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An Experimental Analysis of Instructional Technologies Applied to the Three Contingency Model of Performance Management

Judith S. DeVoe
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AN EXPERIMENTAL ANALYSIS OF INSTRUCTIONAL TECHNOLOGIES
APPLIED TO THE THREE-CONTINGENCY MODEL
OF PERFORMANCE MANAGEMENT

by

Judith S. DeVoe

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
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Western Michigan University
Kalamazoo, Michigan
December 1994
This research had four goals: (1) to refine the theory of performance management based on rule-governed behavior and refine the three-contingency model of performance management, (2) to develop a university-level programmed instruction unit to teach the three-contingency model of performance management, (3) to test for functional independence between response classes—using concept-discrimination and concept-exemplification, and (4) to test a common assumption of programmed instruction—the necessity for active responding (this assumption was tested with both concept-discrimination training and concept-exemplification training).

Participants included fifty-nine undergraduates enrolled in a behavior analysis course. They were randomly assigned to one of four groups: (1) the active concept-discrimination and active exemplification-training group, (2) the passive concept-discrimination and passive exemplification-training group, (3) the active concept-discrimination and passive exemplification-training group, (4) the passive concept-discrimination and active exemplification-training group.
ing group, and (4) a control group. A pretest and post­
test measured concept-discrimination mastery and exemplifi-
cation-response mastery. There were no significant
differences between the four groups on either the pretest or the posttest. Furthermore, none of the groups showed
significant improvement from pretest to posttest of
either concept-discrimination mastery or exemplification
response mastery. Because of this lack of improvement,
the experiment was not able to test for functional inde­
pendence of response classes or the relevance of active
responding. This lack of improvement was not due to a
ceiling effect on the pretest, because the pretest mean
percentage correct for the four groups ranged from 76% to
83% for concept-discrimination and from 83% to 89% for
exemplification-response; there was room for significant
improvement. The lack of progress may have resulted from
a test that did not adequately measure the repertoires
the programmed instruction was teaching, or it may be
that the programmed instruction did not teach.

Considerable progress was made toward the refine­
ment of the three-contingency model, and the development
of this initial programmed instruction unit. Further
research and development should be done on instructional
materials and mastery measures.
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An experimental analysis of instructional technologies applied to the three-contingency model of performance management

DeVoe, Judith Sue, Ph.D.

Western Michigan University, 1994
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Judith S. DeVoe
# TABLE OF CONTENTS

ACKNOWLEDGMENTS ..................................... ii  
LIST OF TABLES ....................................... vii  
LIST OF FIGURES ...................................... viii  

CHAPTER  
I. INTRODUCTION ............................... 1  
  Goal 1: Theory Development ............ 1  
    Rule-Governed Behavior .............. 1  
    Human Operant Research .............. 4  
    Theoretical Analysis ................ 7  
    The Three-Contingency Model  
      of Performance Management ............ 13  
    The Need for the Three-Contingency Model  
      of Performance Management: Applications  
      in Higher Education ................... 19  
    Refinement of the Three- 
      Contingency Model ..................... 28  
  Goal 2: Instructional-Program  
    Development ............................. 30  
    Concept Training ..................... 30  
    Conceptual Relationship .............. 31  
    Principles ........................... 32  
    Strategies ........................... 33  
  Goal 3: Testing for Functional  
    Independence and Transfer .............. 35  
    Instructional Typology .............. 35  

iii
# Table of Contents—Continued

## CHAPTER

<table>
<thead>
<tr>
<th>Concept-Discrimination Training</th>
<th>39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept-Exemplification Training</td>
<td>42</td>
</tr>
<tr>
<td>Functional Independence and Transfer</td>
<td>43</td>
</tr>
</tbody>
</table>

**Goal 4: Testing the Value of Active Responding** | 50 |
| Active Responding | 50 |

**Behavioral-Based Instructional Programs Employing Active Responding** | 55 |

**Experimental Purpose** | 59 |

## II. METHOD | 60
| Subjects and Setting | 60 |
| Materials | 60 |
| Workbook and Checklist | 60 |
| Mastery Test | 61 |
| Materials Development | 62 |

**Procedure** | 63
| Active Concept-Discrimination and Active Concept-Exemplification Response Group (AD-AE) | 63 |
| Passive Concept-Discrimination and Passive Concept-Exemplification Response Group (PD-PE) | 64 |
| Active Concept-Discrimination and Passive Concept-Exemplification Response Group (AD-PE) | 64 |
| Control Group (C) | 65 |
| Mastery Test | 65 |
# Table of Contents—Continued

## CHAPTER

- General Procedures 65
- III. RESULTS 67
  - Concept-Discrimination 67
  - Lower-Scoring and Higher-Scoring 67
  - Concept-Exemplification 69
  - Homework Units 70
- IV. DISCUSSION 71
  - General 71
  - Instructional-Materials Development 73
  - Job-Aid Checklist 74
  - Ineffective-Natural Contingencies 77
  - Performance-Management Contingencies 79
  - Theoretical Contingencies 82
  - Checklist Changes 84
  - Independent Variable 90
  - Dependent Variable 92
  - Procedural Issues 93
- Summary 94

## APPENDICES

- A. Informed Consent Form 98
- B. Instructional Unit for the Main Experimental Group 101
- C. Checklist 121
- D. Pretest/Posttest 124
Table of Contents—Continued

APPENDICES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Checklist</td>
<td>121</td>
</tr>
<tr>
<td>D</td>
<td>Pretest/Posttest</td>
<td>124</td>
</tr>
<tr>
<td>E</td>
<td>Sample Instructional Unit for Control Group</td>
<td>128</td>
</tr>
<tr>
<td>F</td>
<td>Instructions to Students</td>
<td>135</td>
</tr>
<tr>
<td>G</td>
<td>HSIRB Proposal Approval Letter</td>
<td>137</td>
</tr>
</tbody>
</table>

BIBLIOGRAPHY .............................. 139
LIST OF TABLES

1. Typology of Verbal Instructional Tasks ............ 38
2. Concept-Discrimination Training:
   Mastery Test Mean Scores .......................... 67
3. Concept-Discrimination: Mean
   Difference Scores .................................. 69
4. Concept-Exemplification: Mastery
   Test Mean Scores ................................. 69
LIST OF FIGURES

2. Monthly Examinations .................................................. 22
3. Weekly Examinations .................................................. 25
4. Contingencies and the Hierarchical Relationship .......................... 32
CHAPTER I

INTRODUCTION

This research had four goals: (1) to refine the theory of performance management based on rule-governed behavior and to refine the three-contingency model of performance management, (2) to develop a university-level programmed instruction unit to teach the three-contingency model of performance management, (3) to test for functional independence between response classes—using concept-discrimination training and concept-exemplification training, and (4) to test a common assumption of programmed instruction—the necessity for active responding (this assumption was tested with both concept-discrimination training and concept-exemplification training).

Goal 1: Theory Development

Rule-Governed Behavior

Contingency-shaped behavior is the direct control of behavior by a contingency, without the involvement of rules. A rule is a description of a behavioral contingency. However, a behavioral contingency is not a rein-
forcement contingency unless the reinforcer immediately follows the behavior. If the person can state the rule specified in the contingency, that rule may have control over the behavior, and the contingency can then function as an analog to reinforcement. For example, if a mother takes her son to a movie tomorrow for having cleaned his bedroom today, this contingency probably would not control the child's future behavior unless he can state the rule describing it. A behavioral contingency is "the occasion for a response, the response, and the outcome of the response" (Malott, Whaley, & Malott, 1993, p. 22). And rule-governed behavior is "behavior under the control of a rule" (Malott et al., 1993, p. 344).

As a discriminative stimulus, a rule is effective as part of a set of contingencies of reinforcement. A complete specification must include the reinforcer which has shaped the topography of a response and brought it under control of the stimulus (Skinner, 1988, p. 227).

Although Skinner (1969) first referred to rules as discriminative stimuli, others have argued convincingly that rules act as function-altering stimuli (Blakely & Schlinger, 1987; Schlinger, 1993; Schlinger & Blakely, 1987) or as establishing operations or warning stimuli (Malott, 1989). So there is a lack of agreement among behavior analysts regarding the function of a rule or instruction and there is little empirical evidence to support or to refute the various theoretical orienta-
tions; however, the resolution of these differences may rest on logical analyses as much as empirical analyses.

Vaughan (1989) divided the history of empirical work on rule-governed behavior into three areas: (1) developmental research (Braam, 1994; Vaughan, 1985), (2) stimulus-equivalence research (Devaney, Hayes, & Nelson, 1986), and (3) schedule-sensitivity research (Catania, Matthews, & Shimoff, 1982). Schedule-sensitivity research focuses on the relationship between self-generated instructions or other-generated instructions equated with rules and behavior control. The schedule-sensitivity research is only tangentially related to the present work because the three-contingency model of performance management addresses control by rules describing indirect-acting analogs to reinforcement and punishment contingencies with delays greater than 60 seconds (Malott, 1993), rather than the direct-acting contingencies of intermittent reinforcement used in the schedule-sensitivity work. Furthermore, this model does not address the generation of rules, but rather the control by rules once they are generated. Due to the prominence this laboratory research has in the literature on rule-governed behavior, the next section will review some of those studies evaluating the effectiveness of instructions and direct-acting contingencies in controlling behavior when schedules of
reinforcement are changed; in other words, schedule-sensitivity research.

Human Operant Research

Matthews, Shimoff, Catania, and Sagvolden (1977) studied the effects of the sensitivity of human responding to schedules of reinforcement. In two experiments, they evaluated the effects of instructions (rule-governance) versus the effects of shaping. The first of two experiments, using a yoked variable-interval/variable-ratio schedule, showed subjects' response rates were higher on a ratio schedule than on a variable interval schedule when behavior was shaped. However, there were no differences in response rates on a ratio schedule compared to a variable interval schedule when behavior was rule-governed, and this insensitivity persisted when the contingencies were changed.

Behavior initially controlled by rules was insensitive to changes in schedules of reinforcement. By contrast, behavior shaped by direct-acting contingencies was sensitive to schedule changes. Within the parameters of this study (Matthews et al., 1977), behavior that is rule-governed is not sensitive to changes in contingencies; instead the behavior continues to respond in accordance with the original rule statement. These
effects occurred for high rates of behavior (Matthews et al., 1977) as well as low rates of behavior (Shimoff, Catania, & Matthews, 1981). Similar results were found by Kaufman, Baron, and Kopp (1966).

Vaughan (1985) trained subjects in a repeated acquisition task using contingency shaping and rule-governance (instructions). Subjects in the instructions group made substantially more errors in responding than subjects in the contingency-shaped group.

In another of these studies, Shimoff, Matthews, and Catania (1986) exposed subjects to changing contingencies (i.e., random-ratio and random-interval schedules). As in previous studies (Catania et al., 1982), students filled out sentence-completion forms indicating what response they thought produced the reinforcers (i.e., push fast for a ratio schedule or push slow for an interval schedule). After feedback for sentence completion forms was discontinued and multiple-schedules were reversed, subjects generally had consistently higher pressing rates in the random-ratio conditions than in the random-interval conditions. These results would seem to support schedule-sensitivity to the contingencies; that is, subjects responded accurately to the changes in the contingencies in the absence of accurate feedback. But the question remained as to whether the sensitivity was
related to rule-governed behavior or contingency-shaped behavior because one of the three subjects exposed to a pair of random-interval schedules responded at a higher rate to a schedule that produced fewer reinforcers. In a second condition, when a multiple random-ratio, random-interval schedule was changed to a multiple random-interval, random-interval schedule, the rate of responding became appropriately low in both components, but discontinuation of feedback for guesses produced high rates of responding. This effect was corrected by reestablishing feedback in one of three students.

The performance of human subjects in this study is atypical compared to the performance of nonhuman subjects on these schedules. In other words, nonhumans always perform at a much higher rate on ratio-schedules than interval-schedules, but in this study, human performance was not consistently high on ratio schedules and consistently low on interval schedules, unless accurate feedback was consistently provided. Therefore, it is concluded that all behavior in this study may have been rule governed, not contingency shaped.

Hayes, Brownstein, Haas, and Greenway, (1986) suggest that even when behavior does change with accompanying contingency changes, it may not be the same as those changes observed in nonhumans resulting from contingency...
changes. In other words, although the topography of the behavior may be the same, the variables controlling the behavior may differ.

Galizio (1979) found that rules produced schedule insensitivity comparable to the findings of Catania et al. (1982). However, when penalty contingencies were introduced, subjects were no longer insensitive to the contingencies, in spite of the initial rule control.

Theoretical Analysis

Malott and Malott's (1991) recent metatheoretical and theoretical work accounts for behavior controlled by indirect-acting contingencies of reinforcement and punishment. A direct-acting contingency is "a contingency for which the outcome of the response reinforces or punishes that response," (Malott et al., 1993, p. 347). An indirect-acting contingency is "a contingency that controls the response, but not because of reinforcement or punishment of that response by the outcome specified in that contingency," (Malott et al., 1993, p. 347). The question is, how is behavior controlled by indirect-acting contingencies? Malott and Malott (1991) argue for the role of private events in rule-governed behavior.

But the inference of private events does not sit well with the dominant methodological behavioristic
orientation in the field of behavior analysis and its emphasis on prediction and control as the goals of science. Malott and Malott (1991) suggest that the goal of science is understanding; though prediction and control are necessary, they are not sufficient to achieve the goal. As Malott et al. (1993) point out, examples of great scientific discoveries, including Darwin's theory of evolution and Copernicus' heliocentric theory, were not valued for prediction and control, but for understanding. Malott and Malott (1991) then argue that understanding the cause-effect sequences involved in rule-governed behavior may require inferences about private events.

The problem with the concept of causality is the frequent emphasis on ultimate cause, instead of on links in the cause-effect chain. The problem with looking for the ultimate or initial cause is that the search results in an infinite regression. For example, if one is to look for the cause of one's existence, then the ultimate cause or distal cause is somewhere far removed in the ancestral heritage back to Adam and Eve or the ape, or as far as we are able to trace. The point is, that cause and effect are important concepts, not simply for understanding the ultimate distal cause, but for understanding the links (proximal cause, in an infinite causal chain),
even when these links involve private events. Malott (1980-81), does not subscribe to the idea of action at a distance and instead focuses on proximal cause. Proximal cause involves those events immediately preceding the behavior of interest.

It is convenient, and not without minimal data support, to consider as distal causes of behavior those events involving delays greater than 60 seconds between the antecedent causal condition and the response and between the response and the consequence. For example, when the delay is greater than 60 seconds, then what would have functioned as a discriminative stimulus when it preceded the behavior by less than 60 seconds now becomes an analog to a discriminative stimulus; and events that follow the behavior become part of analogs to reinforcement or punishment.

In order to account for instances of control by remote events (distal causes) Malott and Malott (1991) propose an explanation based on direct-acting covert causes—proximal causes. The issue is, people seem to respond to stimulus conditions in a significantly delayed fashion. For instance, reading about a sale in the paper today appears to control shopping tomorrow, and this explanation of behavioral control involves intervals greater than 60 seconds. In keeping with the proponents
of proximal cause, rule-governed behavior can be used to explain the control of behavior in terms of direct-acting contingencies of reinforcement or punishment. The statement of the rule is, "If I don't buy that shirt on sale by tomorrow, I will pay 25% more for the same shirt next week." This statement of the rule functions as an establishing operation and immediately produces an aversive condition that evokes behavior when stated. The immediate direct-acting contingency is the aversive thoughts of having to pay more for the same shirt next week. The statement of the rule may also alter the reinforcing effectiveness of the shirt because it costs less. Therefore, the general reliance on public events to explain overt behavior may be inadequate.

It is plausible that behavior apparently controlled by distal events is more adequately explained by proximal causes involving covert behavior or private events. For example, consider a child performing a math problem. A child can be observed counting out loud from one to ten, and subsequently writing the number "ten." Now imagine he has gained expertise at addition and is asked to compute the same problem. In this case he gives the verbal response "ten" after some delay. In the first case, the behavior is a public causal chain and in the second case the behavior is a private causal chain.
Using this example, it is easy to see how private events can control behavior. However, some complex behaviors are more difficult to account for with both a public and a private analysis and reliance on the private events may be the only option. But methodological behaviorists are reluctant to explain behavior with covert process. The issue is that thinking is just another form of behavior and to explain overt behavior with covert behavior places the problem of explaining behavior inside the organism.

Rule-governed behavior might account for control by delayed outcomes in terms of immediate causes. It has been suggested that delayed reinforcement could be accounted for by chaining; however, the main problem is that in everyday behavior there are many interruptions within the chain that produce delays for each successive behavior. Because of these breaks in the chain, Michael (1986) argues that we should resist using chained behavior to explain effective delayed consequences.

Returning to rules as an explanation for behavior controlled by delayed outcomes, a rule may function as an establishing operation for aversive conditions that can be escaped by compliance with that rule (Malott, 1993). Such a nonverbal aversive condition, often called "fear" or "guilt" may arise from failure to comply with a rule. Self-reinforcement or punishment might resemble covert
verbal statements like, "I am doing a good job here, I only have six pages to go," or "if I finish this project at 6:00 p.m. I can go to an evening show," or "if I turn in this report before I leave work I will avoid being reprimanded tomorrow."

There are rules that are easy to follow and rules that are hard to follow. Rules that are easy to follow describe direct-acting contingencies that reinforce or punish a response because the outcomes are immediate, probable, and sizable; or indirect-acting contingencies that control a response by the outcome specified in that contingency because the outcomes are probable and sizable, even though they are delayed. Rules that are hard to follow describe ineffective contingencies that do not control the response because the outcomes are small but cumulative or improbable (Malott, 1993) (Figure 1).

Contrary to much human operant research (Matthews, et al., 1985; Shimoff, et al., 1986; and Shimoff, et al., 1981), rules often control behavior because the outcomes confirm those rules. Self-statements that are generated immediately following the outcome may increase the likelihood of making that statement under similar circumstances. However, if the outcomes fail to confirm the rules—for example, if you put money into a coke machine and you do not get any coke in return, then you will not
continue to put more money in the machine hoping to get a coke—clearly the rule has changed. (There are exceptions, e.g., rules prescribing the prerequisites to entering heaven do not require confirmation.)

Figure 1. Rules: Easy-to-Follow Rules and Hard-to-Follow Rules.

The Three-contingency Model of Performance Management

The three-contingency model of performance management is an applied behavior analytic tool based on Malott's (1993) theory of rule-governed behavior. This model applies to the management of behavior with verbal populations and involves the distinction between direct-acting and indirect-acting contingencies of reinforcement and punishment (that is, between contingencies whose outcomes are sufficiently immediate as to directly reinforce or punish behavior and those that are not).

The three-contingency model of performance manage-
ment should not be confused with Skinner's (1957) three-term contingency. The three contingencies are the ineffective-natural contingency, the performance-management contingency, and the theoretical contingency. We need the model because of the ineffective-natural contingency. This contingency always produces a meaningful outcome affecting society or the individual; but, when the outcome is small and cumulative and improbable, it is ineffective. For example, a single bite of ice cream is probably not harmful; but several bites add up to an unhealthy physical state. The effect of one bite of ice cream is small, but the cumulative effect of several bites of ice cream is significant.

The model operates on aversive control related to the performance-management contingency. Generally the reinforcement contingency is an avoidance contingency. This avoidance contingency can be direct-acting or indirect-acting. An indirect-acting avoidance contingency is an analog to avoidance. A rule-governed analog to reinforcement by the presentation of a reinforcer is defined as "a) An increase in the likelihood of a response b) because of a rule-stating the occasions when the response will produce a reinforcer," (Malott et al., 1993, p. 349). Failure to make the response would result in the loss of an opportunity to get a reinforcer. The
avoidance of the loss of a reinforcer is defined such that, "a) a response becomes more likely in the future, b) if the prevention of c) the loss of a reinforcer d) has immediately followed it e) in the past" (Malott et al., 1993, p. 242). Most people behave in ways that avoid the loss of a reinforcer. Consider driving, for example: most people stop at intersections because failure to stop has a high probability of resulting in the loss of a reinforcer. The following illustrates how the three-contingency model applies to putting your foot on the break at stop signs.

The ineffective-natural contingency would look as follows:

There is a low probability you will get in an accident. ==> Step on the brake. ==> There is an infinitesimally lower probability you will get in an accident.

The performance-management contingency would look like this:

You will lose $10 on Friday at 5:00 p.m. ==> Step on the brake. ==> You will not lose $10 on Friday at 5:00 p.m.

The problem is that behavior is controlled by direct-acting contingencies of reinforcement and punishment, but the performance-management contingency involves a delayed outcome and, therefore, it is not direct-
acting. Behavior controlled by delayed outcomes and indirect-acting contingencies can be understood by explaining the two-factor theory of avoidance.

In general the two-factor theory describes the relationship between the performance-management contingency and the inferred theoretical contingency; this relationship explains how the indirect-acting performance-management contingency controls behavior. In the two-factor theory, avoidance behavior is reinforced by the termination of the warning stimulus, "a) a stimulus that precedes b) the presentation of c) an aversive condition," (Malott, et al., 1993, p. 247), not by the avoidance of the original aversive stimulus condition. So the avoidance response is an escape response. An unlearned (or previously learned) aversive stimulus is paired with a neutral stimulus. After several pairings, the neutral stimulus will become a learned aversive stimulus. The learned aversive stimulus, is called a warning stimulus, when it precedes the presentation of the unlearned aversive stimulus. For example, a light (learned aversive stimulus) is paired with a shock (unlearned aversive stimulus). The light is then turned on for 15 seconds followed by the shock. If the rat presses the lever before the 15 seconds has elapsed, then the light turns off and it is not followed by the shock. If the rat
waits until after 15 seconds has passed, then the shock turns on. A lever press will terminate the shock. A lever press in the presence of the light is an escape response; the rat escapes the learned-aversive light and avoids the presentation of an aversive stimulus (shock).

The inferred escape contingency is the third contingency in the model. The rule describing the performance-management contingency functions as an establishing operation which is

\begin{itemize}
  \item a) a procedure that
  \item b) establishes the sensitivity (susceptibility)
  \item c) (first) to reinforcement or punishment
  \item d) by particular reinforcers or aversive conditions
  \item e) and (second) to evocation or suppression
  \item f) by associated discriminative stimuli
  \end{itemize}

(Malott, et al., 1993, p. 159);

or

an environmental event, operation or stimulus condition that affects an organism by momentarily altering (a) the reinforcing effectiveness of other events, and (b) the frequency of occurrence of the type of behavior that had been conseuted by those other events (Michael, 1993, p. 58).

Its statement establishes an aversive condition labeled "fear" or "anxiety" or just the "cold sweats." In other words, using the previous example involving the intersection, the theoretical contingency would be as follows:

You fear losing $10 on Friday. \implies Step on the brake. \implies You do not fear losing $10 on Friday.

A number of critical variables were used to describe and define each of the three-contingencies in the model.
These critical variables were developed through an empirical analysis, rather than the purely logical analysis that Tiemann and Markle (1990) and Engelmann and Carnine (1982) describe.

The appropriate use of the three-contingency model is (a) to determine the ineffective-natural contingencies that fail to control the target behavior as desired, (b) to identify and employ effective, indirect-acting performance-management contingencies with the intention of appropriately controlling the target behavior, and (c) to infer the theoretical direct-acting contingency that supports the indirect-acting performance-management contingency.

The three-contingency model of performance management can be applied across a range of settings and populations, serving as a trouble-shooting tool to analyze and solve performance problems. Performance management problems can usually be corrected when effective performance-management systems are implemented. Although the present study focuses on problems that involve increasing behavior, the three-contingency model can be used for problems for decreasing behavior.
The Need for the Three-contingency Model of Performance Management: Applications in Higher Education

In all settings, including higher education, there are two common reasons why performance is not at the expected level: (1) the individual lacks the skill, or (2) the individual possesses the skill but does not use it. Therefore, one of two interventions can be used: (1) training or (2) performance management.

In this section, a theoretical analysis of the contingencies controlling academic performance of freshmen is described and related to the three-contingency model of performance management, followed by some examples of research employing different methods of performance management in the academic setting.

Generally it is assumed, that most students entering college have the skills necessary to succeed in college; however, this is not always true. In Michael's (1991) behavioral analysis of college instruction, three problems are identified that explain why incoming freshman fail to do well: the first problem is the different teaching practices between high school and college. High school courses are taught using in-class work groups, presentations, and group discussions; and students grades are based on these performances. The second problem is that, in high school, course grades are based on attend-
ance and participation, with exam scores accounting for an insignificant part of the grade. The third problem is that, in high school, the majority of the course grade is based on activities occurring in the classroom.

By contrast, in college content courses, students' grades are based on textbook learning and lecture, course work is completed outside the classroom, and the grade depends on the exams. Therefore, the freshman may be unprepared to succeed in college because the basic skill repertoire has not been previously established in high school.

Michael suggests that the examination grade motivates study behavior, but adequate examination preparation requires at least twice as much study effort by the student outside the classroom as spent in the classroom in order to acquire an average grade. Exam grades are the primary motivational variables available to the instructor and sufficient study will more likely occur if exams are closely associated with the course grade. The contingencies should be carefully arranged so the student is controlled by (a) the relation between study behavior and the examination grade and (b) the relation between the examination grade and the course grade.

Students typically procrastinate and do all their studying in the last half to last quarter of the study
interval between the assignment and the inflexible examination deadline. Michael calls this the procrastination scallop. Instructors who schedule two or three examinations a semester have students who only study two or three times a semester, just before the examination deadline; however, students who have 12 examinations a semester might study four times as much. Therefore, one way to improve performance on examinations is to ensure that students spend more time studying. Studying can be increased by arranging the contingencies so students have frequent examinations. These are rule-governed analogs to avoidance contingencies, defined as an increase in the likelihood of a response because of a rule stating the occasions when the response will prevent an aversive condition.

These are analog contingencies, because of the substantial delays (greater than 60 seconds), between the time the student has finished a single study session (e.g., one hour of reading a textbook) and the time the student has taken the examination and received the examination grade. It is the statement of the contingency-specifying rule that controls the behavior (e.g., "if you don't study for your examination you will lose the opportunity to get an acceptable grade"). With rule-governed behavior, performance can be successfully managed; even
with delayed outcomes.

The three-contingency model of performance management can be used to analyze the more traditional monthly examinations (Figure 2) that poorly control studying and the recommended weekly examinations (Figure 3) that more effectively control studying. This analysis should explain why weekly examinations are more effective.

**Ineffective Natural Contingency**

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has one level of knowledge</td>
<td>Study text for one hour</td>
<td>Has a small increment of knowledge</td>
</tr>
</tbody>
</table>

**Effective Indirect-Acting Performance Management Contingency**

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Prob. of loss of op. for good grade</td>
<td>Study text for one hour</td>
<td>Slightly lower prob. of loss of opportunity</td>
</tr>
</tbody>
</table>

**Direct-Acting Theoretical Contingency**

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little fear of loss of op. for good grade</td>
<td>Study text for one hour</td>
<td>Slightly less fear of loss of opportunity</td>
</tr>
</tbody>
</table>

Figure 2. Monthly Examinations.

As the two figures show, the same ineffective-natural contingency applies to both the more traditional
monthly examinations and the recommended weekly examinations. In both cases, a rule describing the ineffective-natural contingency fails to control studying because the outcome of any single instance of studying is too small, even though the outcomes of repeated instances of studying will be of cumulative significance. However, a difference in the frequency of exams results in different performance-management contingencies, and it is this difference in the resultant performance-management contingencies that causes the difference in amounts of study assumed to occur.

First consider the monthly examination: during, for instance, the first five days after an examination, a single instance of failure to study will have little impact on the student's examination grade because the student still has enough of time to study before the examination deadline. In other words, the outcome of a single instance of studying will have little effect in preventing the loss of an opportunity for a good grade—the change from the before condition (low probability of the loss of the opportunity for a good grade) to the after condition (slightly lower probability of the loss of the opportunity for a good grade) will be too small to evoke an instance of studying (Figure 2).

Now consider the consequences of studying for the
weekly examination: during the first five days after an examination, a single instance of failure to study will have a large impact on the student's examination grade because the student does not have much time to study before the next examination deadline. In other words, the outcome of a single instance of studying will have an extraordinary effect in preventing the loss of an opportunity for a good grade—the change from the before condition (high probability of the loss of the opportunity for a good grade) to the after condition (lower probability of the loss of the opportunity for a good grade) will be sizable enough to evoke an instance of studying (Figure 3).

However, both performance-management contingencies are analogs to avoidance contingencies (i.e., they involve outcomes that are too delayed to maintain studying). Therefore, a direct-acting contingency needs to be inferred to account for the difference in effectiveness of the two performance-management contingencies.

Again, consider the monthly examinations first: during the first five days after the examination, a statement of the rule describing the performance-management contingency will function as an establishing operation to create very little aversiveness. In other words, suppose the student states the rule, "studying for
Ineffective Natural Contingency

Before
Has one level of knowledge

Behavior
Study text for one hour

After
Has a small increment of knowledge

Effective Indirect-Acting Performance Management Contingency

Before
High Prob. of loss of op. for good grade

Behavior
Study text for one hour

After
Much lower prob. of loss of opportunity

Direct-Acting Theoretical Contingency

Before
Much fear of loss of op. for good grade

Behavior
Study text for one hour

After
Much less fear of loss of opportunity

Figure 3. Weekly Examinations.

one hour will slightly reduce the probability of the loss of an opportunity for a good grade." Or the student might state this variant: "if I don't study for an hour now, I will have a low probability of losing the opportunity for a good grade." This is easily translated into, "even if I don't study for an hour now, the probability of losing my opportunity for a good grade is still low." In any case, the best such statements can do is to establish a low level of fear of the loss of the opportunity for a good grade. And such a low level of aversiveness
in the before condition causes the inferred escape contingency to be ineffective (the third contingency in Figure 2). So, why are the monthly examinations relatively ineffective in controlling studying? Because the monthly schedule generates a relatively ineffective performance-management contingency, at least during the first part of the monthly interval. And why is that performance-management contingency ineffective? Because it, in turn, generates a relatively ineffective, inferred, direct-acting escape contingency, at least during the first part of the monthly interval.

The difference between the ineffective performance-management contingency—monthly examinations and the effective performance-management contingency—weekly examinations, is the degree of aversiveness produced by a statement of the rule describing the performance-management contingency. As seen in Figure 3, the change from the before condition to the after condition in the performance management contingency is significant which generates an effective inferred, direct-acting escape contingency.

In a sample of the literature on performance management in higher education, Jackson and Malott (1994) and Malott (1993) noted that the most common reasons given for student attrition included academic skill deficits,
low motivation, and lack of self-management or time-management. If the student is deficient in academic skills, however, motivation alone will not result in successful performance and the student will need additional academic training. Finally, motivation as well as self-management (time-management) can be accomplished using effective performance management systems. However, the distinction between motivation and self-management (time-management) skills is often moot; in other words, students who are commonly and falsely blamed for being unmotivated may really be doing poorly because of poor self-management skills, not because lack of motivation. Jackson and Malott (1994) suggest one solution to the problem of attrition among high-risk black students: the three-contingency model of performance management.

For example, why is it that students do not study more frequently? It is easy to get students to commit to an intensive study schedule, but it is difficult to get them to comply with that schedule. In most areas of performance, professionals often fail to realize that commitment is rarely sufficient to guarantee compliance; instead compliance often requires performance-management contingencies (Malott, 1992).

Yancey (1983) used a performance-management system to deliver point reinforcers for frequent study using
daily self-monitoring sheets; although there was a trend favoring the experimental group, the results were not statistically significant. However, a follow-up study by Jager (1984) found a statistically significant overall increase of 0.66 (grade point average) in the experimental group, compared with 0.26 for the control group (p < .05). Wittkopp's (1984) and Jackson's (1990) replication studies failed to support these results. These studies do not provide conclusive findings regarding the utility of performance-management systems; however, most behavior analysts would agree that performance management is necessary in many conditions. Students have the skills necessary to succeed in college; there just are not effective performance-management contingencies.

Reinforcement of the Three-Contingency Model

In the three-contingency model, each contingency must meet specific criteria for theoretical consistency. Because students find this difficult, the goal of the current effort is to develop an effective instructional unit to teach the proper application of the three-contingency model.

The approach used here, toward the refinement of the three-contingency model of performance management was the development of a set of critical variables, in the form
of a checklist, for the appropriate application of the three-contingency model. In relatively new areas, such as behavior analysis, systematic efforts to revise instructional materials until they are optimally effective can readily result in an increased clarity and precision of the concepts, principles, or theory being taught.

The present symbiotic interaction between theory and instruction is done with the goal of developing a job aid or checklist of critical variables to help the user discriminate between appropriate and inappropriate applications of the three-contingency model during training and to facilitate appropriate applications to novel behavioral problems. A critical variable functions as a rule, in the sense that it gives the student critical information about the contingency, not exactly in the sense of rule-governed behavior. What follows each critical attribute in the workbook units are a series of examples and nonexamples that attempt to teach that critical variable. Theoretically, the critical variable checklist should be a complete set of principles that defines each concept; however, as gaps between theory and practice are revealed, the critical variable checklist must be revised to accommodate gaps defining concepts.
Goal 2: Instructional-Program Development

Concept Training

From a behavioral perspective, a concept is a set of stimuli that share common properties (Malott et al., 1993, p. 213). A concept can control behavior simply as a result of a statement of the definition. However, for more complex or subtle concepts, training to discriminate between examples and nonexamples is needed. Concept learning and analysis is part of a broader category of complex cognitive learning which also includes principle applying, and strategies (Tiemann & Markle, 1990).

Behavior analysts traditionally talk about the development of conceptual stimulus control in terms of simple contingency control or contingency shaping (Chase & Danforth, 1991); however, conceptual control can also be acquired by advanced learners through rule control (definitions of the concepts). In keeping with the rule-control approach, Markle's (1964) theory and practice of instructional design is based on the presentation of a rule, followed by discrimination training. A sequence of examples and nonexamples are used to teach the learner fine discriminations between concepts by altering one critical attribute at a time, in a sequential manner.

True conceptual stimulus control occurs only if that
control transfers to novel stimuli sampled from a universe of similar but different concepts within the same stimulus class. The goal is to teach students (a) to identify instances of the concept, in spite of variations on irrelevant attributes; and (b) to discriminate the concept from similar noninstances that vary from that concept on a single, crucial, relevant attribute.

Conceptual Relationship

The relationship between concepts may be superordinate, subordinate, or coordinate. For example, in the three-contingency model of performance management, contingencies are the superordinate; and natural ineffective contingencies, performance-management contingencies, and theoretical contingencies are subordinate to contingencies; these three contingencies are coordinate with each other (Figure 4).

In discrimination training, examples and nonexamples should be presented at the coordinate level. And it is important to ensure that these categories at the coordinate level are mutually exclusive; otherwise, the teaching process will produce an ambiguous learning condition and learning will not be faultless (Englemann & Carnine, 1982). In the present example, the categories of the three contingencies are mutually exclusive. Concerning
conceptual instruction, Tiemann and Markle (1990) state:

At the very minimum, we expect to see: (a) more than one example used to illustrate the concept; (b) nonexamples, usually of coordinate concepts which may also be named; and, (c) appropriate practice items presenting new specimens to test for generalization and discrimination (p. 83).

This summarizes the teaching of concepts. Next we will consider the teaching of principles.

Principles

Principles is the second area of complex cognitive learning. Tiemann & Markle (1990) define "a principle as a statement of a conceptual relationship, usually between two or more concepts" (p. 141). For example, the natural contingency must be ineffective; that is, it does not control behavior, and it must have a small outcome, that
is, it is not sizable enough to control behavior. Therefore, the need for performance management. The relationship between these two concepts describes the degree of control the natural contingency has over the behavior.

Principles must be stated accurately (Tiemann and Markle, 1990). For example, it would be inaccurate to state, that all natural contingencies are ineffective. Instead, it would be accurate to state, that some natural contingencies are effective, but the majority of natural contingencies are ineffective and therefore the need for performance management is important. Stating this principle in an IF..., THEN... format more clearly specifies the relationship between the concepts. If the contingency fails to control behavior, then it is an ineffective contingency. When the set of exceptions to the rule is small and discrete, then the exceptions may be added to the rule statement, otherwise attempting to clarify the exceptions complicates the rule.

Strategies

Strategies is the third area of complex cognitive learning. Strategies are procedures, a set of rules, "a strategy is an organized attack on a problem situation" (Tiemann & Markle, 1990, p. 165). Strategies can be developed and applied to a range of content areas inde-
dependent of the complexity of the content area. However, an individual may be expert when applying a particular strategy, but meet with failure if that individual lacks sufficient knowledge of the content area. Therefore, successful application of a strategy often requires both expertise in the content area and expertise in applying the strategy.

In this section we have covered the teaching of concepts, principles, and strategies—all three of which are subsumed under what Teimann and Markle call complex cognitive learning. These categories are interrelated. Teimann and Markle (1993) point out, that once a strategy is developed to solve a problem, it may be applied to problems with different content (p. 167). However, a few things may go wrong.

First, if the strategist has forgotten to include a step in the procedure or if the step is unclear these omissions or ambiguities will result in failure to solve the problem, unrelated to its complexity. For example, when applying the three-contingency model to increase study behavior, the analyst may associate the theoretical contingency to the natural contingency, an error of procedure; instead the theoretical contingency should be associated with the performance-management contingency. The omission of this critical attribute results in fail-
ure to follow each step in the application of the model. A second problem results from inadequate application and follow through of a strategy. For example, if the behaviorist applies the model to a person instead of a behavior, then the model has been incorrectly applied. The model is a strategy designed for the purpose of changing behavior across a range of settings and with different populations. And third, even if the procedure has well sequenced steps and the order of the steps is logical, problem solving will not be successful if the analyst is not familiar with the content of the subject matter being analyzed. For example, someone using the model would not only know how to follow the strategy, but also have some expertise in behavior analysis.

Goal 3: Testing for Functional Independence and Transfer

Instructional Typology

Chase, Johnson, and Sulzer-Azaroff (1985) developed a learning typology which they evaluated in terms of its utility for classifying conceptual learning and which they applied to their own research on discrimination learning and transfer of training. The typology also describes the present work with its emphasis on concept-discrimination training and concept-exemplification training.
Johnson and Chase (1981) reviewed surveys of the type of instructional technology required to train experienced trainees; they identified nine competency areas for building an expert repertoire. The surveys showed that about 19% of training applications focused on teaching trainees to state facts, figures, and definitions. From 50% to 98% focused on teaching trainee's to define and recall complex tasks.

Their conclusion was that current typologies and instructional programs are inadequate for the building of expert repertoires. For example, Bloom's taxonomy of learning includes six classes: knowledge, comprehension, application, analysis, synthesis, and evaluation. Johnson and Chase (1981) cite the following deficiencies with such a typology: (a) the classification is based on inference; (b) the focus is on structural properties of objectives, disregarding the context in which performance occurs; and (c) the typology makes assumptions about the difficulty of its various instructional classes. But Johnson and Chase emphasize that such a typology has two even greater deficiencies: (1) the classes are assumed to be hierarchical and, (2) the typology classifies tasks based on inferences about unobservable mental processes (schema's) that yields low interrater reliability between task and class.
To elaborate, a hierarchy implies that one level of learning precedes the next. In other words, before a learner can advance to higher levels of learning he or she must first master the responses at preceding levels. Although this is true in some cases, this is not always supported by empirical evidence (White, 1973).

The use of inferred mental processes (schema's) produces a lack of agreement when attempting to classify instructional tasks. It can be difficult to determine whether to classify a learning task as synthesis or as comprehension. For example, the task of constructing a performance-management contingency might be classified as application by one rater and classified as synthesis by a different rater.

As an alternative to Bloomian typologies, Johnson and Chase (1985) recommended using a typology based on Skinner's (1957) analysis of verbal behavior, including his concepts of echoic, textual, intraverbal, and tact. The typology is a functional classification system that accounts for four important weaknesses in other classification systems: (1) the relations between stimulus conditions and verbal performance is specified, (2) the typological classes are not assumed to be hierarchical, (3) the classes can be applied across different content areas with different populations of learners, and (4) the
typology can be used to discriminate between basic and extended or generalized learning (Table 1).

**Table 1**

Typology of Verbal Instructional Tasks

<table>
<thead>
<tr>
<th>Elementary and Conceptual Tasks</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echoic</td>
<td>Correctly repeat the following lines from Shakespeare's <em>Hamlet</em>. Be sure to copy my intonation closely.</td>
</tr>
<tr>
<td>Textual</td>
<td>Correctly copy the following medical terms.</td>
</tr>
<tr>
<td>Transcriptive</td>
<td></td>
</tr>
<tr>
<td>Copying from text</td>
<td>Correctly copy the following Chinese letters.</td>
</tr>
<tr>
<td>Taking dictation</td>
<td>Correctly spell the following names for laboratory equipment as I say them.</td>
</tr>
<tr>
<td>Intraverbal</td>
<td></td>
</tr>
<tr>
<td>Define/describe</td>
<td>Define reinforcement.</td>
</tr>
<tr>
<td>Example identification</td>
<td>Say which of the following written scenarios is an example of positive reinforcement.</td>
</tr>
<tr>
<td>Example-request</td>
<td>Give an example of reinforcement.</td>
</tr>
<tr>
<td>Tact</td>
<td></td>
</tr>
<tr>
<td>Example description</td>
<td>Describe the technical properties of the plant specimens on the laboratory table.</td>
</tr>
<tr>
<td>Example identification</td>
<td>Say whether each of the following videotaped scenarios illustrates assertive or aggressive behavior.</td>
</tr>
</tbody>
</table>
Table 1—Continued

<table>
<thead>
<tr>
<th>Elementary and Conceptual Tasks</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example component Analysis</td>
<td>Identify at least three distinctive features of each of the wines in the goblets in front of you.</td>
</tr>
<tr>
<td>Combinations</td>
<td>Any two or more of the above tasks. Includes tasks requiring mands.</td>
</tr>
</tbody>
</table>


Concept-Discrimination Training

Discrimination training is one of the two methods of concept training used in the present research. This discrimination training procedure involves discriminations between examples and nonexamples of the concept (Tiemann & Markle, 1990, pp. 111-112). More specifically, the student discriminates between examples containing all the critical variables and nonexamples that do not contain all the critical variables.

Consider the concept of effective performance-management contingency (example) versus ineffective performance-management contingency (nonexample). A critical attribute is that the effective contingency must have a deadline, at least for those contingencies designed to increase or maintain performance. So an exam-
ple would be as follows:

At 10:00 a.m., Bob will lose opportunity to borrow the family car. ==> Bob does the breakfast dishes. ==> At 10:00 a.m., Bob will not lose opportunity to borrow the family car.

And a nonexample would be as follows:

Bob does not have opportunity to borrow the family car. ==> Bob does the dishes. ==> Bob has opportunity to borrow the family car.

Incidentally, this second contingency is ineffective, at least relatively ineffective, because it allows Bob to procrastinate on doing the dishes much longer than his parents might wish.

A new example results when variable features are changed, like changing the reinforcer from the opportunity to borrow the family car to the opportunity to get the weekly allowance.

Nonexamples are close in when they differ from an example by only one critical attribute (the deadline); they are far out when they differ along many critical variables at the same time (the deadline, the size of the reinforcer, and the probability of the reinforcer). Several close-in nonexamples of the critical variables are necessary. Discrimination training with close-in examples is more difficult than with far-out examples,
but it produces better conceptual control when presented with novel examples.

The difficulty in concept training can be illustrated in a study by Miller and Weaver (1976). They evaluated the effectiveness of a concept training program to teach behavioral concepts, to determine if the programming resulted in generalization of the concept, and to determine if the programmed text was more effective than a traditional textbook. The programmed materials consisted of an introduction, concept training, and testing in four different concept areas, research methods, stimulus control, aversive control, and reinforcement control.

First, all sections were effective in teaching the concepts; subtest scores on the methods unit and aversive control unit resulted in performance increases from 78% and 67% correct respectively, to 95% correct. Second, results show that programmed materials were effective in training for students to generalize and that different components of the training materials resulted in successive improvements in their ability to generalize. Third, a comparison of the effectiveness of programmed text versus traditional text, students having read the programmed text gained an average of 24% on posttest scores and students having read the traditional text gained 15%
on posttest scores. Discrimination training and exemplification training are two different methods that can be used to teach the same concept. However, it is unclear if one method has distinct advantages over the other method.

**Concept-Exemplification Training**

Exemplification training differs from discrimination training in some important ways, particularly in the context of programmed instruction. Exemplification training requires the student to learn a different response than the response trained in discrimination training.

An exemplification response requires that the learner "do" something, create or design a response contrasted with a discrimination response which requires the learner makes one of two or more responses that have been provided. From a methodological perspective exemplification training is usually more resource intensive and usually limited to one on one teaching. Feedback cannot be programmed easily; instead the trainer must observe the student's response to provide feedback. Exemplification training requires that the student provide an example. The construction response usually involves a chain of behaviors before the end product is completed. Errors
can occur at any point in the chain. Without corrective feedback the student is likely to be discouraged and fail. The scoring criteria for exemplification responses can be less objective or more variable than with discrimination responses, depending on the complexity of the concept being trained.

Shimamune (1992) pointed out that when the desired terminal response is an exemplification response, then it may be more desirable to train using exemplification rather than discrimination because studies have failed to conclusively show functional dependence between response classes, i.e., discrimination and construction responses (Shimamune, 1992; Chase, Johnson, & Sulzer-Azaroff, 1985). Further, testing, training, and scoring construction responses are significantly more time consuming than are testing, training, and scoring discrimination responses (Shimamune, 1992; Tudor & Bostow, 1993).

**Functional Independence and Transfer**

Chase et al. (1985) also developed an instructional program. The instructional program involved programmed concept training on three different concepts. For each concept subjects were tested using Skinner's (1957) verbal classification system, specifically related to the intraverbal which is divided into three different func-
tional subclasses: (1) defining concepts (definition), (2) identifying novel examples of those concepts (discrimination), and (3) generating original examples of the concepts (exemplification) (Table 1).

During training, subjects were given a prose passage that defined, described, and exemplified the concept. This was followed by definition, identification, and exemplification tasks for the subject to complete. Performance on each intraverbal task was measured in terms of rate and accuracy (percentage correct). Subjects were provided immediate feedback at the completion of each question. During testing for extension (testing on items similar to training) and transfer (testing on items that were novel), subjects were required to perform on definition, identification, and exemplification tasks without the prose passage. The experimental questions were: Do subjects have different rates of accurate responding during training for the three different intravernals? Does training on one intraverbal facilitate performance on a different intraverbal—simple transfer of training? And is training on some intraverbal tasks more effective than training on others in producing higher accuracy on test items requiring a combination of the intraverbal tasks?

Performance on the identification (discrimination)
problems was rapid, but filled with errors; performance on definition and exemplification problems was slow but accurate (Chase et al., 1985). The authors suggested that this hints at a functional difference among the three intraverbal tasks. They also found other data more strongly supporting functional differences and even functional independence among the three intraverbal tasks. Learning one type of intraverbal, e.g., definition, did not increase performance on a different intraverbal, e.g., exemplification. This effect was evaluated during the training sessions, where subjects were tested using a counterbalanced Latin square experimental design.

Transfer of training differs from generalization, but the two concepts are sometimes equated. Suppose a response is evoked by a novel stimulus possessing some, but not all of the critical variables of the trained stimulus. In other words, the response is under weak stimulus control by the critical variables of the concept. By contrast, a response that is evoked by a novel stimulus possessing many of the critical variables and several variable attributes, is under better stimulus control. For example, if a child is trained to correctly name a square, but later said "square" in the presence of a rectangle, then the child would have made an error of generalization. A rectangle does not possess the criti-
cal attribute of four equal lines intersecting to create four right angles. If the child said "square" in the presence of a box, a square house, a block, or a square picture frame the child would be demonstrating transfer of training, synonymous with generic tact extension (Alessi, 1987). Generalized responses are only in error when the same response is made to a novel stimulus outside of the stimulus class for which the subject was trained. A generalized response tested in the presence of a novel stimulus within the stimulus class for which the subject was trained is not in error.

Gorrell (1993) evaluated the trainee's ability to solve novel problems using concepts and rules from behavior analysis. The results suggested that skills learned in training transferred when the students were presented with a novel problem. In a 2 x (cognitive modeling versus direct instruction) by 2 (implicit rules or explicit rules) study, Gorrell found a statistically significant improvement on posttest concept scores. And the cognitive-modeling/implicit-rules group had higher concept-use posttest scores than the direct-instruction/explicit-rules group when using behavior-analysis concepts to solve hypothetical classroom problems. The posttest scores for applying rules correctly, in hypothetical situations, significantly improved with both
cognitive modeling and direct instruction. The authors did not describe either the cognitive-modeling or direct-instruction teaching programs; therefore, it is unclear whether these technologies were distinctly different or if there was overlap.

The present study employs the typology recommended by Johnson et al. (1985). Two types of intraverbals were trained: concept-discrimination and concept-exemplification. The third type of intraverbal, definition, was not trained. The term concept-discrimination training is synonymous with Chase and Johnson's (1981) use of the term identification. One purpose for training each of the two intraverbals is to determine if transfer of training occurs, in other words, does training on concept-discrimination transfer to concept-exemplification?

Training is implemented using several examples and nonexamples, then student performance is evaluated using novel examples and nonexamples of the trained concept. When students correctly discriminate between novel examples and nonexamples, they have learned to discriminate what is and is not the trained concept. The smaller the differences along some relevant attribute between examples and nonexamples of a concept, the more difficult the discrimination. For instance the small but relevant differences between a performance-management outcome with
a deadline and a performance-management outcome without a deadline will result in a more difficult discrimination and thus more difficult concept formation. Large multi-attributional differences between an ineffective-natural contingency and a performance-management contingency will result in easy concept formation with regard to those two concepts.

In the current research, all three types of intra-verbals—definition, discrimination, and exemplification—were part of the training materials. The job aid lists not only the critical variables but also the definition of each attribute; the students were not required to memorize the definitions; in other words, the checklist bypasses the need for training to state the definitions. So presumably this job-aid checklist reduced the amount of training time. It would be more important for the students to memorize the definitions of the critical variables, if the students were using them every day, or if fluency was crucial. Each critical attribute was elaborated in the workbook unit. The workbook contained sections on both concept-discrimination training and concept-exemplification training.

Shimamune's (1992) results were mixed: subjects trained on the discrimination response did well on the posttest discrimination questions and construction ques-
tions; however, subjects trained on the construction response did less well on the posttest discrimination questions, but performed better on the posttest construction questions. These results hint at the possibility that teaching one type of task may be more effective than another at facilitating transfer of training. Chase et al. (1985) found that performance accuracy differed between identification tasks and definition or exemplification tasks, suggesting functional independence between intraverbal subclasses. Because of these results, the present study attempted to test for transfer of training or functional independence between two intraverbal response classes. If, for example, a subject was trained to discriminate between performance-management contingencies and ineffective-natural contingencies using discrimination training, would he or she be able to produce a better example of each contingency without having received exemplification training, than if he or she had received no discrimination training at all? All groups differed significantly from the control group on the construction posttest. The construction-response group did not perform significantly different than the reading group or the concept-training group on the posttest construction questions. This finding was unexpected, because theoretically it is anticipated that subjects
trained on discrimination type questions have not learned the prerequisite skills required to accurately respond to exemplification tasks. These results would seem to support the notion of functional dependence between response classes. In other words, transfer of training from one response class (discrimination versus construction or construction versus discrimination) to another response class seemed to occur.

Goal 4: Testing the Value of Active Responding

Active Responding

The present study is a continuation of a line of thematic research begun by Shimamune (1992) and Vunovich (1994). They tested two common assumptions of behaviorally-based programmed instruction: The first assumption is that active responding (e.g., making explicit discriminations between examples and nonexamples of a concept) is more effective than passive responding (e.g., simply reading correctly classified examples and nonexamples of a concept).

The second assumption concerned terminal response training. A terminal response is that response specified in the objective (Brethower & Smalley, 1992). For example, does training on discrimination tasks transfer to testing using exemplification tests. In other words, are
these response classes functionally dependent (allowing for transfer) or are they independent?

Shimamune's study involved three experimental groups: active concept training, active construction-response training, and passive concept training, and a control group. The construction-response training was an exemplification task and the concept-training was a discrimination task. Both tasks were assessed on a pretest/posttest measure. Shimamune found significant differences within groups from the pretest to the posttest scores at the P < .01 for all experimental groups, using a paired-t test with 13 df.

Performance improvement for the active concept-training group and for the passive concept training group were about equal and performance improvement for the construction group was significantly less, on the discrimination questions. The similar levels of improvement obtained for the passive reading group and the active concept-training group failed to support the need for active responding. In other words, active responding did not improve performance on discrimination questions, contrary to conventional behavioral wisdom, (Kinder & Carnine, 1991).

One of the arguments against the active response requirement is the lack of control for active responding
in the passive-response-only groups. A student could covertly rehearse an answer or calculate the answer to a math problem without making any overt response, like writing a sentence or a number on paper. Several factors may contribute to the lack of data that support the benefits of active responding (Silverman, 1978; Tobias, 1973). One is that experienced learners most likely possess a repertoire of problem solving skills and strategy implementation that is automatically implemented, thus obviating the need for active responding. Novice learners may need to take an elemental approach to problem solving; they may need to "think aloud" resulting in overt behaviors that correspond to each step in the problem solving process, even though the instructional program did not explicitly require them. Other reasons why the benefits of active responding were not found may be because of the learners' familiarity with the content of the programmed instruction (Abraham & Kagen, 1975) or the effectiveness of the instructional materials (Kemp & Holland, 1966; Vargas, 1986). Perhaps a series of systematic replications to test for these individual effects would result in a better understanding of the utility of these common assumptions.

Todor and Bostow (1991) tested whether active responding would improve concept learning measured by
accuracy and generalization. They developed an automated instructional program; the content material was presented on a computer using the principles of programmed instruction. They found active responding was more effective in teaching the concepts than was passive responding or no responding. Students in the active-responding groups averaged 14% more correct responses than students in the read only groups LSD = 9.19. Further, those subjects in the active-responding groups had greater accuracy than those in the passive-responding or read-only groups on the posttest measure. The active-response group showed a statistically significant 13% gain (M = 48.2%) over the passive-response group (M = 35.7%), F(1, 70) = 12.5, p < .001. When students were asked to make a construction response using rules learned in the programmed instructional material, results showed a 21% difference, F(1, 70) = 10.1, p < .001 between the two groups, passive-response group (M = 43% correct) and the active-response group (M = 64% correct). Finally the subjects in the active-response group were able to accurately apply the concepts of programmed instruction when developing novel programs compared with the other groups, demonstrating transfer of training.

Barbetta, Heron, and Heward, (1993) using an alternating treatment design, studied students with develop-
mental disabilities. Students received either verbal error-correction feedback where the teacher recited the correct response, i.e., no student response, or the student recited the correct response, i.e., active student response. The no-student-response group in this study is similar to groups labeled passive responding in other studies.

Four test sessions for word learning were given on the day of training and the day following training. For students in the active-student-response group, the mean test scores, on the day of training were 5.4, 6.7, 7.8, and 8.6. For students in the no-student-response group, these scores were 3.0, 4.6, 5.9 and 6.4 respectively. For students in the active-student-response group, the mean test scores, on the next day of training were 4.0, 6.5, 7.7, and 8.3. For the no-student-response group, these scores were 2.6, 4.2, 5.4, and 6.2 respectively. Students in the active-student-response error correction group learned and maintained more words than students in the no-response-error correction group. These results demonstrate that active responding is more effective when using an error correction procedure for instructional word learning programs. In the present study, active responding was tested in both the concept-discrimination training and concept-exemplification training.
Behavioral-Based Instructional Programs
Employing Active Responding

Although there are many theories and strategies regarding instructional technology, this section will focus on behavioral-based theories, technologies, and applications. Behavioral-based instructional technology has been available for decades, yet educators and some industrial trainers fail to utilize proven methods (Englemann & Carnine, 1882; Markle, 1990; Cook, 1983). Factors that may account for failure to employ methods such as programmed-instruction technology include the extensive development time of the instructional materials (Homme & Glaser, 1959), the cost of development (Mechner, 1965), and the inconsistent results regarding the effectiveness of programmed instruction (Gilbert, 1959). However, programmed instruction has proven highly effective in some learning environments. The claims against programmed instruction may be negligible when the cost and time for development is considered from a long-term perspective. The initial time and investment is large; but, the long-term gain can be substantial.

Two behavioral programs that have successfully employed program instruction are direct instruction and precision teaching, and both require active responding. Both strategies most frequently have been used to help
children who are behind in the educational system.

Direct instruction is a teaching technology that has been successfully employed by a select group of educators for more than 20 years. The theoretical foundation of direct instruction is comprised of three components: empirically based analysis of behavior, logically based analysis of communication, and the logical organization of the analysis of knowledge systems (Engelmann & Carnine, 1982).

Project Follow Through is probably the largest study in the history of educational research where the effectiveness of different instructional technologies was compared. This study was conducted across 22 sites (Engelmann, Becker, Carnine, & Gersten, 1988). Most sites involved students from disadvantaged backgrounds performing below national norms on standardized tests. Generally, these students were followed from kindergarten through the third grade. By the end of the third grade a comparison was made of percentile scores on M.A.T. total reading scores, total math scores, spelling scores, and language scores. This comparison revealed that students in the direct-instruction group were at or above national norms on all measures. A behavior-analysis group (using traditional programmed instruction and contingency management) was also evaluated. These students were at or
above national norms on spelling and total reading.

Behavioral-based instructional design includes four principles: (1) responding overtly in teaching rules and strategies, (2) selecting a range of examples varying on irrelevant attributes while retaining similar attributes, (3) sequencing examples to provide students with alternating examples and nonexamples that vary on fine discriminations, and (4) ultimately, making the trained behavior covert and automatic. The success of direct instruction rests on both the instructional materials and the teaching of those materials using brisk pacing and student-error correction procedures. Two extra recommended features are the use of small groups and repeated practice (Kinder & Carnine, 1991).

Binder, Haughton, and Van Eyk (1990) reported the findings of a study of attention span with kindergarten-through-eighth-grade students. They studied the effects of shorter versus longer practice duration's (15-second intervals up to 16-minute intervals) of digit writing. They found that those students who were less fluent wrote fewer digits and produced more errors with increasing time intervals; in fact, in some cases students stopped working. Students who had attained fluency (rapid, accurate responding) were able to work for longer periods of time.
In a second study reported in the same paper, these authors tested first-grade students in a premultiplication skill. The students were required to write to 20 by 2's for periods ranging from 2 minutes to 10 minutes. They found that when students had not achieved fluency, but were required to perform at longer intervals, they had reduced learning rates compared to those students who had achieved fluency.

Precision teaching was developed in free-operant laboratories (Lindsley, 1992) and shares the same presentation principles as direct instruction, including self-pacing, mastery criteria, practice, and charting of performance using "standard celeration charts" (Binder, 1988). The benefits of precision teaching are improved retention, increased attention span or endurance, and an improved ability to apply skills fluently to novel situations (Binder, 1987). Fluency (a high rate of accurate performance) is the key to precision teaching.

Most programs applying the two behavioral-based instructional technologies have been targeted at disadvantaged children. One program, Morningside Academy, started its work with children labeled attention-deficit disorder. The program has now added literacy training for adults and uses a variety of instructional materials and techniques including direct instruction, precision
teaching, personalized system of instruction, and the methods of Tiemann and Markle (1990). A similar program at Malcolm X College in Chicago, Illinois uses the same instructional design technology to teach disadvantaged precollege students basic college-level skills (Johnson, 1991); both are private sector programs.

Experimental Purpose

To answer experimental questions concerning the necessity of active responding and functional independence, three experimental groups differed (a) as to whether active-discrimination training was required, (b) whether active-exemplification training was required, or (c) whether passive responding on both types of training was sufficient. A fourth group, the control group, received instructional materials related to basic behavioral contingencies. There were a pretest and a posttest, identical across the four groups. Experimental materials in this study included two workbook units covering the three-contingency model. These instructional materials were based on the programmed instructional technology developed by Tiemann and Markle (1990).
Subjects and Setting

Fifty-eight male and female undergraduate students between the ages 18-60 participated in the study; 15 students in each of groups one and two and 14 students in each of groups three and four. Two students were dropped from the analysis: one in group two and one in group four, because they were absent from class and did not take the pretest. Student volunteers were enrolled in three sections of Psychology 360, Concepts and Principles of Behavior Analysis, during the 1994 winter semester, at Western Michigan University. Each participant was given an informed consent form and the risks and benefits were explained, along with acknowledgment of the participant's right to withdrawal from the study without prejudice or penalty at any time (Appendix A).

Materials

Workbook and Checklist

The materials in this experiment consisted of two workbook units designed to teach the three-contingency
model of performance management (Appendix B). These two assignments followed textbook assignments on rule-governed behavior, including a brief introduction to the three-contingency model. The two workbook units included objectives for the units, definitions of the three contingencies used in the model, and definitions of the 14 critical variables used to evaluate correctness of applications of the model. In keeping with the direct-instruction approach described earlier, most of the two workbook units involved examples and nonexamples of contingencies meeting each of the 14 critical variables. Students in two of the three experimental groups were required to discriminate, using multiple-choice questions, violations of the criteria defined in the three-contingency model of performance-management checklist. Students in one of the three experimental groups were required to construct original examples of the three contingencies—diagraming original contingencies and generating original applications of the three-contingency model.

**Mastery Test**

A pre/posttest was developed. The test consisted of completed, correct examples of the three-contingency model of performance management followed by 18 multiple-
choice discrimination-questions and one exemplification-response question. Multiple-choice questions required the student to discriminate among natural contingencies, performance-management contingencies, and theoretical contingencies and to evaluate that contingency in terms of the 14 critical variables. The construction-response question required the student to generate an original example of an application of the three-contingency model.

Materials Development

The experimenter refined the three-contingency model and developed the two units over a period of four months. A major part of this process involved the identification of the 14 critical variables, followed by the creation of a checklist (job aid) listing those criteria and their definitions (Appendix C). The experimenter developed instructional instances of contingencies meeting and failing to meet each critical variable. These materials were tested with thirteen students in Psychology 460, Survey of Behavior Analysis Research (students who had completed Psychology 360). After each evaluation test with two to four of those students, the experimenter would revise and then retest the instructional materials. The same procedure was followed for the development of a
pretest/posttest instrument, involving eight students (Appendix D).

Procedure

Within each of the three sections of Psychology 360, students were randomly assigned to one of four groups: three experimental groups and a control group. The three experimental groups differed among themselves in terms of the structure of the workbook assignments, but not the content of those assignments.

Subjects were randomly assigned within each section to avoid potential biases within classroom settings. (Otherwise, such a bias would have occurred because the students were assigned to each section based on a pretest score at the beginning of the semester; thus, students scoring in the low range were in one section, students scoring in the middle range the next section and students scoring in the high range the third section.) Next, all students in each section were given the pretest, workbook units and four days later followed by the second workbook unit and the posttest.

Active Concept-Discrimination and Active Concept-Exemplification Response Group (AD-AE)

Workbook assignments included active concept-discrimination between instances meeting and not meeting
the 14 critical variables and active concept-exemplification training. In concept-exemplification training, students constructed original examples of key concepts and applications of the three-contingency model, using contingency diagramming. This group and the other two experimental groups used the 14-critical variables check-list as a job aid during their workbook assignments.

Passive Concept-Discrimination and Passive Concept-Exemplification Response Group (PD-PE)

These workbook assignments included active concept-discrimination training and passive concept-exemplification training. In place of the active concept-exemplification requirements, the students read completed examples of the concepts and applications.

Active Concept-Discrimination and Passive Concept-Exemplification Response Group (AD-PE)

These workbook assignments included active concept-discrimination training and passive concept-exemplification training. The concept-exemplification questions were correctly answered where the student in the active concept-exemplification group would have had to come up with his or her own answer.
Control Group (C)

These workbook assignments included two sets of instructional materials, the first pertaining to the eight contingencies of reinforcement and the second pertaining to punishment and penalty (Appendix E).

Mastery Test

Immediately prior to the first workbook assignment and immediately following the second workbook assignment, subjects in all four groups completed the pre/posttest (described earlier). The control group not only controlled for potential confounds that might occur between the pretest and the posttest, but they also controlled for the effects of taking the same test twice.

General Procedures

During the first of two, two-hour class sessions, each student completed the pretest and the first workbook unit, according to the group to which the student was randomly assigned. During the second class session, each student completed the second workbook unit and then the posttest. Four days separated the two sessions.

The conduct of the study was part of the planned course in the usual classroom setting. Students received
20 points for classroom participation and 20 points for the workbook assignment.
CHAPTER III

RESULTS

Concept-Discrimination

None of the four groups showed statistically significant improvement from pretest to posttest on the discrimination questions (analysis of covariance: F(3,57) = 1.27, P > .2940). Therefore, it is not surprising that there were no significant differences among the four groups on the discrimination questions in the posttest (Table 2).

Table 2
Concept-Discrimination Training: Mastery Test Mean Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>AD-AE</th>
<th>PD-PE</th>
<th>AD-PE</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>13.7</td>
<td>15.1</td>
<td>13.8</td>
<td>13.9</td>
</tr>
<tr>
<td>Posttest</td>
<td>14.5</td>
<td>15.2</td>
<td>13.6</td>
<td>14.1</td>
</tr>
</tbody>
</table>

Note: The maximum number of points for the concept discrimination section of the mastery test was 18.

Lower-Scoring and Higher-Scoring

Being further from the asymptotes, students scoring lower on the pretest might have benefitted more from the
workbook than higher-scoring students. Students in all groups were combined and ranked, for the purpose of calculating an overall median score dividing students into higher-scoring students and lower-scoring students. A median score for all groups was calculated, dividing all students into two groups. Students with a score of 14 and below were in the lower-scoring group and students with a score over 14 were in the higher-scoring group. Subjects' data were then presented by group, resulting in eight subgroups.

The difference between the mean pretest and posttest scores was then computed for each of the eight subgroups, reflecting the amount of improvement from pretest to posttest for each subgroup. All lower-scoring subjects in the experimental groups showed mean score increases on posttest scores while all higher-scoring experimental groups showed mean score decreases on posttest scores (Table 3).

An analysis of variance comparing low-scoring subjects with higher scoring subjects revealed a significant difference between higher-scoring and lower-scoring students on the posttest, $F(3,57) = 16.77, P < .0001$, but there was no significant between-group effect, $F(1,56) = 1.01, P > .3946$. 

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Table 3

Concept-Discrimination: Mean Difference Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>AD-AE</th>
<th>PD-PE</th>
<th>AD-PE</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower-Scoring</td>
<td>1.5</td>
<td>0.83</td>
<td>0.44</td>
<td>0.43</td>
</tr>
<tr>
<td>Higher-Scoring</td>
<td>-0.14</td>
<td>-0.25</td>
<td>-1.</td>
<td>-0.17</td>
</tr>
</tbody>
</table>

Concept-Exemplification

None of the four groups showed statistically significant differences; using an analysis of covariance, from the pretest to the posttest between experimental groups on the exemplification response, $F(3,56) = 1.24, P < .3041$ (Table 4). Each student was asked to diagram a solution to an original problem using the three-contingency model of performance management. The concept-exemplification response was scored using the 14 critical variables in the three-contingency model of performance-management checklist (Figure 1).

Table 4

Concept-Exemplification: Mastery Test Mean Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>AD-AE</th>
<th>PD-PE</th>
<th>AD-PE</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>10.8</td>
<td>10.5</td>
<td>11.</td>
<td>10.7</td>
</tr>
<tr>
<td>Posttest</td>
<td>9.5</td>
<td>10.5</td>
<td>10.5</td>
<td>10.5</td>
</tr>
</tbody>
</table>

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Homework Units

There were only two groups actively answering discrimination questions on the homework units: AD-AE and AD-PE. The other experimental group read the questions and answers were filled in for them. There were no mean differences between experimental groups on the discrimination responses; 73 points were possible. The active concept-discrimination and active concept-exemplification group (AD-AE) had a mean score of 62.9 or 86% and the active concept-discrimination and passive concept-exemplification group had a mean score of 63.8 or 87%. Only one group actively answered the concept-exemplification questions; 19 points were possible. The mean score for the AD-AE group was 13.6 or 72% for the concept-exemplification response.
CHAPTER IV

DISCUSSION

General

The results of this study showed no changes from pretest to posttest for any of the three experimental groups or the control group on either concept discrimination or concept exemplification. It was not possible to test for transfer of training from one type of intra-verbal response to another due to the lack of improvement from the pretest to the posttest.

Because the mean pretest scores ranged from 76% to 80% and posttest scores ranged from 75% to 84%, the lack of a change from the pretest to posttest can not be attributed to a ceiling effect.

In this study, there was considerable room for improvement as posttest scores only ranged from 75% to 84%; therefore, there is a need for more effective instructional materials. However, there might have been a training effect if the student population had been more naive about the content materials.

The confounding effects of administering the job-aid during both the pretest and the posttest make it impos-
sible to evaluate the separate contributions of the homework and the job-aid on the mastery test scores. In other words, if the students had been given the pretest without the job-aid, it is conceivable that the pretest scores could have been much lower. Therefore, the post test scores could have been significantly different from the pretest scores for the experimental groups.

This speculation raises an important question regarding the value of instructional materials, that is, are instructional materials necessary or can job-aids serve the same purpose? Essentially the use of a job-aid may decrease need for effective instructional materials; that is, instructional materials must be more effective when a job-aid is not available in order to produce increments demonstrating performance improvement. In traditional programmed instruction, job aids are used infrequently. A study could be designed to assess the importance of job aids by using a job-aid during training for one of two experimental groups. A difference on the posttest scores between the group with the job-aid and the experimental groups without the job-aid would be evidence of the learning effects contributed by the job-aid.

Assuming the study design in the present study was sound, then the lack of significant results must be
related to the job aid, the independent variable, the
dependent variable, or procedural issues. What follows
is a discussion of these areas. However, before return­
ing to these sources as causes for the lack of experi­
mental effects, first consider in some detail the process
used to develop the materials in the present study—more
specifically the development of the checklist and the
subsequent revisions.

**Instructional Materials Development**

A heuristic method was used to develop the homework
units, the job-aid, and the mastery test. A heuristic
method involves a calibration system. That is, the
developer designs an approximate set of materials and
then tests them out in the population to be tested. The
system is dependent on the feedback provided by the
learners to fine tune the instructional materials.
Student feedback is subsequently incorporated to refine
the instructional materials.

Instructional design involves the systematic evalua­
tion and revision of draft materials (Williams, 1983;
Cambre, 1981). Dick and Carey (1990) describe four basic
types of formative evaluation, including expert review,
one-to-one evaluation, small group evaluation, and field
test evaluation. The present study used a combination of
the small group evaluation method and an alternative to a formative evaluation, the dyadic evaluation. In this case, the evaluator administered a rough draft of the instructional materials to two to four students while documenting feedback and responses provided by students. The students' feedback is then used to modify instructional materials and another group of students is tested with the revised materials. There are two weaknesses of this method: first, there are no time data (data that show how much time it takes to complete the instructional materials); and second, it is not possible to get an individual's opinion. This method was used for both the workbook materials development and the mastery test development, with a sample of 17 students. Although the materials could use additional revisions this method proved to be efficient for the needs of the study.

**Job-aid Checklist**

A job-aid is used to decrease time required for training and to increase rate and accuracy of performance with or without training. Further, job-aids are useful where a process is complex and performance is infrequent. Harless (1985) refers to a job-aid as memory stored on paper to direct the work of real time. Plummer, Gillis, Legree, and Sanders (1992) found that use of a job aid
increased performance when operating a mobile subscriber radio-telephone terminal. The group with job-aid plus demonstration showed a reduction in operation times and had fewer errors than a group receiving a demonstration and use of the technical manual.

In the present study, the job-aid was used with both the pretest/posttest (dependent variable) and the workbook (independent variable). Each contingency—the ineffective-natural contingency, the performance-management contingency, and the theoretical contingency—possesses a number of critical variables. The critical variables were identified and then incorporated into a job-aid to help students learn how to correctly identify and construct each contingency in the three-contingency model.

Development of the three-contingency model of performance management was designed for use in the context of classroom teaching. The ineffective-natural contingency, for example, possesses the following critical attributes: it must (a) be natural, (b) be ineffective, (c) affect quality of life, (d) have a small outcome, or (e) have an improbable outcome. However, there may be other critical variables that define the ineffective-natural contingency that are yet undiscovered. The discovery of new critical variables rests on two factors: (1) the student's learning history and (2) changes in the
context in which the student learns how to identify components of the model and its' application. This is because conceptual information is not concrete or static; the critical variables are subject to alteration as a function of the evolution of the theory and it's applications.

The original job-aid checklist was developed with the intention of identifying and including all of the critical variables for each contingency and the model. However, it was discovered that even when each contingency in the model was correct the entire model could be wrong, if for example, the behavior in each contingency was different. Therefore, each contingency was evaluated using the associated critical variables and another set of criteria was developed that applied to the entire model. Repeated experimentation, in both experimental conditions and during the materials revisions sessions proved that the full set of instructional materials would be subject to ongoing revisions. The purpose of the model is to effectively manage performance. What follows is a discussion of the three contingencies in the model and their associated critical variables.
Ineffective-Natural Contingencies

One of the reasons people fail to perform effectively and consistently is because outcomes occurring in natural environments are often small but cumulative and improbable. These are referred to as natural contingencies because they occur without the intentional intervention of another person. Thus, the first critical variable that must be met for a contingency to be considered an ineffective-natural contingency, is that it is operative prior to performance management, that is, no one intentionally manipulates the consequences to increase or maintain performance.

A second outcome for the ineffective-natural contingency is that it must affect quality of life. This critical variable was selected because if the outcome does not affect quality of life, then who really cares? Quality of life is an ambiguous but important concept, that affects the physical, psychological, social, and spiritual well-being of an individual or society. Most adjectives defining quality of life can be quantified, sometimes through direct observation, self-report, or caregiver reports. The term can be defined more broadly to include economic and vocational well-being and satisfaction with different aspects of one's life. It is difficult to create instructional materials for this
critical variable because an outcome opposite quality of life suggests some "meaningless" outcome that nobody cares about. And this distinction is generally obvious.

The third critical attribute is that the contingency must be ineffective. Ineffective contingencies are the reason we need performance-management contingencies. However, not all natural contingencies are ineffective. If the natural contingency is effective, there is no need for the performance-management contingency. For example, if you burn your finger on a hot light bulb, the burnt finger that immediately follows touching the hot light bulb, decreases the likelihood of touching a hot light bulb in the future. In this case, nobody has intervened to reduce hot light bulb touching, yet there is a decreased likelihood the person will touch hot light bulbs in the future and this is effectively controlled by a natural punishment contingency.

The fourth and fifth critical variables that qualify a contingency as an ineffective-natural contingency include outcomes that are small but cumulative and outcomes that are improbable. Cumulatively significant outcomes don't affect behavior because each individual instance is too small to control behavior. Examples of small outcomes are easy to find in health care. Consider the dieting problem. Most people eat candy, ice-cream,
and other junk foods because there are immediate payoffs. Eating an apple instead of a candy bar has small but cumulative benefits, that is, prevention of weight gain, healthier teeth and good digestion; however, the outcome of eating a single apple is so small, though cumulatively significant, that it often fails to control eating of apples regularly.

The last type of outcome is the improbable outcome. Improbable outcomes pertain to health and safety issues, also legal issues, but in this case you are often then dealing with a performance-management outcome. For example, it is improbable you will get in a motorcycle accident and suffer from a head injury if you do not wear your helmet. Being injured in the accident is a safety issue and wearing a helmet is a legal issue that involves a performance-management contingency.

None of the critical variables for the ineffective contingency were altered as a result of the feedback obtained from the testing situation or the mastery test results. That is, students made few errors on the section involving ineffective-natural contingencies.

**Performance-Management Contingencies**

The motorcycle example demonstrates the need for a performance-management contingency. In this case, the
outcome is controlled by the intentional intervention of another person—representatives of the law. There are five original critical variables for the performance-management contingency. The first, illustrated in the motorcycle example, is that it must be added. The contingency is usually added by a performance manager; someone who is attempting to change the behavior of the managed. The relationship between the first critical attribute—an added contingency—and the second critical attribute—presents an interesting problem. Effective performance-management contingencies are designed to increase the behavior of verbal clients and usually involve a deadline.

However, a natural contingency may also have an added deadline, though not necessarily for the purpose of controlling another persons behavior. There is confusion concerning the difference between a performance-management deadline and a natural deadline. Natural contingencies with deadlines are not designed for the purpose of managing behavior. Further, natural contingencies with deadlines are not limited to nonhuman forces of nature like the light dark cycle or the planting season. Instead, natural contingencies include deadlines imposed by humans necessary to maintain the operating procedures in a system that accomplishes its mission. For example, in
the airline industry, would you consider flight departure and arrival times a performance-management contingency or a matter of standard operating procedure? Is the flight departure time designed to control passengers' behavior, in the sense it is performance management? Is the airline company concerned whether or not the passenger arrives by the scheduled departure time? The departure and arrival times are natural contingencies required to accomplish the systems mission. A coworker constantly reminding another coworker that the plane is about to leave is a performance-management deadline.

This issue was addressed in a follow-up classroom session. A show of hands revealed that more than 50% students equated performance-management deadlines with standard operating procedures; under 50% thought it was different, because the airline company was not intentionally manipulating behavior to change performance.

The third critical attribute, the analog to avoidance contingency, is designed to increase or maintain performance. With verbal clients, a performance-management contingency is usually an indirect-acting contingency, but can be a direct-acting reinforcement or even an escape contingency. Indirect-acting contingencies may be analogs to the avoidance of an aversive condition or analogs to the loss of an opportunity to get a reinforcer.
analogs to the loss of an opportunity to get a reinforcer (usually the latter). Direct acting avoidance contingencies may be related to either the loss of a reinforcer or the avoidance of an aversive outcome.

Effective performance-management analog to avoidance contingencies must produce outcomes that are both sizable (the fourth critical variable) and probable (the fifth critical variable). Sizable outcomes are large enough to control behavior but not unnecessarily large. For example, if an employer is having a difficult time with an employee who leaves early every day, the employer may arrange a performance contract with the employee. The contract stipulates the terms of agreement, where the employee is docked one hour of pay for each quarter of an hour he or she leaves early. The outcome is both probable and sizable.

**Theoretical Contingencies**

The performance-management contingency is required because the natural contingency is ineffective. The performance-management contingency, because it is usually an analog, has delayed consequences. However, the notion of control from a distance is inconsistent with a molecular analysis of behavior. That is, for reinforcement or punishment to occur, consequences must be immediate.
Therefore, a direct-acting theoretical contingency is proposed explaining the effectiveness of the performance-management contingency. Three critical variables were identified for the direct-acting, theoretical contingency.

First, the contingency must be direct-acting. Theoretical contingencies result from the statement of a rule involving a delayed outcome in the performance-management contingency. For example, if the performance manager pays the student $5 on Friday, for each hour of study that week, then the associated theoretical contingency would be the student's fear of the loss of that $5 for failure to study. The student states the rule of "if I do not study this next hour, I will not be paid $5." The cumulative payment for each hour of study is delayed; but, the fear of the loss of the money related to the performance-management contingency is immediate.

The direct-acting contingency is then an escape contingency, the second critical attribute. Consequences for failure to comply with the rule in the performance-management contingency immediately produces an aversive condition for the behavior that produces "fear" or "anxiety." However, this aversive condition is not likely to be overtly detected, instead it is inferred.

The third critical attribute is that the contingency
must be inferred, not directly observable by another person. However, some behavior analysts may argue that fear and anxiety are inappropriate concepts and that we should avoid explanations of behavior that involve unobservable events. Nonetheless, the contingency must be inferred for it to be a theoretical contingency.

Checklist Changes

The fourteen critical variables just described represent critical variables defining each contingency in the performance-management model. Although the critical attribute checklist was intended to be complete, several errors occurred on the concept-exemplification question of the mastery test suggesting the need for further revision to the checklist. No changes were made to the section on natural contingencies.

Two changes were made in the section on performance-management contingencies. Both changes were related to the deadline variable because 72% of the students were marked off for failing to specify the deadline, on both the pretest and posttest. The original deadline variable was subdivided into two critical variables for clarifying performance-management deadlines. First a new critical attribute was added, the explicit deadline—when there is a deadline. The deadline must be explicitly stated in
the before and after conditions. For example, one student used the model to increase daily exercise; however, the deadline was not explicitly stated,

*Ineffective-natural contingency*

Slight muscle tone. $\implies$ Walk .5 mile. $\implies$

Slightly more muscle tone.

*Performance-management contingency*

Lose opportunity for $5.00$. $\implies$ Walk .5 mile. $\implies$

Won't lose opportunity for $5.00$.

*Inferred direct-acting contingency*

Fear loss of $5.00$. $\implies$ Walk .5 mile. $\implies$ No fear of loss of $5.00$.

In this example, the deadline is not specified in the performance-management contingency, which leads one to consider this individual could walk .5 mile today or next week or next year. The purpose of performance management is to change behavior in the desired direction; therefore, responses are time limited and after a certain point the behavior will not have any effect. Therefore, it is critical to specify the deadline. The addition of the *explicit deadline* variable should clarify this problem. The correct way to state this would have been,

*Performance-management contingency*

Will lose opportunity to earn $5.00$, by 9.00 p.m.
tonight. ==> Walk .5 mile. ==> Won't lose opportunity to earn $5.00, by 9.00 pm.

The second change to the deadline critical attribute which was changed to deadlines for avoidance—deadlines are needed only for analogs to avoidance, not analogs to punishment. This change helps to clarify under which conditions a deadline is needed, that is, with avoidance analogs which have indirect-acting contingencies, not with analogs to punishment or direct acting contingencies of reinforcement.

The poststudy changes to the section on theoretical contingencies were substantial; only the escape critical attribute remained the same, two other critical variables were changed and a fourth critical attribute was added. The first critical attribute changed was the indirect-acting performance-management contingency—when the performance-management contingency is indirect-acting, an inferred theoretical, direct-acting contingency is required. If the performance-management contingency is direct-acting, no theoretical contingency is required. This change was intended to facilitate the student's ability to discriminate between indirect-acting and direct-acting performance-management contingencies, thus the necessity for a theoretical contingency. Students occasionally used a theoretical contingency when the
performance-management contingency was direct-acting. In this case, there is no need to infer a theoretical contingency because, the performance-management contingency is direct-acting and is, thus, sufficient unto itself.

An example of this problem follows,

**Ineffective natural contingency**
Angie has one level of social skill. ==> Angie takes a forkful of food. ==> Angie has an infinitesimally improved social skills.

**Performance-management contingency**
Angie will not receive praise immediately. ==> Angie takes a forkful of food. ==> Angie receives immediate praise.

**Theoretical contingency**
Angie fears no praise. ==> Angie takes a forkful of food. ==> Angie does not fear no immediate praise.

In this case, it is unnecessary to infer a theoretical contingency because the performance-management contingency is direct-acting.

The second change was to the inferred critical attribute. The definition of the inferred-contingency critical attribute was altered to strengthen the non-observable aspect of the theoretical contingency, that is, this contingency must be an inferred direct-acting contingency, rather than an observable direct-acting contin-
gency. The opposite of nonobservable is observable. Nonobservable events are sometimes referred to as private events. Private events like anger or pain are accompanied by public events like grimacing or crying. However, the observer has no contact with the internal stimuli that have generated the anger or pain (Michael, 1993). Private events unlike public events are difficult to define.

The three-contingency model is based on rule-governed behavior, behavior that is controlled by a verbal description of the contingencies. These contingencies are generally indirect-acting contingencies with delays of greater than 60 seconds. Therefore, it is necessary to explain the control of behavior by rules in terms of the elementary principles of behavior; or direct-acting contingencies of reinforcement and punishment, thus the theoretical contingency. The theoretical contingency is both inferred and direct-acting. In the original checklist, no direct-acting critical attribute was included, but for these reasons and student errors, it has been added to the revised checklist accounting for the third change.

The fourth modification included addition of a new critical variable—the inferred contingency must relate to the indirect-acting performance-management contingency,
not to the ineffective-natural contingency. When scoring terminal construction responses, one frequent error was associating the theoretical contingency with the ineffective-natural contingency. An example of this problem follows,

ineffective-natural contingency

One level of health. ==> Eat one apple. ==> Slightly better level of health.

and the performance-management contingency would be

Will lose $1 at 5:00 p.m. tonight. ==> Eat one apple. ==> Will not lose $1 at 5:00 p.m. tonight.

and the theoretical contingency would be

Fear of losing $1. ==> Eat one apple. ==> No fear of losing $1.

Instead, students made the following common error relating the theoretical contingency to the ineffective-natural contingency:

Fear of being unhealthy. ==> Eat one apple. ==> Less fear of being unhealthy.

Although these changes to the checklist may improve the students' ability to discriminate between examples and nonexamples of each contingency in the three-contingency model of performance management, it is likely that future revisions will result based on student feedback and performance.
Independent Variable

Having reviewed the materials development process, we now return to explore three possible reasons why the present study results were insignificant. First the independent variable—the homework units and the job-aid.

In retrospect, the job-aid was intended to function as an algorithm. An algorithm is a set of procedures to follow to solve a given type of problem; for instance, a math problem. As long as each step is followed in an algorithm, you will arrive at the correct answer. In contrast to a heuristic system, no feedback is required; the answer is determined by correctly following the sequence of steps designed to solve a particular problem (G. Alessi, personal communication, October 4, 1994).

Three inadequacies of the study materials became clearer after the study. The first problem was assuring that a complete set of critical variables was used. The checklist, used like an algorithm—a problem-solving tool—was incomplete, as it was discovered, and therefore it was ineffective. In fact, the original checklist required additions, deletions, and modifications following the study. This resulted because of the heuristic method used to identify the original critical variables. The critical variables were selected based on a logical analysis of the theory of rule governed behavior and
and ambiguities of the instructional materials. To determine if the critical variables for the concept had been included in that concept domain, repeated testing with students was required. Each of these critical variables was trained using both discrimination questions and construction questions.

A second area that could be improved upon, would be in the design of the instructional materials. It would be beneficial first, to increase the number of questions for each critical variable, and second, to improve upon the design of the questions providing more close in examples and nonexamples. Teimann and Markle (1990) discuss the importance of using examples and nonexamples of concepts that vary on only a single critical variable. However, the number of critical variables identified by the material designer is dependent on the context in which the concept will be applied. For example, if you teach a child to discriminate between a horse and a dog, the critical attribute could be size, especially if the child is only required to make this discrimination in the home environment. However, if this child is now exposed to other environments, like a zoo, then the discrimination along the single critical variable of size is no longer adequate. Then it is necessary to teach discriminations between dog and bird or dog and chimpanzee, while
carefully selecting additional critical variables that teach these discriminations (G. Alessi, personal communication, October 4, 1994). In practice, it is probably the case, that instructional materials are continuously revised as the context in which they are used changes or the history the learner brings to the situation is more varied. Essentially difficulties with instructional materials can be related to the context, the learner, or some combination of the two.

A third area of improvement involves the question of sequencing. Englemann and Carnine (1982) point out that flawless learning occurs when the questions are sequenced correctly. What this means is that teaching a concept involves teaching each component of that concept after it has been broken into its lowest common denominator. Beginning with the lowest common denominator, you build on the concept step by step, providing enough examples and nonexamples for each step.
Dependent Variable

The scores on the mastery test were not different from pretest to posttest. One explanation could be related to the insensitivity of the mastery test. Although the mastery test was designed to include questions pertaining to all of the critical variables, the questions may not have been comprehensive enough. For example, one of the critical variables for the theoretical contingencies was the indirect-acting performance-management contingency. That is, the need for a theoretical contingency when the performance-management contingency is indirect-acting. However, on the mastery test many of the students thought you needed a theoretical contingency when the performance-management contingency was direct-acting, even though this was trained explicitly in the instructional materials and in the checklist. There was room for significant improvement on the posttest compared with pretest scores.

Procedural Issues

In general, study procedures were well controlled. It was advantageous to have the students complete the workbook units within a controlled environment. However, the contingencies applied to the students' performance on the in-class workbook units may have been ineffective
because the rules were not explicitly stated. That is, the students were told at the beginning of both class sessions that their participation on the in class workbook assignment would earn them their usual points—20 points for class participation and 20 points for outside homework completion. However, the critical difference was that usual take-home homework assignments were graded on number of correct responses and students understood this rule. Students completing the in-class workbook units received 20 points unrelated to the accuracy of their performance. And students were never explicitly told they had to earn points based on accuracy of their responses on the in-class workbook units.

It is conceivable the students may not have come into contact with the workbook materials, particularly the read only group—passive responding. If the students did not come into direct contact with the materials they would not show improvements from pretest to posttest. However, this is unlikely given that neither the active response group nor the passive response group showed posttest improvements.

Summary

In summary, there were four objectives of the present study:
1. To refine the three-contingency model of performance management based on a theory of rule-governed behavior.

2. To develop university level instructional materials to teach the three-contingency model of performance management.

3. To test for transfer of training within response classes.

4. To test for the need for active-responding.

The three-contingency model of performance management was refined to include a job-aid checklist. The checklist was developed as a set of rules to solve the problem of the ineffective-natural contingency using the three-contingency model of performance management. The rules included in the checklist were selected using a heuristic method. This contribution was substantial; however, additional work is necessary if the checklist is to function as an effective algorithm.

A set of instructional materials was developed, over a period of four months, for use at the university level. A 16-page homework unit was developed to teach the concepts in the three-contingency model of performance management, in addition to the development of the job-aid and the mastery test.

The mastery test was designed to determine the following:
1. If a student trained on one type of intraverbal task—concept-discrimination—could perform equally well on a different type of intraverbal task—concept-exemplification—for which he or she had not been trained.

2. If active response training resulted in superior performance comparable to students receiving passive response training.

Because results were not statistically significant, it was not possible to answer either of these questions or draw any conclusions regarding these questions.
Appendices
Appendix A

Informed Consent Form
I have been invited to participate in a research project entitled "An Experimental Analysis of Instructional Technologies Applied to the Three-Contingency Model of Performance Management". I understand that this research is intended to find if there are any differences between the teaching technologies and if differences on the post-test scores are caused by the specific teaching method. I further understand that this project is Judi DeVoe's dissertation project.

My consent to participate in this project acknowledges that I will be asked to complete in class a pretest, a homework assignment, and a posttest. I further understand that the homework assignment is supplemental to the assignment listed in the course syllabus. The content of the homework focuses on only the three-contingency model of performance management. I also understand that both the pretest and the posttest will include question formats that may have been included in some or all of the homework assignment, depending on which experimental group I am assigned. I also understand that if I have any questions or would like detailed information about either the instructional technologies or the performance management model, my questions will be satisfactorily answered by either Judi DeVoe or Dr. Malott.

As in all research, there may be unforeseen risks to the participant. If an accidental injury occurs, appropriate emergency measures will be taken: however, no compensation or treatment will be made available to the subject except as otherwise stated in this consent form. At this time the only risk involved might be the additional exertion of effort that could be applied to other preferred activities. One way I may benefit from participation in this activity is by earning optional activity points that can be substituted for a missed class or assignment or quiz. Another way I may benefit by participation in this study is by strengthening my skills in both learning about instructional technologies and by acquiring greater expertise at applying the three-contingency model of performance management to everyday problems.

Understand that all the information collected from me is confidential. That means that my name will not appear on any papers. I will write my social security number on all the forms used in the study. The pretests, homework, and post-tests will be handed in face down. The instructor will identify a student to collect the materials who will seal the envelope returning it the
instructor. The instructor will then give the data to Dr. Malott. Only Judi DeVoe and Dr. Malott will have access to names. Results of the study, will of course, be presented in group format eliminating any need for name disclosure. All forms will be retained for three years in a locked file in the principal investigator's laboratory.

I understand that I may refuse to participate or quit at any time during the study without prejudice or penalty. If I have any questions or concerns about this study, I may contact either Judi DeVoe at 375-1791 or Dr. Malott at 387-4481. I may also contact the Chair of Human Subjects Institutional Review Board or the Vice President for Research with any concerns I have. My signature below indicates that I understand the purpose and requirements of the study and that I agree to participate.

Signature: _________________________ Date: _______________
Appendix B

Instructional Unit for the Main Experimental Group
Assignment
Performance Management and
The Three-Contingency Model

Prepared by Judi Devoe
as part of her Ph.D. Dissertation

Name ________________________________
Group (Don't Mark) 1 2 3 4
Social Security Number _____________
Score ______________________________

Where We've Been and Where We're Goin'

Thus far, we've looked at several important issues:
- Eight basic direct-acting contingencies control our behavior. These contingencies involve outcomes that are immediate, sizable, and probable.
- Rules describing indirect-acting analogs to those eight basic contingencies can also govern the behavior of verbal people. These rules describe contingencies that are indirect-acting because their outcomes are too delayed to reinforce or punish the desired response.
- However, some rules are more difficult to follow than others. Rules describing contingencies with outcomes that are too improbable or too small (though they are of cumulative significance) will be hard to follow, regardless of whether the outcomes are immediate or delayed.

Now we will see how to use performance management contingencies to help the individual perform appropriately, even when the natural contingencies don't support the desired performance. Performance management is the key to applied behavior analysis. The majority of our interventions involve setting up contingencies to manage the performance of clients. Most performance management with verbal clients relies on indirect-acting, rule-governed analogs to the basic behavioral contingencies.

The three-contingency model of performance management provides a framework within which we can construct, analyze, and understand these interventions. The three general types of contingencies are:
- Natural contingencies
- Performance management contingencies
- Theoretical contingencies

Here's an example of the three-contingency model:
Joe's making zilch for progress in writing his honor's thesis. So he contracts with Sue to get it done. He has to pay her $5 every day he fails to write one hour by the noon deadline. As you can imagine, he goes into a panic about 10:55, and really kicks it out for an hour. Here's his diagram.

![Contingency Diagram]

Criterion: Same response —
the response is the same in all three contingencies.

Example: Ineffective Natural Contingency—
Sue has several reports to do. \( \Rightarrow \)
Sue writes one report. \( \Rightarrow \)
Sue has made a small amount of progress on her reports.

Example: Performance Management—
Sue will get a reprimand at 5:00. \( \Rightarrow \)
Sue writes one report. \( \Rightarrow \)
Sue will not get a reprimand at 5:00 PM.

Example: Theoretical—
Sue fears getting a reprimand. \( \Rightarrow \)
Sue writes one report. \( \Rightarrow \)
Sue has no fear of getting a reprimand.

1. What was the common response across all three contingencies?
   a. Sue has made a small amount of progress on reports.
   b. Sue will get a reprimand at 5:00.
   c. Sue writes one report.
   d. Sue fears getting a reprimand.
OBJECTIVES
By the time you have completed this homework assignment it is expected you will be able to correctly apply the three-contingency model of performance management to any problem that involves increasing behavior. This assignment is only about reinforcement, avoidance, and escape contingencies. None of the examples provided in the materials or exemplified by you the student should include punishment or penalty contingencies. Subsequent homework materials will deal with decreasing behavior using the three-contingency model of performance management. You should be able to do one or all of the following:

a. Correctly identify a contingency from multiple choice questions, for each of the three contingencies used in the model.

b. Correctly construct an original contingency, for each type of contingency used in the model.

c. Correctly apply the three-contingency model of performance management to an existing problem defined in the materials.

d. Correctly apply the three-contingency model of performance management to an original problem designed by you.

We will now look at these three types of contingencies in detail. In this assignment, we will look at performance problems where the behavior is occurring less frequently than desired. Then we will more easily be able to understand problems where the behavior occurs too frequently.

Reinforcement

Natural Contingencies

Definition: Natural Contingency—
a contingency that occurs in nature, without being designed by a performance manager to control behavior.

Criterion: Natural Contingency—
The natural contingency is operative prior to performance management and it is not designed to manage performance.

As mentioned earlier, the first two general types of contingencies in the three-contingency model are the natural contingency and the performance management contingency. This criterion simply helps you be sure those contingencies you classify as natural really are natural and not performance management.

Example: Natural—
Jana has no quality report. =>
Jana writes a paragraph. =>
Jana has an infinitesimally small part of her quality report.

This is a natural contingency because it is operative prior to performance management; it is not designed to manage performance (in other words, there are no added contingencies by a performance manager). Furthermore, this natural contingency is ineffective; that is, it will not control behavior because the outcome is small though of cumulative significance.

Example: Performance Management—
Jana has n tokens. =>
Jana writes a paragraph. =>
Jana has n+1 tokens.

This is an added performance management contingency designed by a performance manager to control behavior (the tokens are part of a performance-management token economy).

Example: Natural—
Jana won’t have her homework finished. =>
Jana studies for one hour. =>
Jana will have her homework finished.

This is a natural contingency because it is operative prior to performance management; it is not designed to manage performance.

Example: Performance Management—
Jana will get $70 of pay. =>
Jana works one more hour. =>
Jana will get $80 of pay.

This is not a natural contingency because pay is an added contingency designed by a performance manager (the employer) to control behavior (even though this performance management contingency may not be optimally effective).

Are these examples natural contingencies or performance management contingencies?

2. We just saw a performance management contingency involving Jana’s work. Now let’s look at a different contingency involving her work:

Jana has produced n units of work. =>
Jana works one more hour. =>
Jana produces n+1 units of work.

a. natural_

b. performance management_

3. Is this contingency operative prior to performance management?

a. Yes__

b. No_

4. Is the preceding contingency designed to manage performance?

a. Yes__

b. No_
3. Is the preceding contingency a natural contingency?
   a. Yes
   b. No

6. Jana will lose the opportunity for a significant amount of class participation points. ➞
   Jana goes to class by three PM. ➞
   Jana will not lose the opportunity for a significant amount of participation points.
   a. Natural
   b. Performance management

7. Jana will lose the opportunity for an infinitesimal amount of additional learning. ➞
   Jana goes to class by three PM. ➞
   Jana won’t lose the opportunity for an infinitesimal amount of additional learning.
   a. Natural
   b. Performance management

8. Construct an original diagram of an ineffective natural contingency.

   Before  Behavior  After

   ![Diagram](image)

Definition: Quality of Life (QL)
the physical, psychological, social, and spiritual well-being of an individual or society.

Criterion: Quality of Life
The natural contingency must have an outcome that affects the quality of life of the individual or society, for us to be concerned with it.

This is why we want the contingency to control behavior. Incidentally, the contingency could improve or diminish quality of life, either one. Some natural contingencies have outcomes that do affect quality of life of the individual or society.

Other natural contingencies have outcomes that don’t affect quality of life (QL) of the individual or society. So here, we’re discriminating between two types of natural contingencies, those that do affect quality of life and those that don’t affect quality of life.

Example: The contingency does affect QL—
Mark cannot understand and do his homework. ➞
Mark asks Rob for one hour of homework help. ➞
Mark understands and can do his homework.

This is a natural contingency with an outcome that does affect the quality of life, because its outcome is the improvement of Mark’s understanding and ability to do his homework. So you would answer, yes, since the contingency does affect Mark’s QL. This is the sort of contingency we will want to assure consistently controls of Mark behavior.

Non-example: The contingency does not affect QL—
Jana can’t say the alphabet backwards. ➞
Jana practices it once. ➞
Jana is infinitesimally better at saying the alphabet backwards.

This is a natural contingency, it doesn’t affect QL; saying the alphabet backwards does not affect anyone’s well-being at least we hope not. So you would answer, no, since this contingency does not affect QL. So we would not be concerned to ensure Jana behaves in accord with this contingency.

Note, by the way, a contingency is a description of what could happen, not what has happened. In other words, you could read this contingency as: If Jana practices once, she will be infinitesimally better at saying the alphabet backwards. That doesn’t mean she ever has practiced it, or ever will. It just means that if she practices it, a particular trivial outcome will result.

Does it affect Quality of Life (QL)?

9. Jana cannot say *supercalifragilisticexpedilidosious*. ➞
   Jana practices saying *supercalifragilisticexpedilidosious*. ➞
   Jana can say *supercalifragilisticexpedilidosious*.
   a. Yes, affects QL
   b. No, doesn’t affect QL

10. There are no medical journals in the library. ➞
    Jackie, the librarian, orders several good medical journals for the library. ➞
    There are medical journals in the library.
    a. Yes, affects QL
    b. No, doesn’t affect QL

11. Lauren can’t say nonsense syllables. ➞
    Lauren practices once saying nonsense syllables. ➞
    Lauren can say some nonsense syllables.
    a. Yes, affects QL
    b. No, doesn’t affect QL
12. Jackie has some computer skills. →
   Jackie practices on her computer for one hour. →
   Jackie has slightly better computer skills.
   a. Yes, affects QL
   b. No, doesn’t affect QL

13. Construct an original diagram of an ineffective natural contingency that affects quality of life.

   Before  →  Behavior  →  After

Criterion: Ineffective Contingency—
The natural contingency must be ineffective; that is, it must not control behavior, so we need to use performance management.

There’s no need to hire a high-priced behavior analyst to intervene if the natural contingency does control behavior; then everything’s O.K. The old saying applies, in that case if it ain’t broke, don’t fix it.

Example: Ineffective—
   Sue has moderate health. →
   Sue does one run. →
   Sue has infinitesimally better health.

This is an ineffective contingency so you need a performance management contingency. If the contingency was effective you wouldn’t need a performance management contingency. Incidentally, the reason is that the outcome is too small to reinforce the behavior or to support rule control. The rule describing this contingency would be too hard to follow.

14. Incidentally, is this a natural contingency?
   a. Yes
   b. No

15. And does it affect quality of life?
   a. Yes
   b. No

   Example: effective—
   Sue has no runner’s high. →
   Sue does one run. →
   Sue has runner’s high.

This is an effective contingency, we assume the runner’s high would reinforce Sue’s running or might control it through rule governance. This means we would not have to bring in the performance manager to implement a performance management contingency (as long as the runner’s h does the trick).

16. Incidentally, is this a natural contingency?
   a. Yes
   b. No

17. And does it affect quality of life?
   a. Yes
   b. No

   Example: Ineffective—
   Peter has no retirement savings. →
   Peter puts $50 of his earnings in his retirement savings. →
   Peter now has a mere drop in his retirement bucket.

This is an ineffective contingency: it’s outcome is too small though cumulatively important, so it won’t control behavior. We would like to have people save but without special help, they usually don’t. So this is a case where we’d not bring in the performance manager and an added performance management contingency.

18. Incidentally, is this a natural contingency?
   a. Yes
   b. No

19. And does it affect quality of life?
   a. Yes
   b. No

   Example: effective—
   Renee is slightly affectionate toward Peter. →
   Peter gives Renee some flowers. →
   Renee is very affectionate toward Peter.

This is probably an effective contingency because the outcome is sufficiently large that a rule describing this contingency would probably control Peter’s behavior.

20. So is this a case where we need to bring in the performance manager and an added performance management contingency?
   a. Yes
   b. No

21. Incidentally, is this a natural contingency?
   a. Yes
   b. No
Are these contingencies ineffective or effective?

22. Sam has no progress on thesis. \( \Rightarrow \) Sam writes a paragraph. \( \Rightarrow \) Sam has infinitesimal progress on his thesis.
   a. Ineffective, you need a performance management contingency
   b. Effective, you don't need a performance management contingency

This is an ineffective contingency, because the outcome is too small (though cumulative) to control Sam's behavior.

23. Joe has good health. \( \Rightarrow \) Joe exercises once. \( \Rightarrow \) Joe's health improves infinitesimally.
   a. Ineffective, you need a performance management contingency
   b. Effective, you don't need a performance management contingency

Just making sure you're awake. This is an ineffective contingency, because one instance of exercise has an outcome that is too small to control Joe's workout behavior. In this case you will need a performance-management contingency.

24. Bob has no sweet taste. \( \Rightarrow \) Bob eats a candy bar. \( \Rightarrow \) Bob has sweet taste.
   a. Ineffective, you need a performance management contingency
   b. Effective, you don't need a performance management contingency

This natural contingency is effective, because the sweet taste will reinforce Bob's eating the chocolate.

25. Joe's stomach is empty. \( \Rightarrow \) Joe eats one cheeseburger. \( \Rightarrow \) Joe's stomach is full.
   a. Ineffective, you need a performance management contingency
   b. Effective, you don't need a performance management contingency

26. Mary Jane has no buzz. \( \Rightarrow \) Mary Jane takes a drag of a marijuana cigarette. \( \Rightarrow \) Mary Jane has a buzz.
   a. Ineffective, you need a performance management contingency
   b. Effective, you don't need a performance management contingency

27. Construct an original ineffective natural contingency diagram (which means that the contingency is ineffective in controlling behavior).

28. Construct an original natural effective contingency diagram (which means that the contingency effectively controls behavior).

Rule of Thumb: Natural avoidance contingencies—

Natural contingencies can be any of the avoidance contingencies and their analogs.

All analog performance management contingencies designed to increase performance are analogs to avoidance. Thus it is easy to make the error of assuming the reverse that all avoidance contingencies are performance management contingencies. But it ain't so. Some avoidance contingencies and their analogs are natural contingencies. Furthermore, the natural analogs to avoidance may be effective or ineffective—either they work or they don't.

Example: Natural analog to avoidance—
Jogging Jane will have to run in the dark after 6:30 p.m. (sunset). \( \Rightarrow \)
Jogging Jane terminates her phone call well before 6 p.m. \( \Rightarrow \)
Jogging Jane won't have to run in the dark.
Saying good-bye and hanging up the phone well before the 6:30 p.m. prevents the presentation of an aversive condition—running in the dark. It's easy to assume that a contingency is a performance management contingency when a deadline is involved (like the 6:30 p.m. sunset); but, don't be fooled—a deadline is no guarantee of a performance management contingency. In this case, the contingency involved a natural built-in outcome—the planets rotation in the universe and the resultant light-dark cycle.

29. Procrastinating Paula will have to listen to her screaming kids. ==> Procrastinating Paula hires a baby sitter. ==> Procrastinating Paula won't have to listen to screaming kids.

What kind of contingency is this?

a. natural contingency
b. performance management contingency

This contingency is a natural analog to avoidance of an aversive contingency. It is an analog because the time between hiring a baby-sitter and avoiding the screaming kids is greater than 60 seconds. Furthermore, it may well be an ineffective, natural analog to an avoidance contingency, because Procrastinating Paula probably will not get it together enough to consistently coordinate her schedule with the baby-sitter's.

30. Procrastinating Paula will lose the opportunity to be considered for graduate school after February 1. ==> Procrastinating Paula files her application before the deadline. ==> Procrastinating Paula won't loose the opportunity to be considered for graduate school.

This contingency is a

a. natural contingency
b. performance management contingency

This is an analog to avoidance of a loss of an opportunity to get a reinforcement. Whether or not this performance management contingency is effective or ineffective again depends on the extent to which Procrastinating Paula has her act together. Let's put it this way, if she blows the deadline for application to graduate school, she won't be the first one.

Contingencies with deadlines for big tasks, like doing what it takes to apply, are ineffective more often than we'd like to admit. In other words, contingencies describe outcomes, but, they don't necessarily control behavior effectively.

The contingencies we just looked at were analogs to avoidance, because the outcomes were delayed by more than 60 seconds; but natural avoidance contingencies can also be direct acting, with outcomes delayed by less than 60 seconds. And avoidance contingencies and their analogs can be either effective or ineffective.

31. Dave will have an accident. ==> Dave stops the car at the red light. ==> Dave won't have an accident.

The contingency is a

a. natural contingency
b. performance management contingency

32. Furthermore, the contingency is

a. an analog to an avoidance contingency
b. a direct-acting avoidance contingency

Dangerous Dave will be more likely to stop at a red light he sees a lot of traffic coming on the cross street, in which case, the natural direct-acting avoidance contingency is effective in controlling Dave's behavior. However, if Dangerous Dave sees no traffic on the cross street, then he runs the stop sign, in which case, the natural avoidance contingency is ineffective.

Criterion: Small outcome—
A contingency is ineffective, if the change in the change in the size of the outcome from the before condition to the after condition is too small to control behavior.

If the outcome for a single response is too small, the contingency will not control behavior, even though repetitions the outcome is of cumulative significance.

Example: small outcome—
Joe has mediocre gums. ==> Joe flosses his teeth once. ==> Joe has infinitesimally better gums

This contingency is ineffective, because the condition of Joe's gums is improved only infinitesimally by a single flossing. In other words, the outcome is too small to control behavior. Because this contingency is a natural contingency affecting the quality of life, we will want to add a performance-management contingency.

33. Will this contingency control behavior?

a. Yes, so there's no need for performance management
b. No, so add a performance management contingency

Example: sizable outcome—
Dave will lose the opportunity to have his term paper graded after 5:00 p.m. when the psych. office closes. ==> Dave turns in his paper before 5:00 PM. ==> Dave doesn't lose the opportunity to have his paper grade

This contingency is effective, because the outcome is sizable, it will probably control Dave's behavior. The deadline insures that a point in time is reached where further procrastination will result in a sizable outcome; and at that point Dave hustles his paper into the psych. office. Even though there is a deadline, this is a natural contingency, a performance-management contingency.
Example: sizable outcome—
Rita doesn't have fresh vegetables. ==> Rita picks fresh vegetables from her garden. ==> Rita does have fresh vegetables.

This contingency is effective, because the magnitude of the change from the before condition to the after condition is large (Rita loves fresh veggies and she hasn't eaten all day).

34. Will this contingency control behavior?
   a. Yes, so there's no need for performance management
   b. No, so add a performance management contingency

Example: small outcome—
Joe has $1,000 in his savings. ==> Joe deposits $50 in his savings. ==> Joe has $1,050 in his savings.

This contingency is ineffective because the increment in Joe's savings is too small to reinforce Joe's making the deposit, even though cumulative benefit of such a deposit every two weeks would be considerable.

35. Will this contingency won't control behavior?
   a. Yes, so there's no need for performance management
   b. Ineffective, so add a performance management contingency

Looking at the small outcomes, are these contingencies ineffective?
In other words, are the contingencies ineffective because outcomes were too small to control behavior? If it is a natural contingency affecting the quality of life, then we will want to add a performance-management contingency.

36. Joan has one level of fitness. ==> Joan runs 1 mile. ==> Joan has an infinitesimally better level of fitness.
   a. Effective, so there's no need for performance management
   b. Ineffective, so add a performance management contingency

37. Jack's paperwork is not organized. ==> Jack files one bill. ==> Jack's paperwork is noticeably more organized.
   a. Effective, so there's no need for performance management
   b. Ineffective, so add a performance management contingency

38. Steve will lose $5. ==> Steve eats one balanced meal. ==> Steve won't lose $5.
   a. Effective, so there's no need for performance management
   b. Ineffective, so add a performance management contingency

39. Construct an original diagram that is ineffective because the outcome is too small.

Criterion: Improbable outcome—
A contingency is ineffective, if the change in the probability of the outcome from the before condition to the after condition is too small to control behavior.

An improbable outcome may fail to reinforce or punish behavior even if the outcome itself is of great significance.

Example: Improbable outcome—
The probability that Dodo will get AIDS is very, very low.
Dodo puts on a condom before sexual intercourse. ==>
The probability that Dodo will get AIDS is infinitesimally lower.

Keep in mind that these diagrams describe the contingencies but not what the behavior will necessarily be. Unfortunately, the world is full of Dodos for whom this outcome so improbable that the contingency is ineffective in controlling Dodo's behavior.

Example: Probable outcome—
The probability that Dave will get AIDS in intercourse with a partner who he knows to be HIV positive is very high.
Dave puts on a condom before sexual intercourse with his partner. ==>
The probability that Dave will get AIDS is much lower.

This qualifies as an effective contingency, because it the probability of Dave getting AIDS is greatly reduced by wearing a condom.
40. Daredevil Dan has a low probability of getting seriously injured in an auto accident on the highway. =>
   Daredevil Dan buckles up. =>
   Daredevil Dan has an infinitesimally lower probability of getting seriously injured in an auto accident on the highway.
Most likely this contingency is
a. effective__
   b. ineffective__

41. Daredevil Dan has an extremely high probability of getting seriously injured in his daredevil automobile driving demonstration at the Kalamazoo County Fair. =>
   Daredevil Dan buckles up. =>
   Daredevil Dan has a high probability of getting seriously injured in his daredevil automobile driving demonstration at the Kalamazoo County Fair.
Most likely this contingency is
a. effective__
   b. ineffective__

Example: Small but cumulatively significant outcome—
Bill has a certain level of health. =>
Bill eats a serving of spinach. =>
Bill has an infinitesimally improved level of health.
Eating a healthy, balanced diet once a day is good, but the benefits only occur if the behavior maintains over a long period of time resulting in small but cumulative benefits. Although this contingency is ineffective, it is not because of a low probability outcome; the outcome is probable, but too small.

Are these outcomes small but cumulative or improbable?

42. Mae will get a speeding ticket. =>
   On the highway, Mae drives 65 MPH. =>
   There is an infinitesimally decreased probability Mae will get a ticket.
   a. Small but cumulative__
      b. Improbable__

43. Jen has one level of piano skills. =>
   Jen practices the piano once. =>
   Jen has an infinitesimally better level of piano skills.
   a. Small but cumulative__
      b. Improbable__
Construct an original diagram where the outcome is too improbable to control behavior.

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You Have Completed Part One

Turn In Your Materials To Your Instructor Now

Performance Management
Avoidance Contingencies

Definition: Performance Management Contingency—
a contingency that does not occur in nature and is designed
by a performance manager to control behavior.

With the exception of self-given consequences, the actor accountable to someone else for his or her behavior; that someone else is a performance manager who will deliver the consequences. Performance management contingencies are required when the natural contingencies are ineffective in controlling desirable behavior (exercising daily) or effective in controlling undesirable behavior (smoking).

Criterion: The added contingency —
The contingency is usually added (extrinsic), not built-in (intrinsic).

Example: Added—
Randy will lose his grade of an A. =>
Randy re-writes his essay for OAPs. =>
Randy will not lose his grade of an A.

Example: Built-in—
Gary will get sick. =>
Gary drinks one beer. =>
Gary won’t get sick.
Do the following examples illustrate added-or built-in contingencies?

44. Bob won't get $5. $5 => Bob cleans his room. $5 => Bob gets $5.
   a. added performance management contingency
   b. built-in natural contingency

45. Joan's arousal is not satisfied. Joan is sexual with Dave. Joan's arousal is satisfied.
   a. added performance management contingency
   b. built-in natural contingency

46. Joan has no bonus. Joan achieves her sales goal at month end. Joan has a bonus.
   a. added performance management contingency
   b. built-in natural contingency

47. Joan is dehydrated. Joan drinks one glass of water. Joan is not dehydrated.
   a. added performance management contingency
   b. built-in natural contingency

48. Construct an original contingency diagram of an added performance management contingency.

Criterion: The analog to avoidance contingency—
If an indirect-acting contingency is to increase or to maintain performance, it should be an analog to avoidance.

Definition: Analog to avoidance contingency—an indirect-acting contingency because of a delay greater than 60 seconds

Example: analog to avoidance—
Joan will lose the opportunity to see Pat after 8:00 PM. Joan gives Pat the article at 7:00 PM. Joan does not lose the opportunity to see Pat.

This is an analog to avoidance because the delay is greater than 60 seconds. It takes Joan close to an hour to get it together and get up to the University and give Pat the page she has loaned Joan.

Example: direct-acting avoidance—
Josey will miss the available elevator. Josey ends her conversation with Bob outside the elevator. Josey won't miss the available elevator.

This is an example of a direct-acting avoidance contingency. The elevator comes and goes in seconds.

Example: direct-acting avoidance—
Pete doesn't have a ticket for the 7:00 PM movie. Pete hands the ticket taker $6.00. Pete does have a ticket for the 7:00 PM movie.

This is an example of a direct-acting avoidance contingency because within 60 seconds of handing the ticket taker $6.00, Pete receives a ticket. Pete avoids being without a ticket.

Example: analog to avoidance—
Pete won't see the 7:00 PM movie. Pete hands the ticket taker $6.00. Pete will see the 7:00 PM movie.

This is an example of an analog to avoidance contingency. Pete is avoiding missing the movie by giving the ticket taker money now. The reinforcer is the opportunity to sit in the movie, but the presentation of the reinforcer will not occur immediately, or within 60 seconds of obtaining the ticket.

Are the following examples of analogs to avoidance or direct-acting avoidance contingencies?

49. After 6:00 PM today, McGill will lose the opportunity to buy the washing machine on sale. McGill buys the washing machine before 6:00 PM.
   a. analog to avoidance contingency
   b. direct-acting avoidance contingency

50. Josey will be thirsty. Josey drinks one glass of water. Josey won't be thirsty.
   a. analog to avoidance contingency
   b. direct-acting avoidance contingency

Definition: Indirect-acting contingency—a contingency that controls the response, but not because of reinforcement or punishment of that response by the outcome specified in that contingency.

These contingencies are effective analogs to
- avoidance of an aversive condition/ or loss of an opportunity to prevent an aversive condition.
- avoidance of the loss of a reinforcer/ or loss of an opportunity to get a reinforcer

Example: Analog to avoidance of the loss of a reinforcer—
Jackie will lose her phone service. => Jackie pays her phone bill. => Jackie won’t lose her phone service.

This is an example of an analog to the avoidance of the loss of a reinforcer based on the assumption that phone services are reinforcing to Jackie. And in this case talking with other people is reinforcing to Jackie.

Example: Analog to avoidance of an aversive condition—
In the middle of winter, Jackie will have no heat => Jackie pays her electric bill => Jackie will have heat.

This is an example of an analog to avoidance of the aversive condition of freezing.

What kind of analog to avoidance contingencies are these examples of?

51. Tory won’t get her raise without a prepared speech for today’s 5:00 PM lecture. => Tory writes her speech. => Tory will get a raise for having prepared her speech.
   a. analog to avoidance of an aversive condition/ OR loss of an opportunity to prevent an aversive condition
   b. analog to avoidance of the loss of a reinforcer/ OR loss of an opportunity to get a reinforcer

52. Rita will lose $10 on Friday. => Rita does her work on Thursday. => Rita won’t lose $10 on Friday.
   a. analog to avoidance of an aversive condition/ OR loss of an opportunity to prevent an aversive condition
   b. analog to avoidance of the loss of a reinforcer/ OR loss of an opportunity to get a reinforcer

53. If John doesn’t close the deal tonight before midnight he will lose his job. => John closes the deal. => John will not lose his job.
   a. analog to avoidance of an aversive condition/ OR loss of an opportunity to prevent an aversive condition
   b. analog to avoidance of the loss of a reinforcer/ OR loss of an opportunity to get a reinforcer

54. Larry’s oil light is on, if he doesn’t put oil in his engine, his car will seize. => Larry puts oil in his engine. => Larry’s car will not seize.
   a. analog to avoidance of an aversive condition/ OR loss of an opportunity to prevent an aversive condition
   b. analog to avoidance of the loss of a reinforcer/ OR loss of an opportunity to get a reinforcer

55. Construct an original performance management contingency diagram for an analog to avoidance of the loss of a reinforcer.

Criterion: The Analog to Punishment Contingency—
If an indirect-acting contingency is to decrease performance, it should be an analog to penalty or punishment.

Criterion: Deadlines for Analog to Avoidance—
Deadlines are needed only for analogs to avoidance, and not analogs to punishment.

When deadlines are not involved, people tend to procrastinate and never complete the targeted task. Even when deadlines are in place, the tendency is to complete the task immediately prior to the deadline. For this reason the quantity or quality of the work is frequently lacking. In the absence of a deadline, if behavior is to occur at all, there must be a direct-acting contingency that reinforces that response.

Example—Deadline for Analog to Avoidance—
Nick will lose $5 after 5:00 PM. => Nick cleans his room. => Nick won’t lose $5 after 5:00 PM.

This is an example of an analog to avoidance of the opportunity to get a reinforcer. It is an analog because he does not get the $5 until after 5:00 PM and assume he finishes cleaning his room more than 60 seconds before 5:00 PM. The deadline, "after 5:00 PM", is explicitly stated in the before and after conditions.

Example—No Deadline for Analog to Avoidance—
Nick’s room is messy. => Nick cleans his room. => Nick’s room is not messy.

This is an example of analog to avoidance without a deadline. It’s hard to tell what kind of avoidance, but probably is an analog to avoidance of an aversive condition, that is, screaming parents. The kid cleans his room before the parent gets home from work and avoids getting yelled at.
There is no deadline, either implicit or explicit specified in the before and after conditions.

56. Lynn will lose the opportunity to be considered as a candidate for a teaching position. \(\Rightarrow\) Lynn applies for the job before February 15th. \(\Rightarrow\) Lynn does not lose the opportunity to be considered as a candidate for a teaching position.
   a. Deadline
   b. No deadline

57. In the above example, is the deadline a
   a. performance management contingency
   b. natural contingency

58. Lucy will lose 30 points at the end of class. \(\Rightarrow\) Lucy participates during class-time. \(\Rightarrow\) Lucy won't lose 30 points at the end of class.
   a. Deadline
   b. No deadline

59. In the above example, is the deadline a
   a. performance management contingency
   b. natural contingency

60. John will have read Atwood's novel, Lady Oracle. \(\Rightarrow\) John goes to the movie with Jan. \(\Rightarrow\) John won't have read Atwood's novel, Lady Oracle.
   a. Deadline
   b. No deadline

61. In the above example, is the no deadline a
   a. performance management contingency
   b. natural contingency

62. Bob won't have 10 tokens if he doesn't clean his room by noon. \(\Rightarrow\) Bob cleans his room. \(\Rightarrow\) Bob will have 10 tokens by noon.
   a. Deadline
   b. No deadline

63. In the above example, is the deadline a
   a. performance management contingency
   b. natural contingency

Criterion: The Explicit Deadline—
When there is a deadline, it must be explicitly stated in the before and after conditions.

Example: Explicit Deadline—
Albert will be reprimanded at 9:00 AM. \(\Rightarrow\) Albert drives to work at 7:00 AM. \(\Rightarrow\) Albert won't be reprimanded at 9:00 AM.

The deadline is explicitly stated in the before condition—9:00 AM. In order for Albert to miss rush hour traffic and get to work before 9:00 AM, analog to the avoidance of an aversive condition, he leaves home at 7:00 AM.

Example: Implicit Deadline—
Joan will pay roommate $10. \(\Rightarrow\) Joan has David use a condom. \(\Rightarrow\)

Joan won't pay roommate $10.

This is an example of a performance management contingency since Joan has agreed to pay her roommate $10 if she has sex without a condom. The deadline is implicit such that using the condom after sex wouldn't have any appreciable preventative benefit.

64. Janice will lose the opportunity to apply for graduate school if she doesn't mail her application before 12:AM tonight. \(\Rightarrow\) Janice mails her application. \(\Rightarrow\) Janice won't lose the opportunity to apply for graduate school.
   a. Explicit Deadline
   b. Implicit Deadline

65. Albert has a low probability of being injured if in an accident while driving. \(\Rightarrow\) Albert fastens his seatbelt before driving. \(\Rightarrow\) Albert has an infinitesimally lower probability of being injured if in an accident while driving.
   a. Explicit Deadline
   b. Implicit Deadline


Rule of Thumb: The ineffective performance management contingency—
Many performance-management contingencies fail to do the trick; but, in any event, let's classify them as performance management, if they were designed to manage performance.

DO NOT fail to classify a contingency as a performance management contingency just because it's ineffective. Example: ineffective—
Joan has a moderate probability of getting a speeding ticket. \(\Rightarrow\)

Joan drives 65 miles per hour. \(\Rightarrow\)
Joan has a slightly lower probability of getting a speeding ticket.
Although this is a performance management contingency it fails to control behavior consistently. Think about your own behavior—does this contingency prevent you from speeding? It probably would if you saw a policeperson parked in the median ahead of you on the highway, but otherwise I doubt it.

**Criterion:** The sizable outcome—
The change in the size of the outcome magnitude, from the before condition to the after condition, must be large enough to control behavior.

**Example:** Sizable outcome—
Jane won't have $50 at the end of the week, Friday. => Jane works one hour landscaping the yard. => Jane will have $50 at the end of the week, Friday.

**Example:** Small but cumulative outcome—
Jane won't have healthy gums. => Jane flosses her teeth once. => Jane will have infinitesimally more healthy gums.

Are the following outcomes sizable or small but cumulative?

67. Sherry will lose the opportunity to get a student loan by 5:00 PM tomorrow. => Sherry gives the loan officer her completed loan application. => Sherry won't lose the opportunity to get a student loan.
   a. Sizable outcome
   b. Small outcome

68. Morgan has poor communication skills. => Morgan smiles once when he initiates one conversation. => Morgan's communication skills are infinitesimally improved.
   a. Sizable outcome
   b. Small outcome

69. Construct an original example of an effective performance management contingency with a sizable outcome.

**Criterion:** The probable outcome—
The change in probability of the outcome from the before condition to the after condition, must be large enough to control behavior.

**Example:** Probable—
A cop is sitting in his car on the corner, there is a strong probability Morgan will get a ticket. => Morgan stops at the red light. => There is a strong probability Morgan won't get a ticket.

**Example:** Improbable—
There are no cops in sight, Morgan has a slight probability of getting a ticket. => Morgan stops at the red light. => Morgan has a slightly lower probability of getting a ticket.

Are the following examples probable or improbable performance-management outcomes?

70. Charles hears on the radio that there is one million dollars in the jackpot for tonight's drawing, there is some probability Charles will win the lottery. => Charles buys a lottery ticket. => There is a infinitesimally increased probability Charles will win the lottery tonight.
   a. Probable
   b. Improbable

71. Jane probably will get a ticket, because there is a police sitting at the intersection. => Jane stops at the red light. => Jane probably won't get a ticket.
   a. Probable
   b. Improbable

72. Construct an original example of a performance management contingency with a probable outcome.

**Two-Factor Theory of Avoidance**
Here's the problem: when implementing performance management contingencies, why does a statement about posted behavioral outcomes on Monday control behavior
Friday? Why, for example, when a student receives an assignment on Monday does he or she turn in the product on Friday as directed on Monday? Before we get too far with this let's take a break and introduce the two-factor theory of avoidance that will hopefully, clarify and bridge the transition from performance management contingencies to theoretical contingencies.

**Definition: The two-factor theory of avoidance**

The warning stimulus becomes a learned aversive stimulus, through pairing with the original aversive stimulus; and that response is reinforced by the contingent termination of the warning stimulus.

This so-called avoidance behavior is reinforced by the termination of the warning stimulus, not by the avoidance of the original aversive stimulus. So the avoidance response is really an escape response.

The two-factor theory of avoidance involves both a learned aversive stimulus and an unlearned aversive stimulus. For the sake of review, recall that the learned aversive stimulus is paired several times with the unlearned aversive stimulus.

**Example: Pairing Procedure**

- **light on** (learned aversive stimulus) => **shock** (unlearned aversive stimulus)
- light on precedes shock

This is a pairing procedure, shock followed by light on establishes the light as a learned aversive stimulus or a warning stimulus in the cued avoidance procedure.

**Example: Escape contingency**

- light on => lever press => light off

**Example: Avoidance contingency**

- shock on in 10" => lever press => shock not on in 10"

The rats lever press escapes turns off the light and avoids the shock. The light off, prevents the shock on. The light on is the learned aversive stimulus. The light on has been previously paired with the shock on. If Rudolf presses the lever he will avoid the shock on. Really avoidance contingencies control the avoidance response through an escape contingency, because the light on is now aversive; therefore, Rudolf presses the lever to escape the aversive light on and avoid the aversive shock.

The lever press then terminates the light—avoidance by prevention of the presentation of an aversive condition, the aversive condition being the shock; thus the two-factor theory: termination of light and prevention of shock.

**light on => lever press => light off: escape contingency**

**shock on in 10" => lever press => prevents shock on in 10": avoidance contingency**

The following questions relate to the two-factor theory of avoidance and the preceding examples...

73. **What is the procedure?:** buzzer => shock
   a. pairing
   b. extinction

This is a pairing procedure, the unlearned aversive stimulus has been paired with a neutral stimulus, the buzzer which through pairing acquires the aversive properties of the shock.

74. **What is the buzzer?:** buzzer => chain pull => buzzer
   a. unlearned aversive stimulus
   b. learned aversive stimulus

The buzzer is the learned aversive stimulus.

75. **What is the shock?:** shock => chain pull => no shock
   a. unlearned aversive stimulus
   b. learned aversive stimulus

The shock is the unlearned aversive stimulus.

76. **Which contingency is this?:** buzzer => chain pull => no buzzer
   a. escape contingency
   b. avoidance contingency

This is an escape contingency, the rat pulls the chain to escape the aversive sound of the buzzer that has been previously paired with the shock.

77. **Which contingency is this?:** shock in 10" => chain pull => no shock in 10"
   a. escape contingency
   b. avoidance contingency

This is an avoidance contingency, the rat pulls the chain to terminate the buzzer which prevents shock on.
78. Construct an original example of a pairing procedure and label the unlearned aversive stimulus and a learned aversive stimulus.

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79. Construct an original example of an escape contingency and an avoidance contingency using your pairing example.

**Escape contingency**

Before | Behavior | After
--- | --- | ---

**Avoidance contingency**

Before | Behavior | After
--- | --- | ---

"--even when the avoidance outcome follows the response within 60 seconds (and is, in a sense, direct-acting),
--and even when we can't directly observe the warning stimulus (then we must infer it).

So it's not surprising that we need to infer a direct-action escape contingency to explain the control of our indirect-acting, performance-management analogs to various forms of avoidance. But, I should warn you not to be surprised that such inferences make many traditional behavior analysts itch. These behavior analysts feel we must be able to get interobserver agreement on all aspects of our analysis! My view is that it ain't always possible, though interobserver agreement is always desirable.

**Theoretical Escape Contingencies**

**Definition:** Theoretical contingency—
An inferred, direct-acting contingency that explains the effectiveness of the indirect performance management contingency.

Performance management contingencies that increase behavior, are usually analogs to some form of avoidance. In the case of such performance management contingencies, you need a theoretical contingency. In the case of such performance management contingencies, here's an area: The rule describing the performance management contingency functions as an establishing operation. It's statement establishes an aversive condition which we might loosely speak of as "anxiety" or "fear" or just the "cold sweats". The client then complies with the performance management rule and contingency and that compliance is reinforced by the termination of the aversive condition.

**Criterion:** The indirect-acting performance management contingency—
When the performance management contingency is indirect-acting, an inferred theoretical, direct-acting contingency is required. If the performance management contingency is direct-acting, then no theoretical contingency is required. If the performance management contingency is indirect-acting, then you need to infer a theoretical contingency.

**Example:** Indirect-acting performance management contingency—
David will lose $5 on Friday. ➔
David does the dishes today. ➔
David won't lose $5 on Friday.

Because the performance management contingency is indirect-acting, you need a theoretical contingency.

**Example:** Theoretical Contingency—
David fears he will lose $5 on Friday. ➔
David does the dishes today. ➔
David does not fear he will lose $5 on Friday.
Example: Direct-acting performance management contingency—
David does not get praised. ➞ David does the dishes today. ➞ David does get praised immediately.

If the consequence immediately follows and controls behavior, then it passes the direct-acting performance management contingency test and you do not need a theoretical contingency. In other words, David could be a chimp trained to wash the dishes, you only need to introduce the theoretical contingency when rule-governed behavior is involved.

Are these examples of indirect-acting performance management contingencies or direct-acting performance management contingencies?
80. Rob has no snickers in his mouth. ➞ Rob reads one paragraph. ➞ Rob has one bite of snickers in his mouth.
   a. direct-acting contingency
   b. indirect-acting
81. Do you need to infer a theoretical contingency for the previous question?
   a. Yes
   b. No
82. Charlie will lose $20 on Friday. ➞ Charlie does one homework assignment on Wednesday. ➞ Charlie will not lose $20 on Friday.
   a. direct-acting
   b. indirect-acting
83. Do you need to infer a theoretical contingency for the previous example?
   a. Yes
   b. No
   a. direct-acting
   b. indirect-acting
85. Do you need to infer a theoretical contingency for the previous example?
   a. Yes
   b. No
86. If Rob doesn't heat the pool today, he will be docked $20 pay tomorrow. ➞ Rob turns on the heater today. ➞ Rob won't be docked $20 pay tomorrow.
   a. direct-acting
   b. indirect-acting
87. Do you need to infer a theoretical contingency for the previous example?
   a. Yes
   b. No

Criterion: The inferred test—
The contingency must be an inferred direct-acting contingency, rather than an observable, direct-acting contingency.

Remember we're talking about theoretical contingencies here. That's why this contingency must be inferred. If you could observe it, it wouldn't be theoretical.

Example: Effective performance management—
Manny will miss the opportunity to earn $10 on Monday ➞ Manny mows the lawn on Sunday. ➞ Manny won't miss the opportunity to earn $10 on Monday.

This type of performance management contingency is an analog to avoidance of the opportunity to obtain a reinforcer. Manny mows the lawn on Sunday, but receives the reinforcer on Monday. Manny would not lose the opportunity to earn $10 until Monday.

Example: Theoretical inferred—
Manny is "afraid" of missing the opportunity to earn $10 Monday. ➞ Manny mows the lawn on Sunday. ➞ Manny is not "afraid" of missing the opportunity to earn $10 on Monday.

This is an inferred theoretical contingency, and fear of it opportunity to earn $10 is a direct-acting escape contingency. Manny is escaping the aversive condition of being afraid. The word afraid is the operative word that discriminates between the unobservable, inferred direct-acting contingency and the performance management...
contingency. In other words the one difference between
the theoretical contingency and the performance manage-
ment contingency is the addition of the inferred component.
For instance, look at the example of the theoretical inferred
contingency, Manny is not "afraid" of missing the opportu-
nity to earn $10 on Monday. If you deleted the word afraid,
what you have left is the performance management contin-
gency, Manny will not miss the opportunity to earn $10 on
Monday.

Example: Natural contingency—
Willa has one level of knowledge. —> Willa will lose $5.
Willa studies for one hour. —> Willa won't lose $5.
This is probably an ineffective natural contingency. The
outcomes are too small and too cumulative to control behavior;
that is why we need a performance management contingency.

Example: Effective Performance Management—
Willa studies for one hour. —> Willa won't lose $5.
This type indirect-acting performance management contin-
gency is an analog to avoidance of the loss of a reinforcer.

Example: Theoretical Inferred—
Willa is fearful of failure. —> Willa will lose $5.
Willa studies for one hour. —> Willa won't lose $5.
This is a theoretical inferred contingency, because you cannot
observe Willa's fear, but we infer she studies for one hour
to escape the anxiety or fear. So this type of contingency
is an escape contingency.

What type of contingency?
89. Tony has a lot of studying to do. —> Tony studies for
one hour. —> Tony has infinitely less studying
to do.
   a. inferred theoretical contingency
   b. natural contingency
   c. performance management contingency
90. Tony is afraid of losing $5. —> Tony studies for one
hour. —> Tony is not afraid of losing $5.
   a. inferred theoretical contingency
   b. natural contingency
   c. performance management contingency
91. Tony will lose $5. —> Tony studies for one hour.
   —> Tony won't lose $5.
   a. inferred theoretical contingency
   b. natural contingency
   c. performance management contingency

Criterion: The direct-acting contingency:
The theoretical contingency must be direct-acting if the be-
havior is controlled.

Example: Performance Management, indirect-acting
Sue will have to pay the plumber for frozen pipes. —>
Sue turns up the thermostat. —> Sue won't have to pay the plumber to fix her pipes.

This is an analog to avoidance of an aversive condition.
This is probably an ineffective natural contingency. The
outcomes are too small and too cumulative to control behavior;
that is why we need a performance management contingency.

Example: Theoretical, direct-acting
Sue is afraid she will have to pay the plumber for frozen
pipes. —> Sue turns up the thermostat. —> Sue is less of afraid she will have to pay the plumber for frozen pipes.

This is a direct-acting theoretical contingency. The state-
ment, "your pipes will freeze if it is too cold in your house"
is a rule that specifies the aversive condition of frozen
pipes. Imagining the financial and physical mess frozen
pipes would produce causes immediate fear, followed by
behavior to escape that fear producing condition. It is direct-
acting because it is immediate. It is theoretical because you
don't see the covert fear response.

Criterion: The escape contingency—
If the performance management contingency is
designed to increase or maintain performance,
the inferred, theoretical contingency
must be an escape contingency.

The performance management contingency is an avoid-
ance contingency and all indirect-acting avoidance con-
tingencies must have direct-acting escape contingencies to support
them. Stating the aversive consequences for failure to ac-
knowledge the rules results in aversive thoughts. Compliance
with the rule terminates those aversive thoughts. The con-
tingency with the rule control behavior.

Example: Performance Management, analog to avoid-
ance contingency—
Joan will have to pay a $5 late fee on Friday. —>
Joan pays her bills on Thursday. —>
Joan will not have to pay a $5 late fee on Friday.

This effective performance management contingency is an
alogous to avoidance of the loss of a reinforcer. The con-
tingency, being an analog is indirect-acting.

Example: Theoretical, escape contingency—
Joan has aversive thoughts about bill collectors. =>
Joan pays her bills. =>
Joan does not have aversive thoughts about bill collectors.

The aversive thoughts are immediate. After Joan pays her bills she can "escape" those aversive thoughts.

Example: Performance Management, Avoidance
David hears "finish your report or else". =>
David writes one late report. =>
Immediately David hears, "well you just bought yourself another day on the job".

This is a direct-acting performance management contingency. David is immediately reinforced for having completed his report. Because the performance management contingency is direct-acting, there is no need for a theoretical escape contingency. However, if David's boss didn't say "well you just bought yourself another day on the job" until the next morning, then the contingency would be indirect-acting and you would need a theoretical contingency.

Example: Theoretical, escape contingency—
David fears he may lose his job. =>
David writes one late report. =>
David is less afraid of losing his job.

Again, this is an escape contingency because David is in a fearful state he would like to terminate.

Are the following examples of performance management avoidance contingencies or theoretical escape contingencies?

92. Jane is afraid of losing $10 tomorrow. => Jane baby-sits her little sister for 2 hours. => Jane is not afraid of losing $10 tomorrow.
   a. theoretical, escape
   b. performance management, avoidance

93. Jane will lose $10 tomorrow. => Jane baby-sits her little sister for 2 hours. => Jane won't lose $10 tomorrow.
   a. theoretical, escape
   b. performance management, avoidance

94. Allen is afraid he will have to pay a late registration fee after 5:00 PM Friday. => Allen pays WMU cashiering. => Allen is not afraid of having to pay a late registration fee.
   a. theoretical, escape
   b. performance management, avoidance

95. Allen will pay a late registration fee after 5:00 PM Friday. => Allen pays WMU cashiering. => Allen will not have to pay a late registration fee.
   a. theoretical, escape
   b. performance management, avoidance

Criterion: Linked to Performance Management—
The inferred contingency must relate to the indirect-acting performance management contingency, NOT to the ineffective natural contingency.

Example: Ineffective Natural Contingency
David has one level of physical health. =>
David walks 5 miles. =>
David has an infinitely improved level of physical health.

This is an ineffective natural contingency so don't relate the theoretical contingency to this contingency. The theoretical contingency is related to the performance management contingency.

Example: Performance Management Contingency
David will pay $5 on Friday. =>
David walks 5 miles. =>
David won't pay $5 on Friday.

The theoretical contingency is related to the consequence specified in the before condition, if you don't walk 5 miles you will pay $5. The $5 payment for failure to walk is a penalty performance management contingency designed by performance manager to improve the unhealthy biking quality of life.

Example: Theoretical Contingency
David fears he will lose $5 on Friday. =>
David walks 5 miles. =>
David does not fear he will lose $5 on Friday.

The contingency specified in the theoretical contingency is related to the performance management contingency, NOT the ineffective natural contingency. The contingency specified in the theoretical contingency ALWAYS relate to the performance management contingency.

The following contingency diagrams are attempts at theoretical contingencies, but do they relate to the performance-management contingency, as they should?

96. Jane is afraid of she will pay $20 this Monday. => Jane rides her bike for one hour. => Jane is not afraid she will pay $20 this Monday.
   Is this contingency linked to the performance management contingency?
   a. Yes
   b. No

97. Then is it a good example of a theoretical contingency?
   a. Yes
   b. No
98. Jane is afraid she will gain weight. \(\implies\) Jane rides her bike for one hour. \(\implies\) Jane is less afraid of gaining weight.

Is this contingency linked to the performance management contingency?
- a. Yes__
- b. No____

99. Then is it a good example of a theoretical contingency?
- a. Yes__
- b. No____

100. Albert is afraid he will lose the opportunity to earn 10 OAPs. \(\implies\) Albert answers the bonus question. \(\implies\) Albert is less afraid he will lose the opportunity to earn 10 OAPs.

Is this contingency linked to the performance management contingency?
- a. Yes__
- b. No____

101. Then is it a good example of a theoretical contingency?
- a. Yes__
- b. No____

102. Albert will lose the opportunity to earn 10 OAPs. \(\implies\) Albert answers the bonus question. \(\implies\) Albert will not lose the opportunity to earn 10 OAPs.

Is this contingency linked to the performance management contingency? (Careful, we're talking tricky business here.)
- a. Yes__
- b. No____

Please explain your answer:

Then is it a good example of a theoretical contingency?
- c. Yes__
- d. No____
104. Check out the diagrammed example of the three-contingency model on the first page this homework. Now give an original example of the three-contingency model, filling in the general description of your example and the diagram.

Original Example

Description:

Conclusions

This has been just a preliminary introduction to the three-contingency model. It will form the basis for much of our analysis in future chapters, so you will gain much more expertise, as we progress through the various areas of applied behavior analysis. Remember the same response criterion as you apply the three-contingency model with your own examples.

105. Compared to other courses, this reading/homework assignment was
   a. much more valuable
   b. somewhat more valuable
   c. average
   d. somewhat less valuable
   e. much less valuable

106. The storyline and examples were
   a. very valuable
   b. somewhat valuable
   c. so so
   d. not too valuable
   e. a waste

107. The multiple-choice questions were
   a. very valuable
   b. somewhat valuable
   c. so so
   d. not too valuable
   e. a waste

108. The contingency-diagramming questions were
   a. very valuable
   b. somewhat valuable
   c. so so
   d. not too valuable
   e. a waste

109. Generally, integrating the workbook into the textbook
   a. very valuable
   b. somewhat valuable
   c. so so
   d. not too valuable
   e. a waste

110. About how many hours did you spend on this total assignment?
   a. 1 or less
   b. 2
   c. 3
   d. 4
   e. 5 or more

Suggestions and comments:
Appendix C

Checklist
Checklist for the Three-contingency Model of Performance Management

Use this checklist to evaluate an application of the three-contingency model of performance management. You should be able to answer YES to almost all of criteria below.

ALL CONTINGENCIES
1. Criterion: The Same Response—The response is the same in all three contingencies.

INEFFECTIVE NATURAL CONTINGENCIES
2. Criterion: Natural Contingency—A natural contingency is operative prior to performance management and it is not designed to manage performance.
3. Criterion: Quality of Life—The natural contingency must have an outcome that affects the quality of life of the individual or society, for us to be concerned with it.
4. Criterion: Ineffective Contingency—The natural contingency must be ineffective; that is, it does not control behavior, so we need to use performance management.
5. Criterion: The Small Outcome—A contingency is ineffective, if the change in the size of the outcome from the before condition to the after condition is too small to control behavior.
6. Criterion: Improbable-Outcome—A contingency is ineffective, if the change in the probability of the outcome from the before condition to the after condition is too small to control behavior.

PERFORMANCE MANAGEMENT CONTINGENCIES
7. Criterion: The Added Contingency—the contingency is usually added (extrinsic), not built-in (intrinsic).
8. Criterion: The Analog to Avoidance Contingency—If an indirect-acting contingency is to increase or maintain performance, it should be an analog to avoidance.
9. Criterion: The Analog to Punishment Contingency—If an indirect-acting contingency is to decrease performance, it should be an analog to penalty or punishment.
10. Criterion: Deadlines for Avoidance—Deadlines are needed only for analogs to avoidance, not analogs to punishment.
11. Criterion: The Explicit Deadline—When there is a deadline, it must be explicitly stated in the before and after conditions.
12. Criterion: The Sizable Outcome—The change in the size of the outcome from the before condition to the after condition must be large enough to control behavior.
13. Criterion: The Probable Outcome—The change in the probability of the outcome from the before condition to the after condition must be probable for the contingency to control behavior.

THEORETICAL CONTINGENCIES
14. Criterion: The Indirect-Acting Performance Management Contingency—When the performance management contingency is indirect-acting, an inferred theoretical, direct-acting contingency is required. If the performance management contingency is direct-acting, no theoretical contingency is required.
15. Criterion: The Inferred Contingency—This contingency must be an inferred direct-acting contingency, rather than an observable direct-acting contingency.
16. Criterion: Direct-Acting: The theoretical contingency must be direct-acting if the behavior is controlled.
17. Criterion: The Escape Contingency—If the performance management contingency is designed to increase or maintain performance, the inferred, theoretical contingency must be an escape contingency.
18. Criterion: Linked to Performance Management—The inferred contingency must relate to the indirect-acting performance management contingency, NOT to the ineffective natural contingency.
Checklist for the Three-contingency Model of Performance Management

Use this checklist to evaluate an application of the three-contingency model of performance management. You should be able to answer YES to almost all of criteria below.

**ALL CONTINGENCIES**

1. Criterion: The Same Response—The response is the same in all three contingencies.

**INEFFECTIVE NATURAL CONTINGENCIES**

2. Criterion: Natural Contingency—A natural contingency is operative prior to performance management and it is not designed to manage performance.

3. Criterion: Quality of Life—The natural contingency must have an outcome that affects the quality of life of the individual or society, for us to be concerned with it.

4. Criterion: Ineffective Contingency—The natural contingency must be ineffective; that is, it does not control behavior, so we need to use performance management.

5. Criterion: The Small Outcome—A contingency is ineffective, if the change in the size of the outcome from the before condition to the after condition is too small to control behavior.

6. Criterion: Improbable-Outcome—A contingency is ineffective, if the change in the probability of the outcome from the before condition to the after condition is too small to control behavior.

**PERFORMANCE MANAGEMENT CONTINGENCIES**

7. Criterion: The Added Contingency—the contingency is usually added (extrinsic), not built-in (intrinsic).

8. Criterion: The Analog to Avoidance Contingency—The contingency is designed to increase or maintain performance, it should be some form of direct-acting or indirect-acting avoidance contingency.

9. Criterion: Deadline—Effective performance management contingencies are designed to increase behavior of verbal clients usually involve an added deadline.

10. Criterion: The Sizable Outcome—The change in the size of the outcome from the before condition to the after condition, must be large enough to control behavior.

11. Criterion: The Probable Outcome—The change in the probability of the outcome from the before condition to the after condition must be probable for the contingency to control behavior.

**THEORETICAL CONTINGENCIES**

12. Criterion: The Indirect-Acting Performance Management Contingency—If the performance management contingency is indirect-acting, you need to infer a theoretical contingency.

13. Criterion: The Inferred Contingency—This contingency must be inferred not directly observable.

14. Criterion: The Escape Contingency—If the performance management contingency is designed to increase or maintain performance, the inferred, theoretical contingency must be an escape contingency.
Appendix D
Pretest/Posttest
Three-Contingency Model Test

Reinforcement, Avoidance, & Escape

Name: ______________________
Grade: ______________________
Date: ________________
Start Time: ________________
Finish Time: ________________
Social Security Number: ______________________
Group Membership: (Don't Mark) 1 2 3 4

Be sure to fill in all of the data above, EXCEPT, group membership.

The following questions assess your current knowledge of the three-contingency model of performance management. A pinksheet checklist has been included with definitions of the criteria used with the three contingency model. Read over the checklist now and then return to the questions.

Read all of the text and ANSWER EVERY question, even if you are unsure of your answer.

The three-contingency model consists of a triad of contingencies; the natural contingency, the performance-management contingency, and the theoretical contingency.

Ineffective Natural Contingency

Before: Jack has one level of health. ==> Behavior: Jack eats one balanced meal. ==> After: Jack has an infinitesimally improved level of health.

Effective Performance Management Contingency

Before: Jack will lose $5 at Friday's dieter's meeting. ==> Behavior: Jack eats one balanced meal. ==> After: Jack won't lose $5 at Friday's dieter's meeting.

Theoretical Contingency

Before: Jack is afraid of losing $5. ==> Behavior: Jack eats one balanced meal. ==> After: Jack is not afraid of losing $5.

1. What is this contingency? Before: Tony's car engine will be slightly worse. ==> Behavior: Tony changes the oil. ==> After: Tony's car engine won't be slightly worse. ==> a. ineffective natural contingency__ b. performance management contingency__ c. theoretical contingency__

2. In the example above the contingency is a. small but cumulative__ b. improbable__

3. What is this contingency? Before: Tony fears he will lose the opportunity to take performance management psy 360 course. ==> Behavior: Tony registers for psy 360. ==> After: Tony does not fear he will lose the opportunity to take performance management psy 360. a. ineffective natural contingency__ b. performance management__ c. theoretical contingency__

4. In the previous example, is the contingency a. an avoidance contingency__ b. an escape contingency__ c. a punishment contingency__

5. What is this contingency? Before: Tony has one level of curb walking balance skill. ==> Behavior: Tony practices walking 50 feet on the curb. ==> After: Tony has barely improved his curb walking balance skill a. ineffective natural contingency__ b. performance management contingency__ c. theoretical contingency__

6. Does the contingency in the previous example affect quality of life? a. yes__ b. no__

7. What is this contingency? Before: At 7:00 PM, Rob won't have $10. ==> Behavior: Rob washes his father's car at 3:00 PM. ==> After: At 7:00 PM, Rob will have $10. a. ineffective natural contingency__ b. performance management contingency__ c. theoretical contingency__

8. In the previous example, the contingency was a. built-in__ b. added__

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9. What is this contingency?
Before: Rita fears Mom’s scolding. ===> 
Behavior: Rita cleans her room. ===> 
After: Rita doesn’t fear Mom’s scolding.
a. ineffective natural contingency
b. performance management contingency
c. theoretical contingency

10. In the previous example, the contingency was
a. indirect-acting
b. direct-acting

11. What is this contingency?
Before: Joe has a low probability of getting ill. ===> 
Behavior: Joe washes his hands before eating. ===> 
After: Joe has a slightly lower probability of illness.
a. ineffective natural contingency
b. performance management contingency
c. theoretical contingency

12. In the previous contingency, was there a deadline?
   a. yes
   b. no

13. What is this contingency?
   Before: At the end of the day, Sue will lose the opportunity to get $80 on Friday. ===> 
   Behavior: Sue works for one hour with her client. ===> 
   After: At the end of the day, Sue will not lose the opportunity to get $80 on Friday.
   a. ineffective natural contingency
   b. performance management contingency
   c. theoretical contingency

14. In the previous example, the contingency was
   a. analog to the avoidance of the loss of an opportunity to prevent an aversive condition
   b. analog to the avoidance of the loss of an opportunity to get a reinforcer
   c. avoidance of the loss of an opportunity to prevent an aversive condition
   d. avoidance of the loss of an opportunity to get a reinforcer

15. What is this contingency?
   Before: Tony doesn’t hear “good boy”. ===> 
   Behavior: Tony pees in the toilet. ===> 
   After: Tony immediately hears “good boy”.
   a. ineffective natural contingency
   b. performance management contingency
   c. theoretical contingency

16. Do you need to infer a theoretical contingency to explain the preceding example?
   a. yes
   b. no

17. What is the contingency?
   Before: Jona will lose $30 at the end of the week. ===> 
   Behavior: Jona does his homework. ===> 
   After: Jona won’t lose $30 at the end of the week.
   a. ineffective natural contingency
   b. performance management contingency
   c. theoretical contingency

18. In the above example, is the contingency...
   a. avoidance of the loss of a reinforcer
   b. avoidance of an aversive condition
   c. analog to the avoidance of an opportunity to get a reinforcer
   d. analog to the avoidance of an aversive condition
19. Apply the three-contingency model of performance-management to an original problem to increase behavior. Include the ineffective natural contingency, the effective performance management contingency, and the effective theoretical contingency.
Appendix E

Sample instructional Unit for Control Group
Chapter 5
Conceptual Worksheets for Penalty

PRINCIPLES

PUNISHMENT by the presentation of an aversive condition: A response becomes less likely in the future, if an aversive condition or an increase in an aversive condition has immediately followed it in the past.

Punishment by the loss of reinforcers (PENALTIES): A response becomes less likely to occur in the future if the loss of a reinforcer has immediately followed it in the past.

a) RESPONSE COST: The removal of a tangible reinforcer, contingent on a response, with a resulting decreased likelihood of that response. *(Lose something you already have—usually a permanent loss)

b) TIME-OUT: The removal of access to reinforcers, contingent on a response, with a resulting decreased likelihood of that response.* (Removal of the "opportunity" to make reinforced responses—usually for a short period of time, not a permanent loss)

1) EXCLUSIONARY: excluded from the environment

2) NON EXCLUSIONARY: stay in environment

EXAMPLES

PUNISHMENT FOR THE PUSS, PART I

Daisy the kitten jumps onto the kitchen table. Her owner (a former Psy 360 student) immediately sprays Daisy with water. Daisy then jumps down from the table and runs to the safety that lies underneath the bed.

1. Whose behavior?
   a. The brilliant owner
   b. Daisy the kitten
   c. The spray bottle

   [HINT: Who is being punished? Whose behavior do we want to decrease?]

   Answer: b. Daisy the kitten!

2. What is the behavior?
   a. Daisy jumps onto the kitchen table
   b. Daisy jumps down from the kitchen table
   c. The brilliant owner sprays Daisy

   [HINT: 1) It must be Daisy's behavior because she is who is being punished. 2) What behavior do we want Daisy to decrease?]

   Answer: a. Jumping onto the table!

3. What is the before condition?

   [HINT: Since this is a punishment contingency, which means there is a presentation of an aversive condition, it may be easier to look at the after condition prior to looking at the before condition.]

   a. Daisy jumps onto the table
   b. Daisy doesn't get sprayed
   c. The brilliant owner takes Psy 360

   [HINT: See criteria #7 and #8 from the pink sheet]

4. What is the after condition?

   a. Daisy jumps down from the table
   b. Daisy runs underneath the bed
   c. Daisy gets sprayed by the brilliant owner

   [HINT: What does Daisy's owner do to her?]

   Answer: c. Daisy gets sprayed!!!!!
This is a correct contingency diagram because...
#1 The response (Daisy jumping onto the kitchen table) decreases because
#2 an aversive condition (spray of water) has immediately followed it in the past.

PUNISHMENT FOR THE PUSS, PART 2: PENALTY PREVAILS

Macy, Daisy's sister and very best friend, is playing with her favorite toy—a plastic milk ring. Macy throws the ring around until it lands in the plant, which Macy is not allowed near. Macy jumps up into the plant to retrieve her ring but gets caught in the act by her psychologically sophisticated owner. The owner moves Macy to the floor and takes her ring away for five minutes.

1. Whose behavior?
   a. Macy's
   b. Daisy's
   c. The owner's
   [HINT: Who is being punished/penalized? Whose behavior do we want to decrease?]
   Answer: a. Macy's!

2. What is the behavior?
   a. The owner takes away the milk ring
   b. Macy plays with the milk ring
   c. Macy jumps into the plant
   [HINT: 1) It must be Macy's behavior because that's who is being punished/penalized. 2) What behavior do we want Macy to decrease?]
   Answer: c. Macy jumps into the plant!

3. What's the before condition?
   [HINT: Since this is a punishment contingency, which means there is a presentation of an aversive condition, it may be easier to look at the after condition prior to looking at the before condition.]

4. What is the after condition?
   a. Macy jumps back out
   b. The owner takes away Macy's ring
   c. Macy joins Daisy under the bed
   [HINT: What does the brilliant owner do?]
   Answer: b. The owner takes the ring!

HERE WE GO!!! YOU TRY IT.

Bingo is playing with his owner, John. Bingo playfully bites John, and John gives Bingo a doggy treat.

1. What is the contingency?
   a. punishment
   b. reinforcement
   c. penalty
   d. avoidance

2. What is the contingency?
   a. punishment
   b. reinforcement
   c. penalty
   d. avoidance

3. What's the before condition?
   [HINT: Since this is a punishment contingency, which means there is a presentation of an aversive condition, it may be easier to look at the after condition prior to looking at the before condition.]
Daisy jumps onto the kitchen table while her over-worked owner takes a cat nap.

Before | Behavior | After
nothing | Daisy jumps onto table | nothing

2. What is the contingency?
   a. punishment
   b. reinforcement
   c. penalty
   d. none of the above

When little Jenny walks into her house carrying her newly dug up pet worms, which are not allowed in the house, her mother immediately yells at Jenny's big sister.

Before | Behavior | After
No yelling at big sis | Jenny walks in with worms | Yelling at big sis

3. Which criteria does this punishment contingency violate?
   a. #7 and #12
   b. #12 and #2
   c. #2 and #5
   d. None of the above

Elmer goes to Waldo's on Friday night to grab a few drinks. Elmer drank his tenth drink and finally called it a night. He woke up Saturday afternoon with the worst hangover of his life. (Not-for-extra-credit question: Is Elmer a light-weight??? Circle one: YES NO)

Before | Behavior | After
No hangover | Elmer finishes his tenth drink | Hangover

4. This punishment contingency violates which criteria?
   a. #7
   b. #9
   c. #10
   d. None of the above

Daisy is in the kitchen with her owner's roommate. Daisy stands by her food dish which is still completely full and cries, "Meeewooow", repetitively. Finally the frustrated and anxiety ridden roommate yells at poor little Daisy.

Before | Behavior | After
Full food dish | Daisy "Meows" | Roommate yells

5. This punishment contingency violates which criteria?
   a. #7
   b. #8
   c. #10
   d. None of the above

Daisy the kitten sits on the windowsill of an open window. All of a sudden a large gust of chilling wind blows in and makes Daisy shiver with cold.

Before | Behavior | After
No wind blowing | Daisy sits on windowsill | Wind blows

6. This contingency violates which criteria?
   a. #3 and #2
   b. #2 and #4
   c. #4 and #10
REINFORCEMENT

Peggy Pigeon is food deprived. She pecks the key in her Skinner Box, and Julie gives her a food pellet.

1. Which diagram is an example of Reinforcement?

a. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no food</td>
<td>Peggy key pecks</td>
<td>food</td>
</tr>
</tbody>
</table>

b. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no food</td>
<td>Peggy food pellet</td>
<td>food</td>
</tr>
</tbody>
</table>

c. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>food</td>
<td>Peggy key pecks</td>
<td>food</td>
</tr>
</tbody>
</table>

d. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no food</td>
<td>Julie gives Peggy food pellet</td>
<td>Peggy is thirsty</td>
</tr>
</tbody>
</table>

Ron works in an office and makes lots of copies. Today, he presses the "print" button but the machine won't work. He asks Carol for help, but she can't find the problem. Then Ron realizes that the machine was never turned on. He presses the "on" button and the machine works.

2. Which diagram is an example of Reinforcement?

a. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no copies</td>
<td>Ron asks for Carol's help</td>
<td>copies</td>
</tr>
</tbody>
</table>

b. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no copies</td>
<td>Ron realizes it's off</td>
<td>machine on</td>
</tr>
</tbody>
</table>

c. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no copies</td>
<td>Ron presses &quot;print&quot;</td>
<td>no copies</td>
</tr>
</tbody>
</table>

d. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>machine off</td>
<td>Ron presses &quot;on&quot;</td>
<td>machine on</td>
</tr>
</tbody>
</table>
Katie and her dad are putting together a Snoopy puzzle. When Katie correctly places a puzzle piece, her dad gives her a big hug. This makes her giggle as she continues her puzzle playing.

3. Which diagram is an example of Reinforcement?

a. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no giggle</td>
<td>Katie correctly places puzzle piece</td>
<td>giggle</td>
</tr>
</tbody>
</table>

b. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no hug</td>
<td>Katie correctly places puzzle piece</td>
<td>Katie keeps playing</td>
</tr>
</tbody>
</table>

c. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no hug</td>
<td>dad gives Katie hug</td>
<td>Katie giggles</td>
</tr>
</tbody>
</table>

d. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no hug</td>
<td>Katie correctly places puzzle piece</td>
<td>hug</td>
</tr>
</tbody>
</table>

At the factory Jane works with they have recently implemented a feedback system. On the wall in the break room hangs a productivity chart where each employee's progress is graphed daily. Jane goes in the break room and immediately heads for the chart. After her name is a positively sloping line indicating that she has good productivity. Jane smiles and drinks a pop.

4. Which diagram is an example of Reinforcement?

a. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>sight of positive slope</td>
<td>Jane works hard</td>
<td>sight of positive slope</td>
</tr>
</tbody>
</table>

b. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no sight of positive slope</td>
<td>Jane works hard</td>
<td>sight of positive slope</td>
</tr>
</tbody>
</table>

c. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>sight of positive slope</td>
<td>Jane reads chart</td>
<td>sight of positive slope</td>
</tr>
</tbody>
</table>

d. 

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>no sight of positive slope</td>
<td>Jane reads chart</td>
<td>sight of positive slope</td>
</tr>
</tbody>
</table>

Lynn is teaching Gary how to read. For words read correctly out loud, Gary receives a token. Gary sees the word "CAT" and says "cat". Lynn gives him a token and Gary smiles.

5. Fill in the blank with the appropriate behavior to make this an example of Reinforcement.
Behavior After
no token token

a. smile
b. Gary says "cat"
c. Gary reads to himself
d. Gary takes a token

My vocabulary is the pits! Luckily, I have a dictionary for a roommate. In my reading I come across the word "antediluvian". I ask my roommate what it means and she spouts off the definition.

6. Fill in the blank with the appropriate After condition to make this an example of Reinforcement.

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don't hear the definition of the word</td>
<td>I ask roommate the definition</td>
<td>I hear the definition</td>
</tr>
</tbody>
</table>

a. my roommate tells me the definition
b. I just skip the word
c. I hear the definition
d. I don't hear the definition

Amy is teaching her dog Lance to sit. Lance jumps around and licks Amy's hand, but she ignores the slobber. She says "sit" in an authoritative voice. Lance sits, and Amy pets Lance and says "good boy".

7. Which diagram is NOT an example of Reinforcement?

ESCAPE

Todd has been outside building a snowman with Tara for hours. Tara tells Todd that his ears are turning purple. This makes him realize how cold his ears are. He immediately puts on a hat, and his ears warm right up.

8. Which diagram is an example of Escape?

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>purple ears Todd tells Todd his ears are purple</td>
<td>Todd's ears feel cold</td>
<td>Todd</td>
</tr>
</tbody>
</table>
Appendix F

Instructions to Students
To the Student:

Your participation in this study is sincerely appreciated. Essentially, there are five parts to the study. Each of you will have different assignments that require different kinds of participation. Some of you will read only, others will have to choose from multiple choice questions and or construct your own examples. Be sure to provide all identifying information on all three mark sense sheets, all in class homework, the pretest, and the posttest.

1. **Informed Consent:** Please read and sign the informed consent sheet. Your instructor will read this in the class. Ask if you have any questions. After you have signed the form, return it to your instructor and pick up a marked sense sheet, #2 pencil, and a pretest.

2. **Complete the Pretest:** Read and complete the pretest. Mark your multiple choice question responses on the mark sense sheet. Turn in your pretest and mark sense sheet to your instructor.

3. **Complete Part One of the Instructional Materials:** Pick up a new mark sense sheet and ask for your assigned in class homework materials. Read all of the materials up to page 8 where it is clearly marked STOP. Stop at page 8 where part one ends. Turn in both your mark sense sheet and your work materials. Those of you with the shorter assignment will receive a different assignment for each session—so you stopping point will be the last page of the homework each class session.

4. **Complete Part Two of the Instructional Materials:** During your next class, pick up the same mark sense sheet you used for part one and get your assigned materials from the previous class session. Complete Part Two. Part Two begins on page 8 where you left off. Read all of the material. When you have finished return both the mark sense sheet and your assignment. Pick up a posttest and a new mark sense sheet.

5. **Complete the Posttest:** Same directions as the pretest.

That's it!!!!!!
Appendix G

HSIRB Proposal Approval Letter
Date: February 6, 1994

To: Judi DeVoe

From: M. Michele Burnette, Chair

Re: HSIRB Project Number 94-02-03

This letter will serve as confirmation that your research project entitled "An experimental analysis of three instructional technologies applied to the three-contingency model of performance management" has been approved under the exempt category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

You must seek reapproval for any changes in this design. You must also seek reapproval if the project extends beyond the termination date.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: February 6, 1995

xc: Malott, Psych
BIBLIOGRAPHY


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