at the second meeting. During baseline the participants received no programmed stimuli for their work. The participants were provided with instructions to correct as many or as few data sheets as they wish and that they may stop at any point by saying “I’m done.” All baseline sessions continued until the participant declined to correct data sheets. The baseline conditions continued until each participant achieved a stable rate of responding.

intervention

During the intervention phase, participants corrected data sheets for stimuli wherein the delivery of a highly preferred stimulus was systematically thinned. During the intervention, the mean number of sheet corrections completed in baseline was used as the number of sheets required to earn access to one stimulus. For example, if a participant completed an average of 20 sheets across all sessions in the first baseline condition then the participant would earn one stimulus for every 20 sheets completed.

During each session the first earned stimulus was a high preference stimulus. The second stimulus earned was arranged such that there is a 75% chance of earning a high preference stimulus and a 25% chance of earning a low-preference stimulus. The low preference stimulus was randomly determined from the low preference stimuli identified in the stimulus preference assessment. The next stimulus earned was arranged such that there was a 50% chance of earning a high preference stimulus and a 50% chance of earning a low preference stimulus. Each session continued with this arrangement of decreasing the percentage chance of earning a high preference stimulus by adding one low preference stimulus to the total array of stimuli until the participant declined to complete any more data sheets. The decreasing percentage of high-preference stimulus delivery used in the current study was determined randomly given research on progressive ratios indicating no clear effects of step size on breaking ratios (Stafford & Branch, 1998). At the end of each session the primary data collector delivered the earned stimuli if possible.

The percentage chance of being delivered either a high, or low, preference stimulus upon participants reaching a percentage less than 100% was randomly determined before the intervention conditions (see appendix H).

The breaking percentage for each participant was defined as the percentage beyond which the participant no longer completed data sheets. The breaking percentage was calculated by summing all of the last percentages in the intervention conditions that the participants completed work under before declining to complete sheets across all intervention sessions and dividing by the number of sessions.

inter-observer agreement and IV integrity

To ensure the integrity of data collected on the dependent variable, a second independent observer counted the number of data sheets completed on 40% of sessions for each participant. IOA was calculated by dividing the number of agreements (occurrences where the primary and independent sheets count agree) by the number of agreements plus disagreements multiplied by 100. Total agreement between the two observers was 96%.

Independent variable (IV) integrity was collected to ensure that the stimuli scheduled to be delivered during the progressive ratio phase were delivered correctly. A second independent observer recorded the stimuli delivered independently of the primary data collector for 40% of intervention sessions. IV integrity was calculated by dividing the agreements (occurrences where primary and secondary notation of stimulus delivered agree) by the agreements plus disagreements multiplied by 100. Total agreement between the two observers was 100%.

To ensure the accuracy of the sheets corrected, the primary observer reviewed 34% of the data sheets completed by all participants. The participant's corrections on the data sheets were compared to the errors found in the scenario. The primary data collector marked each sheet as either correct (the error highlighted on the data sheets matched the error in the scenario) or incorrect (the error highlighted on the data sheets did no match the error in the scenario, or there was no error highlighted). The accuracy check was calculated by dividing the number of correct sheets by the number of incorrect sheets multiplied by 100. Total accuracy was 97%.

phase 3.

Three groups of participants that did not participate in phase 2 participated in phase 3. The three groups consisted of 5, 10, 25, and 40 members. The group of 40 participants was comprised of the combined 5, 10, and 25 member groups; this measure was taken due to an insufficient number of supervisors. The primary data collector met with participants individually for one meeting. During the meeting the primary data collector first delivered the informed consent. The primary data collector then delivered a preference assessment using the same stimuli delivered in phase 1.

inter-observer agreement

A second independent observer reviewed and recorded the preferences of stimuli for 35% of participants' preference assessments. Both observers designated each stimulus as low preference, medium preference, or high preference. IOA was calculated as in phase 1. Total agreement between the two observers was 100%.

CHAPTER 4

RESULTS

phase 1.

During phase 1 preference assessments were delivered to each of the five participants individually. Stimuli identified for assessment by the nomination included gas gift card, music gift card, convenience store gift card, donut shop gift card, office supplies, fast food gift card, lottery tickets, soda, and cash. Each participant identified both high and low preference item for use in phase 2; if more than one high or low preference item was identified one stimulus was selected at random for use in phase 2.

Participant 1 indicated cash as a high preference stimulus and fast food gift card as a low preference stimulus. Participant 2 indicated music gift cards as a high preference stimulus, and lottery tickets as a low preference stimulus. Participant 3 indicated cash as a high preference stimulus, and office supplies as a low preference stimulus. Participant 4 indicated cash as a high preference stimulus, and office supplies as a low preference stimulus. Participant 5 indicated music gift cards as a high preference stimulus, and soda as a low preference stimulus.

phase 2.

The data for participant 1 are represented in figure 1. In her initial baseline there were several sessions of responding before a precipitous drop. The mean number of sheets corrected in baseline was 10; therefore, during subsequent experimental conditions she was required to correct 10 sheets to earn each item.

When exposed to the first experimental condition the mean number of sheets completed by participant 1 was 12.2. Her level of responding increased above the

baseline mean during the first trial demonstrating possible rule-governance; further corroborating this view, all data points exhibit roughly the same number of sheets corrected plus or minus four sheets. The possibility of rule-governance seems likely given research demonstrating that human behavior can quickly adjust to schedules if rules specify contingencies (Kudadjie-Gyamfi & Rachlin, 2002). This general pattern of responding is present to some degree in all participants.

While responding in the first intervention phase was higher in general than the first baseline phase, there were several overlapping data points between baseline and intervention. When participant 1 was exposed to the second baseline, her data decreased immediately and significantly. All responding in the second baseline remained near 2 data sheets completed. During the final experimental condition responding immediately increased from the second baseline. Responding remained stable around the required 10 sheets with the exception of a dip in the 19th trial. Across all intervention trials Participant 1 reached 100% chance of high stimulus delivery.

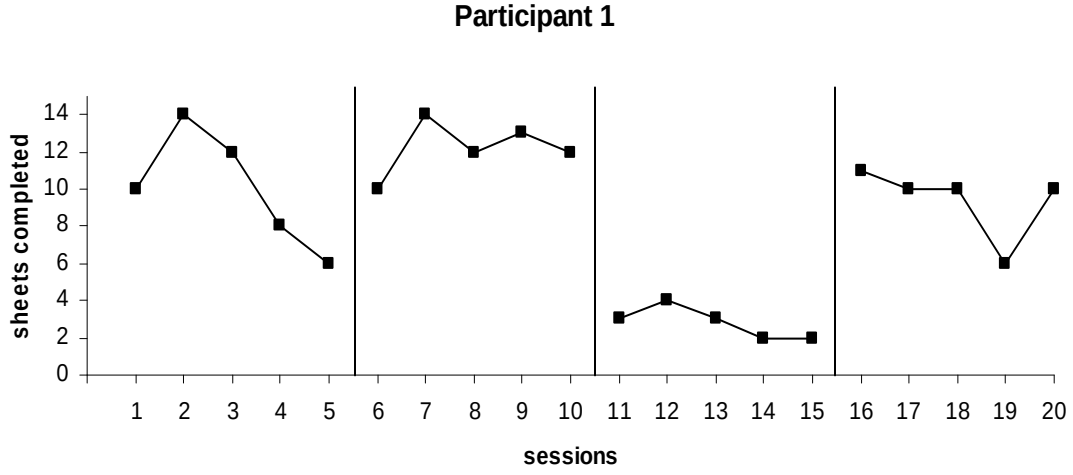

Figure 1

The data for participant 2 are represented in figure 2. The mean responding for the first baseline session was 25 sheets corrected. Baseline was relatively stable over five sessions with a range of 15 to 33. In the following intervention sessions, 25 sheets were required to earn stimuli.

Upon being exposed to the intervention condition, there was an immediate increase beginning with the first session. There was a significant amount of variability in the data beginning with a decreasing trend in the first four sessions before stabilizing. The mean number of data sheets corrected in the first intervention was 48, with a range of 34 to 65.

During the second baseline condition mean levels responding immediately dropped to a mean of 9.2 with very little variation over five sessions. When exposed to the second intervention phase responding immediately increased above levels observed in the second baseline. During the second intervention phase there was very little variation in the data over the five trials with a range of 25 to 34 sheets. The mean percentage reached for reinforcer delivery was 92.9%. The range of earned percentages was 100% to 75%.

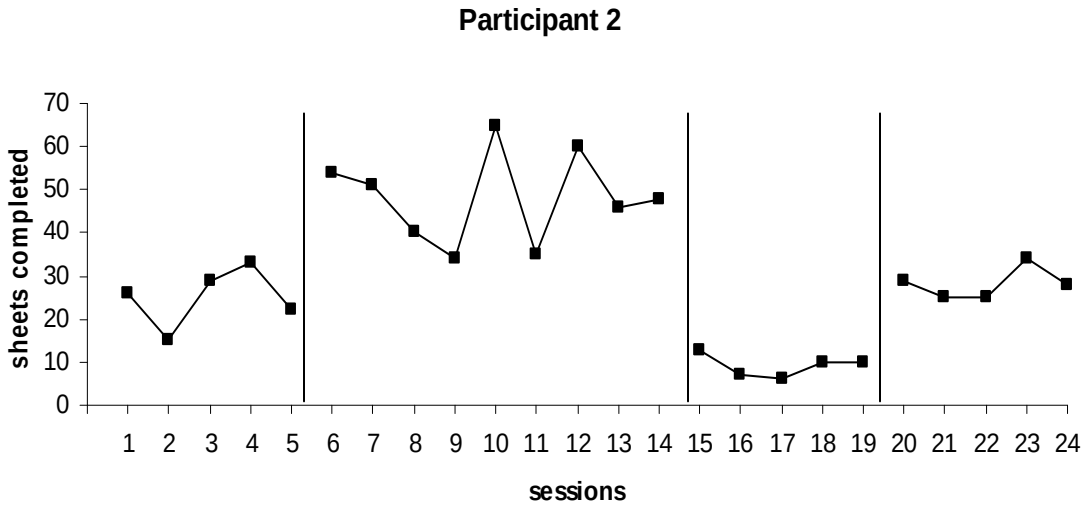

Figure 2

The data for participant 3 are represented in figure 3. The mean responding for the first baseline session was 9 sheets completed. Participant 3 completed sheets for two sessions before demonstrating a precipitous drop in responding. In the following intervention sessions, 9 sheets were required to earn stimuli.

During the first intervention condition, there was an immediate increase beginning with the first session. There was an increasing trend in the first four sessions before stabilizing. The mean number of data sheets corrected in the first intervention was 88.7, with a range of 45 to 128.

During the second baseline participant 3 completed only one sheet per session for 5 consecutive sessions. When exposed to the second intervention phase responding immediately increased to above the mean baseline level. Responding in the second intervention phase was variable but consistently higher than baseline levels with a mean of 52.7 sheets corrected. The mean percentage reached for reinforcer delivery was 20%. The range of earned percentages was 50% to 8%.

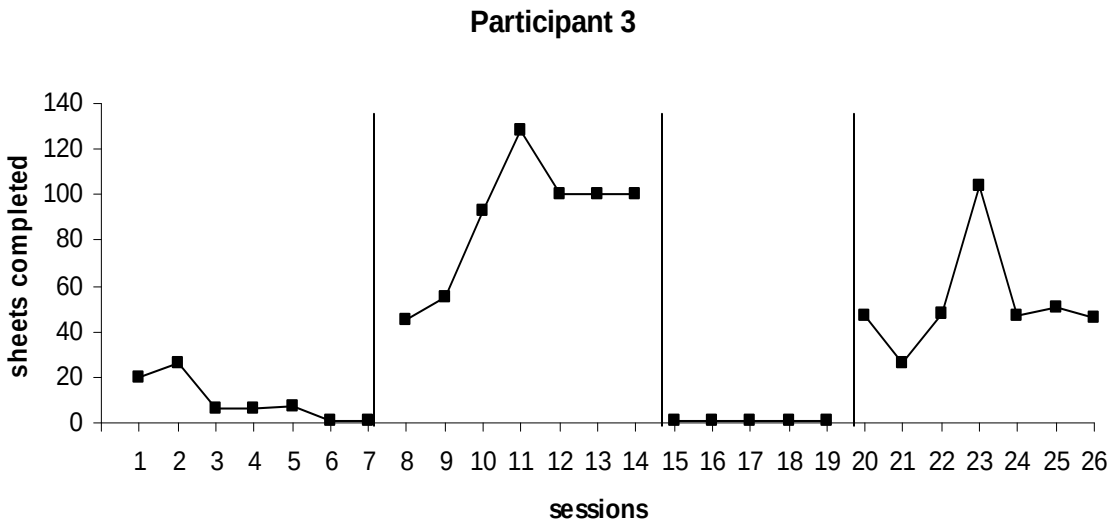

Figure 3

The data for participant 4 are represented in figure 4. The mean responding for the first baseline session was 20 sheets corrected. Baseline responding was stable with the exception of a one-session increase to 44. The baseline range was 10 to 44.

During the first intervention condition, there was an immediate increase beginning with the first session. The intervention phase data also demonstrated a decrease in variability. The mean number of data sheets corrected in the first intervention was 31.8, with a range of 27 to 38.

During the second baseline participant 4 responded for three sessions before demonstrating a decreasing trend for two additional sessions. Upon entering the second intervention phase, participant 4 exhibited an immediate and significant increase in responding followed by a two-session decrease in responding. Responding stabilized after the third session and maintained with little variability. Mean responding in the second intervention phase was 30.7. The mean percentage reached for reinforcer delivery was 93.8%. The range of earned percentages was 100% to 50%

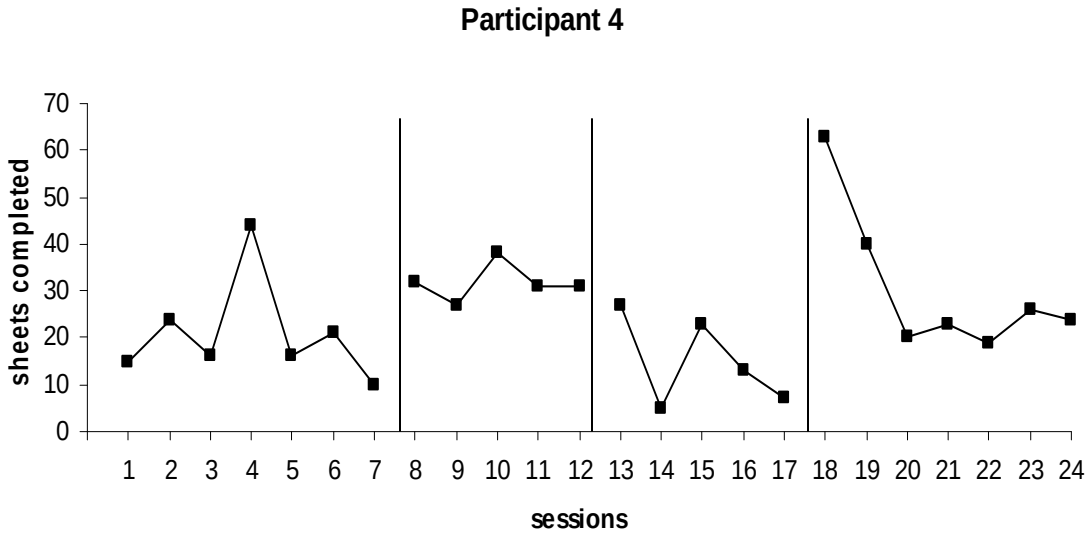

Figure 4

The data for participant 5 are represented in figure 5. In the first baseline condition there was a slight decreasing trend with the exception of an increase in session 4. The mean number of sheets completed in the first baseline condition was 14 sheets. During subsequent experimental conditions she was required to correct 14 sheets to earn each item.

Mean responding during the intervention phase was 16, with a range of 14 to 18. This responding was sufficient to earn one item, but did not represent a significant increase in responding.

When the second baseline was reinstated there was a large drop in responding after the initial three sessions. When the second intervention condition was instituted there was an immediate increase in responding followed by a brief increasing trend until responding stabilized. During the second intervention phase there was a significant increase in responding in the final four sessions. The mean percentage reached for reinforcer delivery was 85.4%. The range of earned percentages was 100% to 75%.

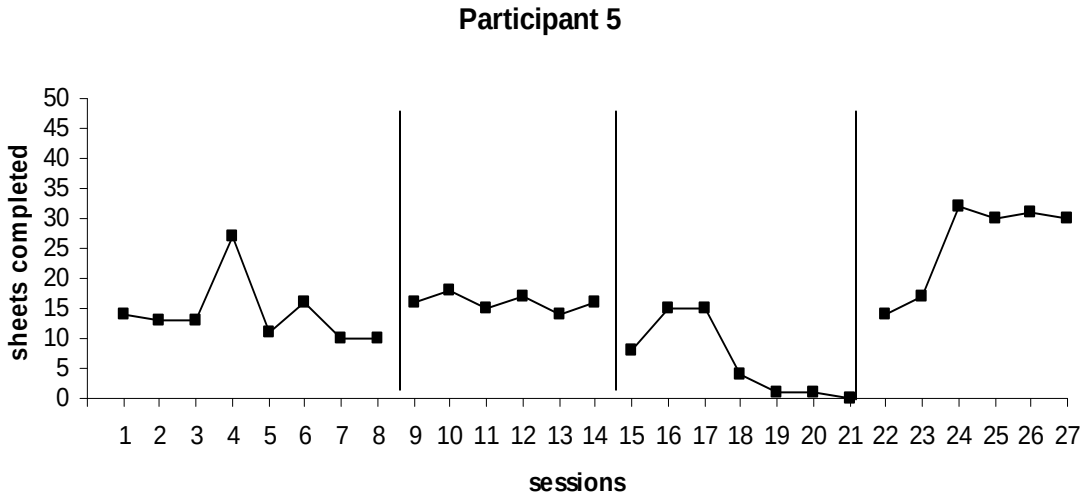

Figure 5

phase 3.

Forty participants completed preference assessments. The group was broken into three groups: 5 participants, 10 participants, and 25 participants. Additionally, the entire 40-participant group was assessed together. Stimuli assessed in phase 3 were identical to the stimulus array used in phase 2. Examination of preference assessment results indicated that various numbers of stimuli were required to account for a high preference stimulus for each participant in the group. High preference stimuli were those ranking was 3 or 4 in the assessment.

Table 1 presents these results. For the group of five participants two separate stimuli were required to account for a high preference stimulus for each member of the group. For 10 and 25 participants three stimuli were required, and for the entire 40-person group four stimuli were required.

Table 2 presents the results found in Table 1 with all stimuli designated as low preference removed from the array. Therefore, more high-preference stimuli were required to account for high preferences of all participants

Table 1

Number of participants	5	10	25	40
Number of Stimuli	2	2	3	4

Table 2

Number of participants	5	10	25	40
Number of Stimuli	2	3	3	5

CHAPTER 5

DISCUSSION

The results of the current investigation indicated that the minimum percentage a participant reached was 8%. For the five participants the mean percentage break was 100%, 92%, 20%, 93.8%, and 85.4% respectively. Across all participants the mean percentage break was 78.24%. When examining the mean percentage break across participants caution must be noted due to the wide range of responding in the five participants. Participant 1 never earned beyond a 100% high-preference reinforcer delivery.

There are several possible explanations for the variation in responding across participants. A primary concern is how the low preference stimulus functioned in the current study. Because this study was designed to present a “worst-case” scenario (i.e., low-preference stimuli were those designated as “0” in the preference assessment) when randomly delivered reinforcers it is possible that the low-preference stimuli may have been a punisher and thus evoked avoidance behavior in some participants. Additionally, while efforts were made to accommodate time and schedules it is possible that time conflicts and repeated exposure to a monotonous task may have altered responding. A final comment must be made about the various histories of the participants. Each participant has a unique history of reinforcement that may result in variations in responding.

Of interest in the current study is the presence of rule-governance influencing participant responding. In the developmental-disability literature it is not uncommon to witness several trials of responding that remain unchanged after phases have changed. In

the current study, when behavior changed it did so without overlapping responding between conditions. This suggests that the participants were able to understand the instructions given to them and generate rules about responding. These results suggest that it may not be necessary to expose employees to contingencies prior to implementing behavior change programs (i.e., it may not be necessary to shape behavior with direct-acting contingencies).

During the third phase, in general, as the number of participants in the groups increased, so did the number of stimuli required to account for high preferences. It is of interest to the current assessment that while the number of stimuli required increased as the participants increased, it is not a direct correlation. For example, when the group increased from 5 to 10 the same number of stimuli were required to account for the high preference stimuli. The current analysis suggests that as the number of employees assessed increase, managers cannot rely on a direct number of increasing preferences. These results should be evaluated with larger numbers of employees. It may be that as group size continues to increase, the number of stimuli required to account for high-preference stimuli may remain relatively small.

The initial aim of the study was to examine how thin the high-preference stimulus delivery can become and maintain responding. The results of the second phase suggest that the answer can vary widely between employees. As mentioned earlier, a likely explanation is the low preference stimulus functioning not as low preference, but rather as a punisher. A potential way to ameliorate the presence of a punisher in the stimulus array would be to drop any items assigned “0.” As table 2 shows this does increase the

number of stimuli required to obtain a high-preference stimulus for each participant. It is likely that the absence of potential punishers would increase responding.

In the current study five participants demonstrated a 78.24% mean percentage break. Between the participants, two items (cash and music gift certificates) were required to account for the high preferences. If these two stimuli were delivered randomly to members of the group for completing tasks there would be a 50% chance of earning a high-preference stimulus. From these results which reported a mean of 78.24%, a 50% chance of earning a high-preference stimulus would not be expected to maintain responding in this group; however, an analysis of the preference assessment indicates the two high-preference stimuli used in the current investigation (cash and music gift certificates) were not identified as low preference stimuli. This raises what will be the primary question for future research—what will the percentage break be when low preference stimuli are excluded from a stimulus array.

When examining the results from phase 3, one need not examine further than the first group of five responders (Table 1) to see that there are problems with implementing a randomly delivered reinforcement program. All groups in phase 3 required two or more stimuli to account for high-preference stimuli in all participants.

Conceptually, in the current study, the high-preference stimulus represents what the participant would prefer to work for in a reinforcement program. The medium and low preference stimuli could be said to represent the high preferences of other participants. In an organization-wide behavior change program a reinforcement procedure is likely to be a component. Delivering each individual's high preference stimulus in an

organization might prove difficult and time-consuming, especially given recent research indicating changes in employee preference (Wine, Hantula, & Gilroy, in press).

A researcher or consultant may do well to consider how many different high preference stimuli are assessed in the employees, what the expected percentage break would be, and what the desired increase in behavior is for the current intervention. In the current study, the data represent a "worst-case" scenario of delivering stimuli to groups. What one employee prefers to earn a counter-part prefers what could be considered either a low-preference, or possibly even a punishing stimulus.

Originally, a decision matrix was conceptualized in the flow chart represented in figure 6. Preferences assessments are first conducted with all employees participating in the behavior-change program. From this point the manager must decide, taking into account a likely percentage break given the number of different high preference stimuli in the group, if delivering the stimuli randomly will produce an increase in behavior sufficient for the goals of the intervention. If the random delivery is likely to be sufficient, then the manager may set up a system where the high preference stimuli are delivered randomly to the employees. If the likely change in behavior is not deemed sufficient for the current goals, then a system where individual preferences are accounted for on an on-going basis, and all high preference stimuli are delivered to the respective employees.

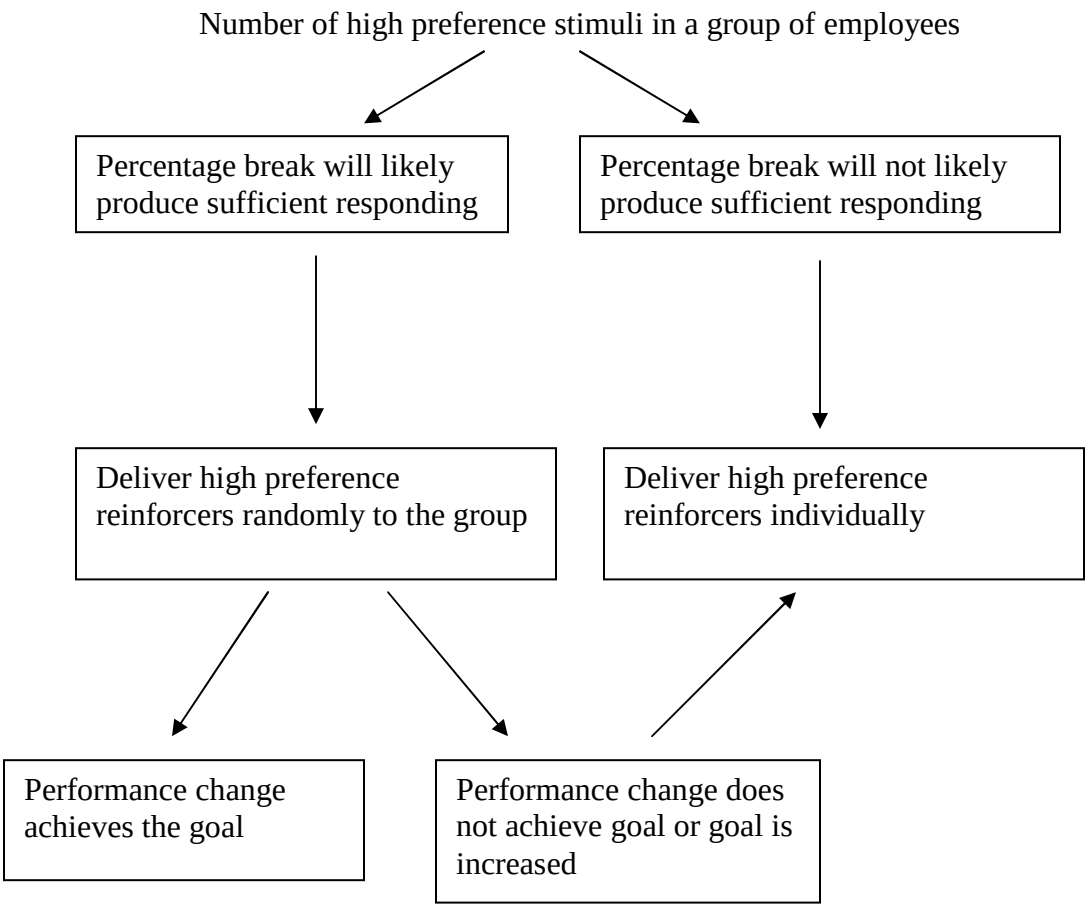

Figure 6

Results from the current study progress only through the first two steps. Two high-preference stimuli produce a 50% chance of high-preference delivery, which would not likely maintain responding. High-preference stimuli would have to be delivered individually.

Future Research

From these results there are several avenues for future research. From the current data set it appears responding may vary significantly between employees. As such, excluding the lowest preference stimuli in the array may prove beneficial. This new arrangement would seek to obtain the fewest number of high preference stimuli required

to account for the high preference stimulus for each participant without any low preference stimuli for the rest of the participants. The experiment would expose participants to high preference and moderate preference stimuli and thus may increase the percentage break. This arrangement may more accurately reflect a “real-world” scenario where many high preference stimuli nominated by co-workers would function as moderately preferred, not low-preference, or punishing stimuli.

An additional avenue for research would be the extension of these procedures outside of analog settings. These results were obtained using a task that approximated real-world tasks. Also, participants were employees and completed the data collection after regularly scheduled work hours. Replicating these procedures in the natural environment using naturally occurring tasks may yield different results.

There are several questions that have been raised by the current data set that were not part of the initial research questions. It has been noted in the basic literature that post-reinforcement pausing in progressive ratios is similar to pausing in fixed ratios (Baron, & Derenne, 2000). There are many topics in this line of research that remain unexplored. There have been mixed results concerning the existence of post-reinforcement pausing in humans (Schlinger, Derenne, & Baron, 2008). The existence of human pausing in progressive ratios has yet to be demonstrated. While formal data on post reinforcement pausing was not collected, pausing did not appear to be taking place.

In the current study an interesting phenomenon occurred when participants returned to the second baseline condition. In all five participants there was a decrease in behavior compared to responses in the first baseline. Three participants exhibited a significant decrease in behavior, while the other two exhibited minor decrements. These

results speak to research that claims a detrimental effect of reinforcement on intrinsic motivation (Deci, Koestner, & Ryan 2001).

The literature on the effects of reinforcement on intrinsic motivation is contentious. Recent reviews have established that the detrimental effect may only be noted when reinforcement procedures are applied to tasks that have high intrinsic motivation (Cameron, 2001). Even when detrimental effects do occur, they may only be realized when under specific conditions; an example of a conducive decrement condition includes performance independent rewards (Cameron, 2001). Moreover, this literature is complicated in that no single-subject designs have been included in reviews; however, no single-subject designs through 2004 indicated detrimental effects of reinforcers on performance (Akin-Little, Eckert, Lovett, & Little, 2004).

The results in the current study do suggest a decrease in responding after reinforce delivery across all participants, notably so in three participants. There are four possible explanations for the current results. First, extended exposure to the monotonous task may have decreased motivation to engage in the behavior. Alternatively, if the tasks were preferred initially, then perhaps the application of reinforcers did decrease “intrinsic” motivation. Several participants did exhibit sustained responding during the initial baseline, suggesting the task may not have been aversive. This is only speculation and so warrants further examination. A third explanation involves a confusion of terms. As noted by Dickinson (1989) what is attributed to intrinsic motivation could actually be behavior controlled by a thin socially mediated intermittent reinforcement schedule. All participants in the current studies were adults with varied learning histories, so the responding could have been controlled in part by socially mediated reinforcers despite the

precautions taken in the methodology. Last, there is a possibility that the results herein are atypical and another unidentified factor produced the recorded results. A more thorough investigation seems warranted given the potential implications of a decrease in employee behavior following the removal of a reinforcement program.

Limitations

The current study has several limitations. The first and most significant limitation is the analog task used in the study. The task, correcting data sheets, is indeed a task found in the natural environment among the supervisor-participants, but the written, standardized scenarios varied from what is found in the natural environment. This variable, along with the contrived nature of the data collection limits the degree to which these results can be generalized to the natural working environment. Replication of these results using a naturally occurring work activity is warranted.

A second limitation to these results is the insular group of participants used in the current study. All participants were employees of a human services agency at the supervisor-level. Employees of other industries, or of higher or lower status, may respond differently to similar contingencies.

A third limitation of the current investigation involves the timing of the stimulus delivery. Delivering stimuli immediately after they are earned, as the current protocol indicates, may be difficult in applied settings. By delaying the delivery of earned reinforcers these stimuli may be less effective in changing behavior. This question extends beyond the current analysis; no research in organizational behavior management has yet to systematically address the delivery of earned reinforcers to employees. Additionally, the delivery of the earned stimuli varied somewhat in that one of the high

preference stimuli in the current study, music store gift cards could not be delivered until they earned a denomination that the gift card was available in (i.e., gift cards that come in $5 increments could not be delivered until participants earned at least $6 worth of the gift card). The gift cards differ from money in that money can be delivered immediately. The variable delivery did not appear to have any effect on the data; however, it is possible there was a minute effect on the results.

A final limitation to the current investigation involves the assumption of temporal stability of preferences. While generalized conditioned reinforcers were used as high preference reinforcers (i.e., cash and gift certificates) to guard against changes in preference, there were no repeated preference assessments. Repeated preference assessments across the course of the study would have assured the delivery of high preference stimuli in the high preference delivery condition.

In sum, the current study indicated that among the five participants the percentage break was not sufficient, given the number of stimuli required to account for the high-preference stimuli for each participant, to maintain responding in the five participants. Furthermore, the percentage break was not sufficient to maintain responding in any of the groups in phase 3. At this point, until the effects of moderate preference stimuli or the exclusion of low-preference stimuli from the array are examined empirically, the use of mixed reinforcer delivery to assist in implementing the reinforcer component of a behavior change plan is not recommended.

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APPENDIX A

CONSENT FORM A

The effects of progressively thinning high-preference stimulus delivery on responding: An empirical analysis and hypothetical application

Student Investigator: Byron Wine, M.S.; Dept of Psychological Studies in Education
Principle Investigator: Saul Axelrod, Ph.D.; Dept of Curriculum, Instruction and Technology in Education

Please read this form so that you can find out more about the research and decide if you wish to take part in our study.

Purpose of the research: This research study examines how long you will work while receiving continually fewer highly preferred rewards.

What your participation involves: During the course of this study, we will ask you to fill out a survey that examines how much you like potential rewards. You will then receive rewards for correcting data sheets over the course of several sessions. The rewards you receive during each session will be thinned out with less preferred rewards as you work until you decide to stop working.

Risks: There are no known risks involved in completing this study.

Compensation: You will receive the items you earn as a result of completing work.

Confidentiality: All documents and information pertaining to this research study will be kept confidential, unless required by applicable federal, state, and local laws and regulations to be disclosed. I understand that records and data generated by the study may be reviewed by Temple University and its agents, the study sponsor or the sponsor's agents (if applicable), and/or governmental agencies to assure proper conduct of the study and compliance with regulations. I understand that the results of this study may be published. If any data is published, I will not be identified by name.

Disclaimer: You are free to decide whether or not you want to participate in this research. If during the course of the study you decide not to participate, you may withdraw at any time. Your participation in this study is voluntary and you may refuse to participate at any time without consequence or prejudice.

Initial____
Date____

The effects of progressively thinning high-preference stimulus delivery on responding:
An empirical analysis and hypothetical application

Questions?: We thank you for choosing to participate in this study. If you have any questions about this study, please email Byron Wine at tub81381@temple.edu or please call Saul Axelrod at (215) 204-6060. If I have any questions about my rights as a research subject, I may contact the Institutional Review Board Coordinator at (215) 707-3390. The IRB Coordinator may also be reached by email: IRB@temple.edu or regular mail:
Institutional Review Board Coordinator
Temple University Research Administration
Student Faculty Conference Center
3340 North Board Street – Suite 304
Philadelphia, PA 19140

Your consent to participate: Signing your name below indicates that you have read and understand the contents of this Consent Form and that you agree to take part in this study. You will receive a copy of the signed consent form.

Signature: _____

Print your name: _____

Today's date: _____

Thank you for your consideration of our research study.

Investigator Signature: _____

Today's date: _____

Initial____
Date____

The effects of progressively thinning high-preference stimulus delivery on responding: An empirical analysis and hypothetical application

Saul Axelrod, PhD
Principle Investigator
Temple University
Philadelphia, PA 19122
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Byron Wine, Graduate
Student Investigator
Temple University
Philadelphia, PA 19122
Email: tub81381@temple.edu

Initial____
Date____

APPENDIX B

CONSENT FORM B

The effects of progressively thinning high-preference stimulus delivery on responding: An empirical analysis and hypothetical application

Student Investigator: Byron Wine, M.S.; Dept of Psychological Studies in Education
Principle Investigator: Saul Axelrod, Ph.D.; Dept of Curriculum, Instruction and Technology in Education

Please read this form so that you can find out more about the research and decide if you wish to take part in our study.

Purpose of the research: This research study examines preferences in what you would like to earn for completing work.

What your participation involves: During the course of this study, we will ask you to fill out a survey ranking items you would like to earn for completing work.

Risks: There are no known risks involved in completing this study.

Compensation: You will not be compensated for this research.

Confidentiality: All documents and information pertaining to this research study will be kept confidential, unless required by applicable federal, state, and local laws and regulations to be disclosed. I understand that records and data generated by the study may be reviewed by Temple University and its agents, the study sponsor or the sponsor's agents (if applicable), and/or governmental agencies to assure proper conduct of the study and compliance with regulations. I understand that the results of this study may be published. If any data is published, I will not be identified by name.

Disclaimer: You are free to decide whether or not you want to participate in this research. If during the course of the study you decide not to participate, you may withdraw at any time. Your participation in this study is voluntary and you may refuse to participate at any time without consequence or prejudice.

Initial____
Date____

The effects of progressively thinning high-preference stimulus delivery on responding: An empirical analysis and hypothetical application

Questions?: We thank you for choosing to participate in this study. If you have any questions about this study, please email Byron Wine at tub81381@temple.edu or please call Saul Axelrod at (215) 204-6060.

If I have any questions about my rights as a research subject, I may contact the Institutional Review Board Coordinator at (215) 707-3390. The IRB Coordinator may also be reached by email: IRB@temple.edu or regular mail:
Institutional Review Board Coordinator
Temple University Research Administration
Student Faculty Conference Center
3340 North Board Street – Suite 304
Philadelphia, PA 19140

Your consent to participate: Signing your name below indicates that you have read and understand the contents of this Consent Form and that you agree to take part in this study. You will receive a copy of the signed consent form.

Signature: _____

Print your name: _____

Today's date: _____

Thank you for your consideration of our research study.

Investigator Signature: _____

Today's date: _____

Initial____
Date____

The effects of progressively thinning high-preference stimulus delivery on responding: An empirical analysis and hypothetical application

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Initial____
Date____

APPENDIX C

PARTICIPANT CHARECTERISTICS

	Age	Tenure in years	Race	Sex
Participant 1	**27**	**4**	**Caucasian**	**Female**
Participant 2	**30**	**1.5**	**African American**	**Male**
Participant 3	**34**	**1.5**	**Caucasian**	**Male**
Participant 4	**43**	**7**	**African American**	**Female**
Participant 5	**28**	**1**	**African**	**Male**

APPENDIX D

SURVEY REINFORCEMENT ASSESSMENT

Please indicate by circling the number, how you would rate the following items.

0 = do not like at all 1 = like a little 2 = like a fair amount 3 = like much 4 = like very much

Item 1

0 2 3 4

Item 2

0 2 3 4

Item 3

0 2 3 4

Item 4

0 2 3 4

Item 5

0 2 3 4

Item 6

0 2 3 4

Item 7

0 2 3 4

Item 8

0 2 3 4

APPENDIX E

SAMPLE BEHAVIORAL SCENARIO

Instructions: Transpose the information below into the appropriate corresponding location on the data sheet.

On 3/11/10 beginning at 2023 GO was at the Severin house. While waiting in the great room he was given an instruction by a peer. GO then engaged in self-injury that prompted staff to redirect GO for 5 minutes.

APPENDIX F

DATA SHEETS

Client Initials

___ ___ ___

Staff Initials	Date	Start Time
___ ___ ___	__ __ /__ __/ __ __	__ __ : __ __

Site Code	Location Code	Activity Code	Antecedent Code
___ ___ ___	___ ___ ___	___ ___ ___	___ ___ ___

Series 1

Behavior	Procedure	Duration
___ ___ ___	___ ___ ___	___ ___ ___

Series 2

Behavior	Procedure	Duration
___ ___ ___	___ ___ ___	___ ___ ___

Series 3

Behavior	Procedure	Duration
___ ___ ___	___ ___ ___	___ ___ ___

Series 4

Behavior	Procedure	Duration
___ ___ ___	___ ___ ___	___ ___ ___

Series 5

Behavior	Procedure	Duration
___ ___ ___	___ ___ ___	___ ___ ___

APPENDIX G

BEHAVIORAL CODES

site code
SGH-Som group home
HDP-Hills day program
BGH-Bridge group home
SEV-Severin group home

location code
ACT-Activity Room
G-Great Room
BY-Backyard
B-Bedroom
D-Dining Room
CFT-Craft Room
COM-Computer Room
FAM-Family Room
FIT-Fitness
K-Kitchen
VAN-Van/Car
H-Hallway

activity code
A-Arising from sleep
L-Leisure activity
M-Meals
MED-Medications
H-Hallway
MOVE-Moving to another activity
SN-Snack time
V-Vocational
W-Waiting
SL-Sleeping

Antecedent code
OP-Coming out of procedure
IP-Instruction by peer
IS-Instruction by staff
L-Loud environment
UN-Unknown
SAW-Student asked to wait
ILL-Physically ill
SRG-request granted
SRD-request denied
RED-request delayed

Behavior code
A-aggression
SIB-self-injury
PD-property destruction
AT-aggressive threats
NCI-non-compliance
AWOL-elopement
M-medication refusal
MR-meal refusal
FR-food refusal
PICA-eating inedible substances

Procedure code
R-redirection
PROB-problem discussion
INT-loss of interval
EX-extinction
I-interruption
MR-restraint
TO-timeout
C-correction
RP-response cost
RD-reinforcement delay

APPENDIX H

STIMULUS EARNING SCHEDULE

	1	2	3	4	5	6	7	8	9	10
100%	HP	HP	HP	HP	HP	HP	HP	HP	HP	HP
75%	HP	HP	HP	HP	HP	HP	LP	HP	HP	HP
50%	LP	HP	LP	HP	LP	HP	HP	LP	LP	HP
33%	HP	LP	LP	HP	HP	LP	LP	HP	LP	LP
25%	HP	LP	LP	HP	LP	LP	LP	LP	LP	LP
20%	LP	LP	HP	LP	LP	HP	LP	LP	LP	HP
17%	LP	LP	LP	LP	HP	LP	HP	LP	LP	LP
14%	LP	LP	LP	HP	LP	LP	LP	LP	LP	LP
13%	LP	LP	HP	LP	LP	LP	LP	LP	LP	LP
11%	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP
10%	LP	LP	LP	LP	HP	HP	LP	LP	LP	HP
9%	HP	LP	LP	LP	LP	LP	LP	LP	LP	LP
8%	LP	HP	LP	LP	LP	LP	LP	LP	HP	LP
8%	LP	LP	LP	LP	HP	LP	LP	LP	LP	LP
7%	LP	LP	LP	LP	LP	LP	LP	LP	LP	HP
6%	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP
6%	LP	HP	LP	LP	LP	LP	LP	LP	LP	LP
6%	LP	LP	LP	HP	LP	LP	LP	LP	LP	LP
6%	LP	LP	LP	HP	LP	LP	LP	LP	LP	LP
5%	LP	LP	LP	LP	LP	LP	LP	LP	LP	LP
5%	LP	LP	LP	LP	LP	LP	LP	LP	LP	HP