The Making of a Textbook on Behavior Analysis and Autism a Behavior Analytic Approach

Sebastien Bosch
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THE MAKING OF A TEXTBOOK ON BEHAVIOR ANALYSIS AND AUTISM:
A BEHAVIOR ANALYTIC APPROACH

Sébastien Bosch, Ph.D.

Western Michigan University, 2001

After deciding that a need existed for writing a textbook on autism from a behavior analytic perspective, Dr. Malott and I developed Behavior Analysis, Autism and Related Disabilities (BAARD) for use by the students enrolled in the autism practicum at Western Michigan University. As in a circular relationship, the practicum students evaluated and guided the subsequent revisions of the manuscript, and the revisions influenced the subsequent evaluations. BAARD covers all the principles and concepts of behavior analysis that are relevant to treatments and issues in autism and related disabilities and numerous treatments and phenomena specific to developmental disabilities.

During its development, the textbook was evaluated at two levels: the students' evaluation and their performance. The four independent groups of students evaluated three versions of the textbook. These evaluations guided the textbook revisions. Each of the 13 chapters and 50 sections were evaluated three times (with the exception of Chapters 7, 10, 11, and 12 which were evaluated twice). In total, 36 chapter evaluations and 143 section evaluations were administered sequentially. All 13 chapters were revised at least once and 8 of those chapters were revised twice. Twenty-nine revisions were made to the sections as a result of the evaluations of the
first and second version of BAARD. The students' evaluations improved across semesters, independently of revisions, and the overall ratings were positive. After reading the final draft of BAARD, practicum students and non-practicum, psychology students (who had not read BAARD) took a conceptual test. The practicum students and the non-practicum students tended to use the same amount of mentalistic terms. However, the non-practicum students made a few more errors in describing or applied the concepts, and the practicum students used considerably more concepts and procedures in their answers.
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Sébastien Bosch
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CHAPTER I

INTRODUCTION

In teaching and supervising a behavior analysis practicum in autism, Dr. Malott and I saw a need for a new textbook on the subject. This dissertation consists of the production and evaluation of that textbook. Before dealing with the specific book, let us consider issues relevant to textbook writing and textbook evaluation, in general.

First, I chose the topic. Interest is one basis for choosing a topic. Another factor is the existence of an audience. Then, writing effectively becomes the main concern. Writing effectively probably means writing something that will control a part of the readers' repertoire beyond the immediate textual responses. Effective writing may be achieved by embedding enough reinforcers in the text to maintain the textual responses (e.g., by using humor or by stating rules that allow the reader to contact reinforcement contingencies) and/or minimizing the textual response effort (e.g., by using short sentences or writing in the style of job aids). Effective writing is also a complex skill that consists of the writer's verbal behavior along with the appropriate audience control. Unfortunately, the audience is not present when the writing

---

1 A textual response, as defined by B.F. Skinner, is a verbal response that is controlled by written verbal stimuli. There, the response has point-to-point correspondence with the verbal stimulus but has no formal similarity. Unlike "reading," using the term "textual response" does not imply that the verbal stimulus (the printed words) is controlling the readers' behavior beyond the immediate response evoked by these printed words.
behavior takes place; so, its control is indirect and weak. The audience control may be stronger when the author engages in revisions. There, specific comments may guide the revisions in terms of content and style. Nevertheless, the initial draft of the book is somewhat controlled by concerns for the audience.

Therefore, writing a textbook may consist of at least three steps: (1) the selection of the topic, (2) the preparation of the first draft, and (3) the successive revisions that result in a finished product. The selection of the topic may interact with the content of the first draft and possibly with the revisions (i.e., there is a dynamic interaction between the three steps). For example, the table of contents presenting the topics was originally like the table of content in Elementary Principles of Behavior (EPB) (Malott, Malott, & Trojan, 2000). However, I decided to revise the table of contents to align it with the most relevant topics in the area of autism. As a result, chapters from EPB like moral and legal control and rule-governed behavior were dropped and chapters like Autism and Related Disabilities and Verbal Behavior were added. However, the similarities in the content of our textbook and EPB would allow for the coordination of the two texts. The following sections present an overview of methods in textbook design and textbook revisions. I also attempted to describe some of the variables that control textbook revisions and that may have controlled my behavior while I worked on Behavior Analysis, Autism and Related Disabilities (BAARD).

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2 The audience, as used by B. F. Skinner, is a general term for the environment that is mediating the reinforcers for the speaker (or writer). The audience may or may not be a live one, and it may be responding to auditory stimuli, as for listeners, or to visual stimuli, as for readers. 

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An Overview of Textbook Design and Controlling Variables

Needs Assessment

Before writing a textbook, authors must identify whether there is a need for that textbook. A *need* may be an array of variables. Some of the variables are general to textbook writing such as, (a) unsatisfactory student performance, (b) the customers' (in our case the students or the university) wanting a more effective or more specific textbook, (c) a client (such as a publishing company) requesting a new textbook, and (d) the anticipated need for the textbook in the future because of the popularization of the subject matter to be covered in the textbook. In the case of BAARD, the second and fourth points are most applicable; that is, the students seemed to want another textbook and I anticipated the need for a textbook explaining the concepts and principles of behavior in the context of autism spectrum disorders. Other variables are more specific to textbooks in the area of autism. The following two points may be most relevant:

1. Practitioners may more effectively use behavior-analytic procedures with autistic children if they have a good understanding of the behavioral principles and concepts underling these procedures.

2. The students will better understand the behavior-analytic bases of these procedures with autistic children if they read a textbook specifically designed to show those behavior-analytic bases.

In other words, it may be too big of a jump to go from a textbook on the
principles and concepts in behavior analysis to a cookbook on procedures for working with autistic children, where the underlying principles and concepts are not clearly and rigorously presented. Students who have a single course outlining the principles of behavior might not be able to reliably put what they have learned into practice. These last two points are relevant to the BAARD project. In addition, I have found no textbook on autism that offers a thorough conceptual analysis of the issues and treatments (more details in the methods section). Alone, this lack of behavior-analytic text on autism may justify the development of a textbook on the topic.

General Strategies for Textbook Writing

Once the needs assessment suggests that writing a new textbook might serve a legitimate purpose, the authors must select, organize, and sequence the topics. Gustafson and Tillman (1991) describe eight ways to structure a course or instructional material (e.g., a textbook); these eight ways might affect the design of the table of contents. The eight approaches are:

1. The chronological approach presents topics according to the passage of time. This may be a traditional and effective technique for the design of history textbooks, but it is not necessarily the most effective approach for other textbooks.

2. The order of performance approach obviously presents the topics in the order in which they are performed. This is frequently done with user manuals or job aids. This approach may be less effective in establishing complex repertoires with no
specific order of performance (e.g., being a behavior analyst). However, this approach may be adequate in guiding the implementation of a functional analysis or a reinforcer assessment, which have a specific order of performance.

3. The known to unknown approach is based on knowledge of the learners’ existing repertoire. Here the textbook’s organization relies on the learners’ prerequisite behaviors.

4. The taxonomical approach, popular in sciences, is based on the common characteristics (e.g., structural and sometime functional) of organisms, objects, and behaviors.

5. The cumulative approach is based on the distinction between complex and simple phenomena. This approach may be typical of biology or math texts.

6. The simple-to-difficult approach is based on the increasing difficulty of the text material. Of course, this distinction should be based on what is difficult for the learner, not for the author. Thus, it is the learner rather than the author who should determine the difficulty of the subject matter. As a result, the author may have to design some tool to assess the learners’ evaluation of difficulty or the learners’ repertoire that will determine whether the material is easy or difficult to learn.

7. The interest-oriented approach takes the perspective of the reader. There, the interest to the reader plays a role in the organization of the topics within a textbook. The organization mixes interesting and less interesting material to maintain the learners’ textual and intraverbal behaviors.

8. Finally, the availability of resources may affect the layout. For example,
time constrains or the availability of the references is a variable that may influence textbook writing. While not desirable for the optimal organization of a textbook, these constraints may force the author to adjust the original table of content.

In our case, BAARD followed the organization of Malott, Malott and Trojan's *Elementary Principles of Behavior* (2000). The authors organized EPB using concepts and principles in behavior analysis and sequenced the chapters from simple to more complex, with the most basic concepts presented first (e.g., reinforcement and extinction) followed by the concepts that make use of these basic concepts (e.g., shaping and differential reinforcement). Then, EPB presents additional basic concepts (e.g., the establishing operation) and moves to more complex chapters, such as stimulus control, generalization, and complex stimulus control. The overall structure of EPB is basic to complex, thus cumulative. Within the chapters, the organization of EPB followed a strategy focusing on the learner's interest. For example, an easy-to-read, human-interest case study always precedes the conceptual and technical material. The narrative style may improve students' performance (Fernald, 1989) and is also preferred to the traditional writing style (Fernald, 1987, 1989).

Although Gustafson and Tillman (1991) proposed these eight approaches in the sequencing of information through a course, each approach may also apply to the sequencing of the instruction within a textbook. A writer may also apply these strategies at the level of chapters. There, each chapter may follow a chronology, a build up from simple to complex, or an organization based around the interest of the material for the learner.
After clarifying the various approaches to the organization of a course or a textbook, Gustafson and Tillman present a strategy for organizing the material within the instructional lesson (or in our case, within the chapters). They describe the traditional beginning of the lesson or chapter as "an overview of the lesson, indicating the topic, and what tool they [the students] will need provides the overall structure" (1991, p. 179). This description seems in contradiction with some other general characteristic of the beginning of the lesson or chapter such as "...in the beginning the author arouses the interest..." (p. 179). I agree with the latter statement and, for BAARD, I attempted to organize the beginning of the chapters accordingly (more details are in the method section).

The organization of the middle of the lesson or chapter may vary depending on the subject matter. Gustafson and Tillman present two strategies at opposite ends of the continuum of strategies for chapter organization. They call these strategies expository instruction and discovery instruction. Typically, the instructor leads the expository instruction. Expository instruction may take the form of a lecture or a demonstration. With the expository strategies, the content is organized and presented in a specific sequence and the students must follow that sequence to benefit from reading the material. The organization should consist of a presentation of the facts or data, the concepts derived from the data, the principles or rules derived from the concepts and/or the data, and finally, the student may have to solve a problem that requires use of the concepts and principles. The problem-solving skill may only be established after mastering numerous concepts and principles. In contrast, the
discovery instruction strategies are learner-oriented. The learner is given a problem and must develop a personal strategy to solve that problem. With this type of instruction, the process is left to the discretion of the student as long as the final product falls within the specification of the instructor.

Finally, the end of the chapter provides the "...psychological need for closure" (1991, p. 180). Behaviorally, reading the end of the chapter and the last word of the last line at the end of the chapter is the last link in a long sequence of textual responses. I speculate that reading the end of a chapter may reinforce the previous textual responses if the end of chapter was more reinforcing than the preceding textual responses. This reinforcing effect may be most noticeable in mystery novels or murder stories, where the last lines reveal the mystery, the murderer or the motives. So, to produce a reinforcing effect, the end of a chapter probably should not be "telling them [the students] what the next lesson is about" (Gustafson & Tillman, 1991, p. 181) or giving an overview of the next assignment.

Another closure strategy proposed by Gustafson and Tillman consists in announcing assignments. Again, reading about an upcoming effortful response (in the form of a practice exercise) may not function as a reinforcer for most students. However, because we cannot insert a little bit of chocolate or a salty snack at the end of each chapter, we are left with some less powerful reinforcers. Among these, quiz hints may provide the most effective consequences for reading the chapter. The effectiveness of the location of the quiz hints is based on the assumption that the students will not read the quiz hints before getting to the end of the chapter or that the
reading of the whole chapter is necessary to answering the quiz hints. Tips and caveats (see Brethower and Smalley, 1998) may also function as reinforcers for learners who will make use of the instructions in their work place or in other settings where the instruction might improve the preexisting performance.

In conclusion, once the need for the textbook is established and the sequence of its content is set, the next step is to decide on the evaluation procedures before starting the textbook redaction per se.

An Overview of Textbook Revisions Methods

Evaluation Models

I will now consider five evaluation models: (1) the Brethower and Smalley (1998) model, (2) the expert evaluation model, (3) the objective-based evaluation model, (4) the management-based evaluation model, and (5) the formative evaluation model. With quality improvement in mind, revisions are guided by various techniques for textbook evaluations. Like the writing of the initial textbook, revision is a long process that can involve extensive testing of the textbook at multiple levels. For example, Brethower and Smalley (1998) describe a 4-step evaluation process that consists of assessing: (1) social validity—did they like it, (2) mastery—did they learn it, (3) transfer of training—did they use it in their work, and (4) utility—did using it do any good? In the case of BAARD, I used two of these four steps. Namely, I evaluated social validity and student mastery. Brethower and Smalley's strategy blends the strength of various existing models, which I will now describe.
This section is based on Dick and Carey (1991) who list the following approaches. Among the various ways of evaluating educational material, the expert opinion is the most common form of evaluation (Dick & Carey, 1991). The expert evaluator is a specialist in the discipline, characteristics of the learner, principles of behavior, educational psychology or measurement, and the intended learning environment. In addition, the expert evaluator's opinion is used to determine the (a) completeness of the content of the instructional material, (b) the match between the material and the learners' repertoire, and (c) the accuracy, quality and feasibility of the instructional objectives (Dick & Carey, 1991).

Briefly, the objective-based evaluation models consist of designing educational objectives tailored to the learner and collecting data on the learners' performance. This empirical method allows the evaluator to assess the effectiveness of the educational material (Worthen & Sanders, 1987). This model minimizes the subjectivity encountered in the expert models of evaluation.

Management-based models evaluate instructional programs throughout their development and implementation. The management-based models include various steps, such as planning, developing, implementing, and measuring the outcomes of the activities defining a program (Dick & Carey, 1991).

The formative model borrowed from an objective-based evaluation or a management-based evaluation. In the context of textbook revision, the initial step of a formative evaluation consists of determining how the data gathered during evaluation will be used in guiding revisions. Dick and Carey (1985) give a detailed account
of the formative evaluation process. First, the prototype materials are tried one-on-one. This means that the evaluator focuses on one learner who is representative of the target audience. The evaluator and the learner have face-to-face meetings and discuss the material. This step of the process provides data regarding the learner's problems with the text structure and the readers' comprehension of the material. In addition, the learner may report whether the material is interesting or informative. This initial step of the formative evaluation process may have a major impact on the effectiveness of the educational material (Gagné, Briggs, & Wagner, 1988). The second step of the formative evaluation consists of a small group tryout. There, the evaluator gathers more data on the clarity and effectiveness of the instructional material. For example, the evaluator measures the level of assistance needed by students when they use the material. Heavy levels of assistance indicate that further improvements of the educational material are necessary. Once the one-on-one trial and the small group trial are completed, the process of field trial may begin. The field trial is the final stage of the formative evaluation process. Much like the small-group trial, the field trial scrutinizes the learners' performance and/or evaluation of the material as well as the feasibility of the delivery of the instruction. The field trial is more like the ultimate target in terms of: (a) the representativeness of the target group; (b) the material, that is more revised; (c) the procedures; (d) the setting; and (e) the instructors.

Some of the dimensions may be evaluated by experts and others may be evaluated by the target audience in the context of field trials. The dimensions addressed
during field trials may include, (a) strategies used to maintain the readers' textual behaviors, (b) the relevance to the reader, (c) the confidence of the reader in the text, (d) and readers' satisfaction with that text. The following dimensions are also part of field trial and, although they are often evaluated by the target audience, they may be best addressed by expert evaluators. These dimensions include: (a) the need for the material, (b) the accuracy of the content, (c) the appropriateness of performance measures and conditions of demonstration of performance, (d) the thoroughness of the instructional strategies, and (e) the durability and feasibility of the instructional material.

**Other Dimensions**

Among the dimensions that are most relevant to the development of BAARD, researchers investigated the following approaches: (a) readability, (b) text structure, and, (c) "text appeal."

**Readability**

Readability refers to formulas that are used to estimate the ease or difficulty of written text. Readability indices typically measure sentence length and familiarity of the vocabulary (e.g., Gunning, 1973). Of course, the assumption that the readability formula *defines* readability may be false or counterproductive (Davison & Kantor, 1982). While some of the "readability" formulas are correlated with behavioral measures of readability, they may not capture all crucial dimensions of readability. For
example, mistakes in typing or wording may affect comprehension, but readability indices are not sensitive to these dimensions (e.g., Charrow, 1979; Freeman, 1978). Other factors that readability formulas are insensitive to but may affect readability include: (a) the structure of the text; (b) whether techniques and concepts are explained or merely assumed based on questionable inferences about the readers' repertoire; and (c) the degree of congruence between the behavioral terms and their vernacular roots. For example, behavioral textbooks might use common words with compatible, additional technical meanings, such as function, extinction, and discrimination (Malott, Malott and Trojan, 2000). In other words, such terms as "extinction," should evoke more intraverbal responses for technical readers than for other readers. If the reader does not have the additional intraverbal responses, the text may be hard to read but the readability formula will fail to indicate that difficulty. Another example of the limitation of readability formula, with regards to the congruence between a behavioral term and its vernacular root, is clear for behavior-analytic terms that depart from their common usage. This is the case for the term contingency (Lattal & Poling, 1981). Because the vernacular use of "contingency" may be opposed to the behavior-analytic use, the layperson may respond to a text incorrectly.

It is also possible that readability formulas are misleading when applied to technical writing because dimensions like word complexity and rarity are relative to the field of study (and the readers' repertoire) rather than to the vernacular usages. For example, some readability formulas, based on the familiarity of the terms, may be
too sensitive to the rare vernacular terms that are, however, common technical terms. This may be the case for terms such as, reinforcement or reinforcer, evoke, operant, etc, that are all common terms in the field of behavior analysis. These are taught to students enrolled in introductory courses and therefore, they are easy, but might appear difficult according to readability formulas.

According to most experts, and mounting research evidence (e.g., Davidson & Kantor, 1982; Duffy & Kabance, 1982; Holland 1981; Sawyer, 1991), it appears that reading formulas are not accurate in predicting ease of reading and are not effective means for making text material more "accessible" to readers. However, in spite of their weak validity, readability formulas are easy to apply. It is possible that invalid techniques that are easy to apply will take precedence over a measurement technique that is difficult to apply. In addition, it is politically or economically important to make sure that textbooks rate well on readability formulas in those States where textbook adoption is based on readability formulas, mainly in the primary and secondary grades (Davidson & Kantor, 1982).

Text Structure

The research on components of text structure is relevant to the present dissertation. Text structure refers to pre-instructional cues (e.g., preview, summary statements), adjunct aids (e.g., learning objectives and questions embedded in the text), and advance organizers (abstract introductory summaries). Text structure may improve reader comprehension and recall, but the findings in this area are mitigated by
many characteristics of the learner. The nature of the principal dependent variable—recall—is probably responsible for the mitigated effect. It has been shown that a myriad of variables affect recall. Nonetheless, the results of structure research may be helpful in organizing the material for maximum recall. Briefly, researchers have found that a "well organized" book (containing previews, learning objectives and summaries) generates better recall than a poorly organized book (e.g., Taylor & Samuels, 1983). Other studies (e.g., Meyer & Freedle, 1984) found that undergraduate students tended to recall material organized in a comparative or causal manner better that material organized as series of descriptions. In addition, the information higher in the text structure (headings and main concepts) is better recalled than details and elaborations, which are lower in the text content structure (e.g., Duffy et al., 1989).

"Text Appeal"

A few articles have been published on the subject of text interestingness and its effect on recall. Anderson, Shirey, Wilson, and Fielding (1986) have listed some variables that affect the readers' interest. They hypothesized that readers were more interested when: (a) they could identify with the characters, (b) the content of the text was novel or unusual, (c) they found the topic important (this dimension is probably not amenable to experimental manipulations) and, (d) the content contained descriptions of actions and feelings. Very few articles have investigated the effect of interestingness on reading comprehension. Hidi and Baird (1988) designed a text
borrowing from Anderson et al.'s (1986) variables. They found that the students (fourth and sixth graders) gave a better evaluation for the passage written with Anderson et al.'s strategies, but the students did not recall (a dubious measure of comprehension) this passage better than other passages that did not use Anderson et al.'s strategies. Both text structure and interestingness research use recall as a dependent variable. Spiro speculated (1980) that the correlation between recall and behavioral measures of readability may be weak and a better measure of readability needs to be found. More research needs to explore this correlation. In addition, no research investigated the effect of interestingness on the duration of the textual response, that is, how long the reader stayed engaged with the reading material. Duration may be an indicator of the reinforcing value of the text.

Variables Controlling Textbook Revisions

Non-Behavioral Approaches

There are various theories on the nature of the variables controlling the behavior of revising or rewriting. For Nold (1981) revising is "the retranscribing of text already produced after a portion of the already existing text is viewed and found wanting" (p. 2). This is a purely topographical analysis of the revising behavior; as such, it tells us nothing about the conditions that evoke or maintain revising. In an effort to understand the variables controlling revising a textbook, other researchers have used the concept of "dissonance." Festinger (1964) describes the relation between two or more "cognitive elements" as dissonant when they contradict each
other; as in what "is" and what "should be." For example, for Festinger individuals have a need to resolve dissonances and they engage in behavior that results in the removal of the dissonances. For others, dissonance may be a stimulus that evokes editing behaviors because the text is flawed in some way (Graves, 1978). For yet other researchers, the dissonance concept may be more vague. For example, Perl (1980) describes it as a “felt sense” that some revisions need to be made.

Behavioral View

The previous definitions tell us little about the variables that evoked the revisions because they attribute revision to "dissonance" and because "dissonance", as it is presented, is an explanatory fiction that cannot explain the revising behaviors without falling into circular reasoning. It is the authors’ “wants” (the establishing operations) or the discriminative stimuli evoking the revisions that must be analyzed. The specific controlling variables for revision or editing behaviors have not been investigated. However, a speculative functional assessment may suggest some controlling variables for revision behaviors. I have identified four variables that may control textbook revisions.

First, the author's revisions may be controlled by an analogue to the direct-acting escape contingency. For example, the following variables may evoke editing and revisions: (a) readers complaints about the quality of the textbook, (b) obsolete or incorrect information due to new research findings, and (c) changes in cultural values regarding some practices advocated in the textbook. Of course, the author's behavior
is governed by a rule statement rather than by the delayed negative reinforcers (e.g., the removal of disapproval).

Second, the author's fear of the loss of a reinforcer may also evoke revisions. Thus, revision as-an-avoidance-response may (1) prevent the loss of market shares and income or prestige due to the introduction of a competing textbook on the market, and (2) prevent the textbook from going out of print.

Purpose

The purpose of this dissertation is the writing, evaluating, and revising of a behavior-analysis textbook. That process is documented in the remainder of this dissertation. As mentioned earlier, the process of developing a textbook consists of generating the initial version and its successive revisions until the final product is complete. In my case, the goal of the book was to present the principles of behavior analysis as applied to autism and other developmental disabilities. The textbook was to have the following two broad design characteristics:

1. It was to use the informal style of Elementary Principles of Behavior (Malott, Malott, & Trojan, 2000). Its narrative style is entertaining while maintaining the rigorous conceptual integrity and an empirical/scientific bases.

2. It was to present up-to-date research on effective treatments for autistic behaviors, along with an analysis in terms of the underlying principles of behavior. Each chapter would explore the relevance of a single behavioral process, such as reinforcement, motivation, or stimulus discrimination, and techniques, such as
reinforcer assessment, functional assessment, and the verbal-behavior approach to
treatment.

Unlike most textbooks in the area of autism and developmental disabilities, **BAARD** would provide a solid foundation in terms of concepts and principles of behavior analysis as it presents applications to autism, developmental disabilities, and mental retardation. Most books, such as *Teaching Developmentally Disabled Children: The ME Book* (Lovaas, 1981) and *Behavioral Interventions for Young Children with Autism: A Manual for Parents and Professionals* (Maurice, Green, & Luce, 1996), are designed to help parents teach specific appropriate behaviors and decrease inappropriate behaviors. As such, they may be the best on the market. However, neither Lovaas nor Maurice et al. offers a behavior analysis of the underlying problems or behavioral explanations of the treatments.

Based on the strength of these books, the goal of **BAARD** was to integrate the technical aspects and the programmatic guidelines of Lovaas and Maurice et al. with the conceptual rigor and style of **EPB**. In essence, **BAARD** would bridge the gap between the practice and its conceptual base.

**BAARD** was intended primarily for undergraduate and graduate classroom use. In addition, it could be used by caregivers/parents and teachers of children and adults with developmental disabilities.

However, **BAARD** would not be developed as a treatment manual (such as the **ME Book**), nor would it be designed to suggest treatment for any particular individual labeled with autism, other developmental disorders (viz., PDD-NOS,
Asperger syndrome, Rett’s disorder, and childhood disintegrative disorder), or mental retardation. Rather BAARD would be developed to present the range of behavioral treatments available for these various populations and to analyze the mechanism of action underlying these treatments.

Finally, this dissertation evaluated the textbook in conjunction with the course in which it was used and it does not address the overall impact of the textbook as an isolated training component.
CHAPTER II

METHOD

This section describes the process of evaluation of the textbook and the revisions that followed each of the evaluations. After reading each chapter of BAARD, the students evaluated them. The analysis of these evaluations determined the revisions that would be made to the text. I gave an overall evaluation of the chapters and an evaluation of the sections. I used the chapter evaluation to determine which chapter would be revised; because of time limitations, I revised only two of the most poorly evaluated chapters. I did not have a clear set of guidelines for using the student evaluations of the first version to determine which section I would revise extensively to produce the second version. However, I did have a clear set of guidelines for using the student evaluations of the second version to determine which section I would revise extensively to produce the third version (more details are presented in the section entitled Revisions of BAARD).

Participants

Textbook Evaluation Groups

For the evaluation of BAARD, four independent groups of students participated in the study. Each group was composed of students enrolled in a Western
Michigan University practicum for children diagnosed with autism. The groups were enrolled and participated in the study during four consecutive 15-week semesters. The first group \((N=19)\) participated in the study during the winter 2000 semester (January-April), the second group \((N=17)\) participated during the Spring/Summer 2000 semester (May-August), and the third group \((N=30)\) participated during the Fall 2000 semester. The fourth group of participants \((N=15)\) only evaluated one chapter—the first version of Chapter 8; this was done during Winter 2001. This fourth group also participated in a comparative evaluation of the textbooks used in the practicum. All participants in the textbook evaluation were previously enrolled in an introductory psychology course, and most participants took a course in an abnormal psychology, and an introduction to behavior analysis prior to their enrollment in the practicum course.

**Performance Test Groups**

Two groups of students took a conceptual test. This conceptual test consisted of two questions. The two groups of students were the practicum students \((N=16)\) and the students from the introductory course in behavior analysis \((N=14)\). Almost all the practicum students had previously enrolled in the introductory course in behavior analysis and some had more advanced courses in behavior analysis. In contrast, the students enrolled in the introductory course in behavior analysis (Psy 360) had not enrolled in practicum nor taken advanced courses in behavior analysis.
The Writing of BAARD

The following variables affected the first version of BAARD, and some of these variables may have also affected the subsequent revisions of BAARD (addressed in the next section).

Target Audience

I wrote the textbook with several target audiences in mind. However, the book was evaluated with only one audience—the undergraduate psychology majors taking the practicum. Though BAARD was designed not to require a background in behavior analysis, it was anticipated that such training might enhance the learning and appreciation that would result from reading the book. In addition, I intended that, while BAARD should be understandable and enjoyable to learners naïve to behavior analysis, it should not be too redundant with the prior training of those students who already taken a course in behavior analysis. It should be of value for these advanced students to read about the application of behavioral principles they have already learned, and to better understand the way in which those principles underlie those applications.

BAARD is intended for undergraduate and graduate classroom use. The textbook is also intended for caregivers and teachers of children and adults with developmental disabilities; so it should be sensitive to the target audience's typical knowledge level. To facilitate this sensitivity to the target audiences I have designed an evaluation form for each chapter (Appendix A) and each section within a chapter.
As I wanted the students to find the material interesting, understandable and useful, I evaluated their responses along those dimensions. However, these dimensions also somewhat controlled the writing for the first draft of BAARD. In other words, having a target audience in mind resulted in that imaginary target audience controlling my writing.

Dr. Malott and EPB

The style, content, structure, and analytical/conceptual rigor of EPB and Dr. Malott's feedback had a major influence on the writing of the text. I attempted to reproduce the narrative style of EPB, where a relevant motivational example precedes the introduction of a more abstract concept or principle. Other elements of EPB that I adopted were: (a) the table of contents, (b) the contingency diagrams, and (c) the boxed definitions.

Dr. Malott and I met for two hours every other week and reviewed BAARD. During this time, Dr. Malott made suggestions for stylistic and content revisions. In turn, I revised the material before printing it and distributing it to the students who then evaluated it.

Needs Assessment

Since 1996, data was collected on students' evaluations of Lovaas' ME Book (1981). At the end of each semester, the practicum students answered a questionnaire along various dimensions of the practicum. One of the evaluation question was "the
ME Book was..." and the practicum students responded on a Likert scale (with 1 being *good* and 5 being *bad*). These evaluations revealed considerable variations across semesters (see Figure 1).

![Graph showing student evaluations](image)

**Legend.** □ 1(good) ▪ 2 ▪ 3 ▪ 4 ▪ 5(bad)

Figure 1. The ME Book Was...

The poor and mixed evaluations between Fall 97 and Winter 99 were one of the factors in the decision to write **BAARD**. The variability in the evaluations of the ME Book may be attributed, in part, to the instructors varying degree of expertise (undergraduate or graduate teaching assistants) with regard to behavior analysis, behavioral interventions, and teaching in general. In addition, the variability may also result from the instructors' statements about the quality and relevance of the ME Book or whether the ME Book was actually discussed during the seminar time. That is, the failure to address the content of a textbook in the seminar may have had a negative effect on the students' evaluations of that textbook.
In addition, another factor that controlled the decision to write BAARD was that the ME Book was written as a treatment manual rather than a didactic textbook. Thus, BAARD was developed to show the conceptual basis of behavior-analytic procedures applied to autism. I found no books on that topic. I searched for books in the field of autism and behavior analysis listed in PsycInfo. I obtained 84 titles by entering “behavior analysis and autism or developmental disabilities” in the PsycInfo database. Many of these book titles did not suggest a behavior analytic orientation, and none presented the basic principles of behavior in the context of autism. In addition, I have found other behavior-analytic books that were not listed in PsycInfo (e.g., Ghezzi, Williams & Carr, 1999; Lovaas, 1981; New York State Department of Health Early Intervention Program, 1999; Sundberg & Partington, 1998), but none were designed to explain the concepts and principles of behavior analysis in the context of treatments for autistic children.

The Relation Between BAARD's Goals and Psychology 357 Course Goals

On the practicum site, Croyden Avenue School, the students were assigned to pupils diagnosed with autism or related behavioral problems. For the duration of the semester, two hours per day, five days per week, the practicum students implemented behavioral procedures inspired by Lovaas' ME Book (1981). Throughout the semester, the Croyden Avenue School staffs evaluated the implementation of the procedures and their effectiveness. There, the practicum students received feedback during and after the implementation of the discrete-trial procedures.
In addition to their practicum experience, all practicum students met for a seminar for 2 hours, once a week. During that time, the teaching assistant and the students discussed practical issues related to their practicum experience and conceptual issues relevant to the weekly reading assignments. In addition, the practicum students took weekly quizzes over Lovaas' *ME Book* (1981) and Maurice's *Let Me Hear your Voice* (1993).

**BAARD** was linked to the goals of the practicum. While working with a child labeled autistic, the behavioral technicians performed reinforcer assessments, and learned to deliver contingent and differential reinforcement, as well as implementing specific procedures such as extinction of inappropriate behavior, etc. These basic skills were necessary to conduct a discrete-trial session and they were clarified in **BAARD**.

Practicum students should also be able to apply behavioral principles to solve problems arising during the instructional session. For example, the behavioral technician should be able to make an educated guess about the function of an inappropriate behavior; and though **BAARD** would cover advanced procedures like functional analysis I would not expect the students to implement these procedures independently simply as a result of reading this book and taking this practicum.

**Psychology 357 Course Textbooks Description**

Before discussing the layout of **BAARD**, I evaluated the other textbooks that were required for the Psychology 357 practicum. For the rest of this dissertation I

Teaching Developmentally Disabled Children: The ME Book (Lovaas, 1981)

An appraisal of the ME Book is necessary because, (a) I continuously evaluated the students' interest in that book by asking on a questionnaire whether they "liked the ME book", and (b) I asked the students to compare the ME book to BAARD.

The ME book was intended to aid those teaching and designing programs for children diagnosed with autism and other developmental disabilities. It features basic behavioral techniques (e.g., prompting, fading, and shaping) presented in the context of one-on-one behavior therapy (i.e., discrete-trial training). The ME Book is the first book to present behavioral treatments for children diagnosed with autism. In addition, Lovaas' reputation makes this aging book influential, even 20 years after its publication. The book is organized into chapters presenting a hierarchy of teaching objectives.

Lovaas adopted a cognitive approach to language development, but used the tools offered by behavior analysis. Paradoxically, his book also essentially defined the approach used by most behavior analysts working with children labeled with autism.

The section below reviews some of the limitations of Lovaas' curriculum. I wrote BAARD with these issues in mind and attempted to clarify these points in our
First, the behavior-analytic technology has evolved since the publication of Lovaas' book. This evolution has rendered some techniques obsolete or socially undesirable (e.g., see punishment chapter) and has added techniques to the armamentarium of the behavior analyst (e.g., improved reinforcer assessments, functional analysis, incidental teaching, etc.).

Second, although Lovaas makes use of behavior techniques (shaping, prompting, fading, etc.) to teach language, he is using a psycholinguistic approach to language with its rough expressive/receptive dichotomy. Behavior analysts who are not using the verbal behavior paradigm (Skinner, 1957) are borrowing from other fields. The linguistic model fails to provide a theoretical framework that integrates and elucidates the research because that model does not take into consideration the function of the units of verbal behavior. In contrast, the Skinnerian approach to verbal behavior allows for a comprehensive and coherent integration of empirical studies. However, suggesting the need for the adoption of Skinner's verbal-behavior theory and technology does not imply that the current treatment techniques used with individuals with language delays have failed (e.g., Durand & Carr, 1992; Duker, 1988; Lovaas, 1987; Reichle, Brubakken, & Tetreault, 1976). Bear, Wolf and Risley (1968) made the following argument about the field of behavior analysis, but the same argument may also hold true for the field of verbal behavior. Namely, the applications and the development of a technology, based on the theory of verbal behavior, provide a conceptual system that offers verbal behavior as "...a discipline, rather than a collection
of tricks" (Bear et al., 1968, p. 7). As such, the technology of verbal behavior must either produce clinically significant effects or else fail, and must also compare favorably with other behavioral language training curricula (Williams & Greer 1993).

Third, the hierarchy of skills taught in the ME book is based on traditional developmental stages. Lovaas makes the distinction between receptive language and expressive language and suggests a sequence of training. Lovaas' teaching sequence hierarchy of some verbal operants is not always congruent with more recent research findings. Namely, Lovaas emphasizes the training of a tact repertoire before mand training can begin. In the light of more current findings (e.g., Caroll & Hesse, 1987), this practice may not be optimal. In addition, Lovaas introduces receptive language training with the set of assumptions that it will transfer to expressive language, but the results are mixed. This practice is supported by some studies (Cuvo & Riva, 1980; Goldstein, Angelo, & Mousetis, 1987) and not by others (Guess, 1969; Smeets & Striefel, 1976) and other studies gave ambiguous results (e.g., Guess & Baer, 1973). In contrast, the opposite approach yield results that are more consistent. That is, the majority of the studies analyzing the interaction between receptive and expressive repertoires demonstrate that when a response is mastered expressively (either as a mand or as a tact), this same response will show some degree of generalization to the receptive modality. Thus, the ME Book is not congruent with the more recent research findings in the area of verbal behavior and autism.

In spite of these weaknesses, informal reports from practicum students reveal that Lovaas' textbook is well organized, easy to understand and presents valuable
techniques for working with children diagnosed with developmental disabilities.

Let Me Hear Your Voice: A Family's Triumph Over Autism (Maurice, 1993)

Maurice (1993) tells the story of her family's struggle to obtain an appropriate diagnosis and effective treatment for their autistic children. After the promises of cures and the reality of failures, they discovered the ABA interventions. The story describes the intense treatment necessary to get their children into a "normal" classroom.

Maurice's book features the warm testimony of a mother. It is non-technical, but provides valuable information about autism, behavioral treatments, and bogus treatments. This book contributed to the dissemination of the behavioral approach because it is a story of success told in an emotionally contagious manner. Maurice is also an excellent narrator, which makes the book a pleasure to read.

Revisions of BAARD: Field Trial

I developed the following evaluation to provide the basis for the revisions to improve BAARD. Both field trial and small group tryouts were implemented simultaneously.

Both chapter and section evaluations (described below) resembled the field trial described in the formative evaluation literature. The field trial is the final stage of the formative evaluation process. It scrutinizes the learners' performance or attitude toward the material and the feasibility of the delivery of the instruction. The
field trial is more like the ultimate target in terms of: (a) the representativeness of the target group (for this dissertation, I used only one target group); (b) the refinement of the material, which is closer to the final version (for this dissertation, the group of students enrolled in Fall 2000 read material that had been revised twice); and (c) the authenticity of the procedures, the setting and the instructors that are also more like the target environment. For this dissertation, the frequency of the reading assignments, the classroom, and the instructor (teaching assistants) were similar to conditions encountered in standard teaching environments. However, the students did not take quizzes based on BAARD.

For the field study, four independent groups of students enrolled in the Psy 357 practicum read BAARD throughout four consecutive 16-week semesters. They read one or two chapters per week. Each week, they evaluated the overall chapter and each section within that chapter. The section evaluation questions immediately followed each section within a chapter. This type of molecular analysis of the text material allowed for revisions targeting specific concepts and their illustrations. The content of the evaluation had no effect on students' grades. I believe that this method of evaluating allows for the development of educational material that matches the demands of the students.

The textbook evaluation occurred across semesters and for the successive drafts of BAARD. Nine chapters were introduced during the Winter 2000 semester. During the Spring/Summer 2000 semester, some sections from the nine chapters were revised using the Winter 2000 evaluations as guidelines, and four more chapters were
added. During the Fall 2000, the sections that received the worst evaluation based on Likert scale mean ratings, obtained during the Spring/Summer 2000 semester, were revised. In addition, other sections were revised based on the specific feedback from students. The number of revisions made to the chapters and their sections varied considerably across chapters and across semesters. Based on the evaluations, some chapters or sections were not revised at all, while others were lightly or extensively revised. A "light revision" means that 15% of the original number of sentences were altered or up to 15% of new sentences were added; an "extensive revision" means that more than 15% of the original sentences changed or that more than 15% of new sentences were added.

The chapter and section evaluation combined an A-B-C design for all chapters except Chapters 1 and 8. Instead, an A-B-B design was used for Chapter 1 and an A-B-C-A reversal design was used for Chapter 8. This means that for Chapter 8, the first version—presumably the least developed—was evaluated by two independent groups of students who enrolled in the practicum one year apart. This second evaluation of the same version of Chapter 8 was intended to determine the effect of confounding variables.

Student Textbook Evaluations

Student evaluation of the textbook was the main source of data for the revisions of the textbook and for determining the success of those revisions. This student evaluation occurred at two levels: (1) data were collected on the students' overall
evaluation of each chapter, and (2) also on their evaluation of each section within each chapter.

The student evaluations of the textbook consisted primarily of their responses to evaluative questions using a 7-point Likert scale. I will now separately describe the details of the chapter evaluations and the section evaluations.

Student Chapter Evaluation

The students evaluated each chapter by answering four Likert-scaled questions rating: the value of the concepts, the value of the case studies, the practical utility of the case studies, and the value of the chapter compared to the ME Book. (Appendix A).

For each of the four questions, I computed the mean Likert-scale rating, represented by a single number. I computed each of these four mean Likert-scale ratings for each chapter and each revision. To facilitate comparison among chapters and across revisions, I used these means of ratings rather than the actual frequency distributions of ratings on which the means were based (see the results section for more details).

For the first revision, I revised two of the four chapters that received the poorest overall chapter rating. The deadlines for getting the chapters ready for the next semester prevented revisions of more chapters at that time. I did not use the section evaluations of the first version in revising for the second version, also because of deadline constrains. However, I used the section evaluation of the second version,
and not the chapter evaluation, in revising for the third version of the textbook, because the section evaluations gave more specific guidance than did the overall chapter evaluations.

**Student Section Evaluation and the Criterion for Revision**

For ease of the evaluation and revisions, each of the thirteen chapters was divided into two to five sections. Each section consisted of one or more case studies illustrating a concept, the analysis of the intervention or the events depicted in the case study, the technical presentation of the concept, and a few homework questions related to that concept.

A set of six evaluation questions was inserted after each section (Appendix B). These questions covered six dimensions: (1) understandability, (2) clarity, (3) convincingness, (4) interestingness, (5) informativeness, and (6) value of the concepts. The students responded to each question on a 7-point Likert scale (1 being good and 7 being bad). The responses were used as a basis for subsequent revisions of BAARD.

For the final version of the textbook, I prioritized the revision of the sections that obtained a high percentage of ratings (at least 10%) of 5 or higher on the 7-point Likert scale (Appendix C). No significance tests were performed.

The section evaluation guided the last revision the textbook, but did not guide the first revision of the textbook because of time limitations; namely, I was too busy writing new chapters during the first round of revisions, in preparation for each class.
of that semester.

**Book Comparison Questionnaire**

I also evaluated student preference for BAARD and the other books used in the practicum (i.e., the ME Book and Let Me Hear Your Voice). This evaluation was achieved with a questionnaire that asked the students to rate their preference for each book and which book they might discard (Appendix D).

**Analysis of Student Conceptual Skills**

The performance, on a conceptual test, of the students attending the practicum was compared to that of students enrolled in an introductory course in behavior analysis (Psychology 360). Both group were explicitly taught the concepts required to answer the conceptual test questions. For the test, the students were asked to solve some problems using the behavior analytic concepts, principles, and procedures they read about in BAARD and in EPB. The Psy. 360 students learned the concepts and procedures required to answer the conceptual test from Elementary Principles of Behavior (Malott, Malott, & Trojan, 2000).

The test consisted of two questions, depicting real life situations that required detailed answers (Appendix E). The groups of students were asked to provide as many answers as possible that would be relevant to the questions. Each student received one point for using a concept or a procedure appropriately. In addition, each student lost one point for using a mentalistic term (e.g., the child *understands*) and
lost one point for each error. An error could be an inaccurate concept usage or definition (e.g., "I would use extinction to punish the behavior."). The points counted as bonus points that could be added to other bonus points earned during the practicum course or the introductory behavior analysis course. These points could replace one low grade, such as a quiz grade, or a class participation grade. The answers to the conceptual questions were not explicitly addressed in the *Me Book* (Lovaas, 1981). I asked each group of students to write as many concepts and procedures as possible within the context of the question. The first question presented the case of an unmotivated child who stopped working. The second question presented the case of a self-injurious child. For each question, four average scores were obtained for the group of practicum and the group of non-practicum students. The four scores were: (1) the mean number of concepts, (2) the mean number of procedures, (3) the mean number of errors, and (4) the mean number of mentalistic explanations.

Contingencies Controlling the Student Reading

The contingencies for reading *BAARD* were weak. As mentioned earlier, the students were not tested on the content of *BAARD* and they lost no credit for failing to read the material. Thus, reading was either maintained by a weak rule (e.g., "reading is good for my education") or by some other variable. The quality of the seminar discussions, lead me to believe that most or all students read most or all of the material. Conceivably, the aversiveness of not being able to discuss the material during the seminar may have maintained reading as-an-avoidance-response.
CHAPTER III

RESULTS AND DISCUSSION

The first section of this chapter describes the extent of the revisions. The
second section describes the product—the textbook (Appendix F). The third section
describes the results of the evaluation of the textbook.

The Revisions

The combined writing, evaluating, and revising of BAARD took approxi­mately 720 hours; in my case, that was 1.5 years at an average of 10 hours per week.
(In addition, the final revisions necessary to present BAARD to the publishers may take an additional 100 to 150 hours.)

All 13 chapters were revised at least once and 8 of these chapters were revised twice. Eleven of the 13 chapters had one extensive revision. Of the 50 sections, 23 were revised at least once, and 6 of these sections were revised twice. In total, 29 revisions were made to the sections as a result of the evaluations of the first and second version of BAARD.

Of the 1685 lines in the final version of BAARD, I altered 1643 lines during the revision process. However, this elevated number does not mean that all the lines had a revision, because some of the revisions were additions and some lines were revised more than one time. However, this number indicates that the number of
revisions, from the first to the final version of BAARD, was substantial.

The Product

Quantitative Description

BAARD contains approximately 50 thousand words, 15 graphs and tables, 66 contingency diagrams, 31 case studies and experiments, and 58 concepts, rules, and principles. BAARD consists of 13 chapters. It deals explicitly with all the major principles and concepts from EPB. It includes 42 of the 200 principles and concepts listed in EPB. In addition, 16 concepts and principles are not included in EPB because they are uniquely relevant to autism (e.g., anti-learning repertoire, over-selective stimulus control, etc.).

General Description

BAARD emphasizes the treatment and education of children and adults diagnosed with autism or other developmental disabilities. In doing so, it also addresses common issues with the intervention known as “discrete trial training” (cf. Lovaas, 1981). BAARD roughly parallels the structure of EPB. Throughout the textbook, it presents various behavioral problems typical of individuals diagnosed with autism and suggests interventions from a behavioral perspective. In keeping with the style of EPB, the textbook also uses a narrative style text, blending the technical specificity of the ME Book with an attempt at the emotional impact of Let ME Hear Your Voice.
BAARD intersperses expository material and homework exercises. This format should produce a better conceptual mastery than traditional text formats. However, because of time constraints, homework was not assessed. Rather, this dissertation focused on the student evaluations of the textbook.

Structure

Originally, BAARD was to have the same number of chapters as EPB. It did include 18 of EPB's 30 chapters, either as individual chapters or as combined chapters, with the exception of those chapters dealing with schedules of reinforcement, rule governed behavior, respondent conditioning, and research methods. As the textbook evolved and the development of the various chapters became clear, I intentionally excluded those chapters. There is one more chapter that I have yet to include and plan to include before sending the book to the publishers. That chapter is entitled "Job Placement in the Field of Behavior Analysis and Autism" and it corresponds to Chapter 30 in EPB.

Currently, the 13 chapters include principles of behavior that came from basic behavioral research (see Table 1). Each chapter also includes: (a) fictionalized studies based on peer-reviewed articles and written in a narrative style; (b) technical analyses, boxed definitions, and explanatory diagrams to complement the analyses and clarify the contingencies underlying the case studies and laboratory experiments; and (c) multiple examples of the principle. Each concept starts with a real life situation based on a case study illustrating that concept, followed by an analysis of the
### Table 1

Detailed Table of Contents for BAARD

<table>
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<tr>
<th>Chapter</th>
<th>Title</th>
<th>Concepts</th>
<th>Case Studies</th>
<th>Procedures</th>
<th>Examples and Discussions</th>
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<td>Reinforcement and Reinforcers</td>
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concept and additional clarifications, which are in turn followed by questions (objectives). The following sections present the unique pedagogical features included in the structure of the textbook.

**Contingency Diagrams**

I used the contingency diagrams because they had proved to be useful explanatory tools in EPB. A contingency diagram clarifies the causal relation between the behavior and its reinforcing and punishing outcomes by reducing the relation to its essential features—the before condition, the behavior, and the after condition. These diagrams are important analytical tools, as the contingencies underlying our behavior are often masked by the excessive detail and complexity of our lives.

However, I modified the standard EPB contingency diagram slightly by placing it in a frame (a bold rectangle) that represents the effects of the establishing operation on all the terms in that contingency.

**Educational Applications**

To illustrate many behavioral contingencies I used hypothetical, yet practical, examples or actual case studies from special-education classrooms and home programs. These applied examples are necessary because learning and understanding the principles of behavior does not guaranty the transfer of training to new situations and applied environments. Therefore, I emphasized the classroom and the home to show practical applications of the concepts.
Boxed Definitions

The textbook features *boxed definitions* and *boxed general rules*. The boxes were used to increase the discriminability of the important concepts and guidelines for the applications of the concepts.

Field Trial

This section describes the field trial, an evaluation strategy for assessing the textbook in the context that is most closely related to the final usage of the textbook. In my case, the seminar course, the students enrolled in that course, and the teaching assistants were elements that are found in the receiving environment.

This section presents the results of the practicum students' answers to the evaluation questionnaires across semesters. This evaluation occurred at the level of the chapter as well as with smaller portions of chapters I call "section." Each of the 13 chapters and 50 sections were evaluated three times (Chapters 7, 10, 11, and 12 were evaluated twice). In total, 36 chapter evaluations and 143 section evaluations were administered.

For each of the following graphs, a rating of 4 indicates that **BAARD** was evaluated as being average (or equal), a rating of 5 or above indicates that **BAARD** was evaluated less favorably, and a rating of 3 or below indicates that **BAARD** was evaluated more positively. For each graph, a chapter cluster—a group of 2 to 4 bars—represents the evaluation of the successive versions.
Student Chapter Evaluations

Sample of Frequency Distribution

The basic student-evaluation data can be presented in graphs showing the distribution of the student ratings, along seven values of the Likert scale (1 being better and 7 being worse), for each of the four questions included in the chapter evaluation. At first, I looked at both these frequency distributions of responses along the Likert scales and the mean of each distribution for each Likert scale, in order to compare different versions of individual chapters. Both the means and the distributions seemed to show similar trends of improvement across revisions, though it was much easier to see those trends when looking at the means of the distributions than the distributions themselves. This is illustrated for Chapter 8, in Figures 2, 3, 4, and 5, which show the Likert-scale distributions of the responses to the four chapter evaluation questions and in Figure 6, which shows the mean of each of those distributions, across the three revisions. This set of five graphs also shows the value of looking at the means of the Likert-scale distributions rather than the distributions themselves, when comparing versions. Furthermore, Chapter 8 is representative of the other chapters in this respect. Therefore, for the remainder of this dissertation, I used evaluation means, rather than the distributions themselves for the analyses of both the student chapter evaluations and the student section evaluations. Thus, the clearer measure of mean student evaluations seemed more appropriate, albeit not as detailed. To illustrate this I will present detailed frequency distributions for Chapter 8.
Figure 2. Chapter 8 Frequency Distribution: "Compared to the ME Book This Chapter Was…"

Legend. ■ First version ■ Second version ■ Third version

Figure 3. Chapter 8 Frequency Distribution: "The Concepts and Definitions Were…"

Legend. ■ First version ■ Second version ■ Third version
Figure 4. Chapter 8 Frequency Distribution: "The Case Studies Were…"

Figure 5. Chapter 8 Frequency Distribution: "The Case Studies and Examples Described Interventions That You May Use…"
Individual Student Chapter Evaluation Questions

In the previous section, I presented the frequency graphs for Chapter 8 and concluded that the mean student evaluations seemed more appropriate than the detailed frequency graphs. Therefore, I will now present the means of the frequency distributions for each of the four chapter evaluation questions for each of the 13 chapters. Three independent groups of students evaluated the successive revisions of the 13 chapters with the four evaluation questions. These three groups of students evaluated three different versions for nine chapters and two versions for four chapters. Like the frequency distributions for Chapter 8, the evaluations of each of the four individual questions for each of the 13 chapters reveal that the ratings improved across semesters regardless of the number of revisions made to the chapters.

For the first question, I asked students to evaluate BAARD by indicating their
preference for BAARD compared to the ME Book. I carried out this comparative
evaluation because one of our initial reasons for writing BAARD was the poor stu-
dent evaluation of the ME Book. In that context, I wanted to make sure I could write
a textbook the students would evaluate at least as well as the ME Book, and hopefully
better, as I was an untested textbook writer. And, in spite of the fact that the student
evaluations of the ME Book improved across semesters, the students evaluated the
first version of BAARD equally with the ME Book; and they even consistently pre-
ferred all of the chapters in BAARD over the Me Book across evaluations of later
versions of BAARD. Furthermore, the evaluations improved across revisions, inde-
dependent of the extent of those revisions.

Throughout a semester of evaluation, BAARD provided a floating base for
comparison. In other words, early in the semester the students compared a given
chapter of BAARD with the first few chapters of the ME Book; but by the time the
students evaluated the last chapter of BAARD, they compared it with the whole ME
Book, which they had read by that time. In general, students appeared to prefer indi-
vidual chapters of BAARD to reading the ME Book (see Figure 7).

In the following figures, the different shades and patterns of the bars represent
differences in the amounts of revisions made to a particular version. The amount of
revisions was either extensive, light, or not at all; an extensive revision means that
more than 15% of the material was revised.

For the second question, I asked students to evaluate the worth of the concepts
and principles presented in BAARD. Each of the three groups of students said the
Figure 7. Compared to the ME Book the Chapters Were....

concepts and principles covered in each chapter were valuable (see Figure 8). And this evaluation also improved across revisions, independent of the extent of those revisions.

However, few or no concepts and definitions were changed. So, we would expect little or no improvement for that item. Nevertheless, changes made to the chapter and clarifications of the concepts may have improved the ratings.

For the third question, I asked students to evaluate how interesting the case studies were. Each group of students said that the case studies were interesting, and the evaluation means improved across semesters, independent of the extent of the revisions (see Figure 9).

For the fourth question, I asked students to evaluate the potential usefulness of
Figure 8. The Concepts and Definitions in the Chapters Were....

Figure 9. The Case Studies Were....
the case studies and examples. Each group of students said that they would use the procedures described in each chapter often if they were in the relevant situation, and these evaluations also improved across semesters independent of the extent of the revisions (see Figure 10).

Figure 10. The Case Studies and Examples Described Interventions That You May Use....

Averaged Student Chapter Evaluation

The averaged chapter evaluation graph is yet another way to analyze the data previously presented as mean score for the four individual chapter evaluation questions. The overall evaluation for a given chapter is the mean of the four evaluation questions asked for that chapter (the averaged chapter evaluation data were obtained by averaging the average score for the four questions found at the end of each
The averaged chapter evaluation graph (see Figure 11) reveals that the ratings improved across semesters regardless of the number of revisions made to each chapter (with a minor exception in Chapter 1).

Figure 11. Chapter Evaluation Summary.

**Chapter 8 Reversal: Assessing Confounding Variables**

In an effort to assess a confounding of revisions with some other variables that might produce improved student evaluations (perhaps some other changes in the course), I repeated the evaluation of the first version of Chapter 8 during a fourth semester of evaluation. The first time I gave the first version of Chapter 8 for evaluation, it received one of the two poorest evaluations of the nine chapters evaluated during that semester (Chapters 1, 2, 3, 4, 5, 6, 8, 9, and 13). Then, I did light revisions of that chapter during the next semester and the evaluation improved slightly. I
did heavy revisions of that chapter the third semester, and the evaluation improved again, though more slightly. Finally, I gave the original first unrevised version of the chapter during the fourth semester, and again the evaluation improved. In other words, the same version, when presented during the first semester, received a negative evaluation, and when that same unrevised version was re-evaluated during the fourth semester, it received a greatly improved evaluation (see Figure 12).

So, it was not a revision of that chapter that accounted for this improvement. Presumably, this improvement in Chapter 8 results from unspecified changes in other features of the course or other variables I was unable to identify. One such confounding is that during the three semesters of primary evaluation, I taught one of the two seminar sections the first semester, none of the two sections the second semester, and

![Chapter Evaluation Questions](image)

**Legend.**
- ■ First version
- ■ Second version
- ■ Third version
- □ Second evaluation of the first version

**Figure 12.** Repeated Evaluations of the First Version of Chapter 8 to Control for Evaluation Sequence (Question 1: Comparison With ME Book; Question 2: Value of Concepts; Question 3: Value of the Case Studies; Question 4: Utility of the Case Studies).
both sections the third semester. Then, during the fourth semester, when I evaluated only Chapter 8, I taught one of the two seminar sections. Therefore, changes in evaluations across semesters might be attributable to my teaching during those semesters, rather than changes in the text.

To evaluate this possible confounding, I analyzed the changes in evaluation across semesters, with this problem in mind. Indeed, there is a consistent improvement in evaluations from the second to the third version of the chapters that had two revisions (Chapters 1-6, 8, 9, and 13); this corresponds to the second and third semesters of evaluation; and I taught none of the sections during the second semester and both sections during the third semester.

There is also an improvement from the first to the second version for the chapters that only had one revision (Chapters 7, 10, 11, and 12); again, this corresponds to the second and third semesters of evaluation, when I taught none of the sections and then both sections. So, in both cases, the improved evaluations might be as readily attributable to my increased involvement in the teaching as to improvements in the chapters. Unfortunately, the data were not maintained in a manner that allowed me to compare evaluations for only those sections I taught.

However, there are some data that mildly contradict this confounding: There is also a small but consistent improvement from the first version to the second version of Chapters 1-6, 8-10 and 13, even though I taught one of the two sections for the evaluation of the first version and neither section during evaluation of the second version. But these mildly contradictory data do not significantly attenuate this strong
confound. Because of this confound, no statistical analyses were performed to evaluate the significance of the improvement. A statistical analysis of the data may have yielded significant results, but these results would have been mitigated by the confounding variables that obscured the effects of the revisions.

In conclusion of the analysis of the chapters, each of the four chapter-evaluation questions (comparison to the ME Book, value of the case studies, value of the concepts, and utility of the case studies) was well evaluated for each of the 13 chapters. These good evaluations are reflected in the mean of the four evaluation questions and the frequency distributions for those same four questions examined in Chapter 8. And the student evaluations revealed that no chapter was clearly superior to others. Furthermore, the evaluations improved across revisions; however, these improvements were independent of the extent of those revisions. But, in spite of this confounding, we should not lose sight of the fact that all of the final evaluations of all the chapters were positive; and that was a main goal of writing BAARD.

Student Section Evaluation

In addition to an overall evaluation of each chapter, the students also evaluated the sections within each chapter, by answering a standard, six-question evaluation for each of those sections. Then, I did a multiple-correlation analysis of their answers to these six questions for each of the sections in Chapter 8, in order to determine the relation between the six questions (i.e., the independence of the six questions). All six questions were highly correlated ($r = .6$ to $.9$ and mean of $r = .82$).
Therefore, for each of the 50 sections, I computed the mean of the section's six student evaluation questions and did not further examine the individual six questions.

To determine whether the improvements in section evaluations were related to the revisions of those sections, I looked at these mean evaluation score across the three semesters of evaluation for each of the sections from four representative chapters (Chapters 6, 9, 8 and 10). Each of those four chapters happened to be divided into three sections (the number of sections in other chapters varied from two to five); so, this was a sample of 12 of the 50 sections.

For these 12 sections, I had 21 opportunities to implement revisions (9 of the 12 sections were evaluated three times and could have been revised twice, and 3 of the 12 sections were evaluated twice and could have been revised once). However, not all the sections were revised, and of those sections that were revised, not all were revised for each new version of the textbook; in fact, there were only eight revisions.

In five instances, a section had heavy revisions (more than 15% of the text changed); and in each of those five cases, the evaluation improved after the revision. In three instances, a section had light revisions; and in each of the three cases, the evaluation improved after the revision. However, in 12 instances, a section had no revision from one semester to the following semester; yet, in each of those 12 cases, the evaluation also improved across those semesters.

As with the chapter evaluation, these representative section evaluations show consistent improvement across revisions and across semesters. However, as with the chapter evaluation, the improvement in the section evaluations has a confounding—
successive revisions is confounded with successive semesters in the course. So, it is
difficult to attribute the improvements unequivocally to the revisions (see Figures 13,
14, 15, and 16). For the same reasons that statistical analyses did not seem appropri­
ate for the chapter evaluations, they do not seem appropriate for the section evalua­
tions. Though the cause of the improved evaluation is not clear, the final evaluation
of each of the examined sections was positive, which was a main goal of writing
BAARD.

In conclusion of the student evaluations, I gave top priority to producing the
text and improving the text as much as possible and a lower priority to a rigorous
evaluation process. Those two goals were somewhat incompatible given a finite
number of semesters available to evaluate the textbook. In other words, I could have
strategically gone for a semester with no revisions (this is the case for Chapter 1) to
control for variables that might be confounded with revisions, but that meant that I

![Figure 13. Section Evaluation: Chapter 6.](image)

Legend. □ Version 1 □ Light revisions
□ Extensive revisions □ No revisions

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Figure 14. Section Evaluation: Chapter 9.

Figure 15. Section Evaluation: Chapter 8.
would have to sacrifice the opportunity to make revisions that I thought were needed.

Analysis of Student Conceptual Skills

The conceptual test consisted of two questions. For both questions, the students were asked to use as many concepts and procedures as they could apply to each question. The first question presented the case of an unresponsive child in a discrete-trial session, and the second question presented the case of a self-injurious child. Each student obtained four scores determined by (1) the number of acceptable procedures, (2) the number of concepts, (3) the number of errors, and (4) the number of mentalistic terms. Then, I computed group means for each of these four scores for a group of practicum students who had read BAARD (Psy 357 students) and a group of students enrolled in an introductory course in behavior analysis who had not read
BAARD (Psy 360 students). I compared the four means of these two groups of students to assess the extent to which an improvement in conceptual skills could be attributed to reading BAARD.

In terms of mean scores, the Psy 357 students (N=16) tended to perform better than the Psy 360 students (N=14) in five of eight comparisons and equal to them in the remaining three comparisons across the two questions (see Figures 17 and 18):

1. The mean number of concepts was higher for the Psy 357 students for question 2, and the same for both groups for question 1.

2. The mean number of procedures was higher for the Psy 357 students for both questions.

3. The mean number of errors was lower for the Psy 357 students for question 1, and the same for both groups for question 2.

4. The mean number of mentalistic explanations was lower for the Psy 357

![Figure 17. Conceptual Test Question Number 1 (The Psy 357 Students Read BAARD and the Psy 360 Students Had Not Read BAARD).](image-url)
students for question 2, and the same for both groups for question 1.

5. The preceding analysis was in terms of the mean number of errors per students. However, one might also ask how representative are these means of the individual students in each group. For example, one group might show a higher average number of errors than the other group, but that would not necessarily mean that a higher percentage of student made errors in that group nor that many of the students made a higher number of errors. The increase in the average number of errors might be due to a large increase in errors for a small percentage of the students. Therefore, I also analyzed the data in terms of the percentage of students responsible for the errors and mentalistic explanations. Previously, I had shown that the mean number of errors was lower for the Psy 357 students for question 2, and the same for both groups for question 1. However, the percentage of students making errors seemed to be roughly
the same for both groups; so it is not clear how representative this increased mean number of errors is.

6. Previously, I had also shown that the mean number of mentalistic explanations was lower for the Psy 357 students for question 1, and the same for both groups for question 2. However, the percentage of students giving a mentalistic explanation seemed to be the same for both groups; so again, it is not clear how representative this increased mean number of errors is (see Figures 19 and 20).

7. But 36% of the Psy 360 students and 25% of the Psy 357 students made an error in answering question 2; and 38% of the Psy 357 students and 36% of the Psy 360 students used a mentalistic explanation in answering question 1. These high percentages suggest that there is a considerable potential for improvement for each group of students.

Figure 19. Percentage of Students Making at Least One Error and Percentage Giving One Mentalistic Explanations for Question 1 (The Psy 357 Students Read BAARD and the Psy 360 Students Had Not Read BAARD).
8. Concerning errors, I did not count the following as errors, yet they are not exactly correct. For question 2, all but one of the Psy 360 students recommended the use of a punishment procedure rather than attempting to identify the function of the problem behavior described in question 2. Although this answer (using punishment first) is not conceptually incorrect it is practically, legally and ethically wrong. In practice, since the development of procedures for the functional analysis of behavior (e.g., Iwata, Dorsey, Slifer, Bauman, & Richman, 1994), successful interventions that use extinction or differential reinforcement of alternative behaviors are feasible. Ethically, the indiscriminate use of aversive stimulation may not be justifiable when a milder intervention would achieve the same results. Legally, most intrusive interventions are justified after the demonstration that less intrusive interventions have failed
or are not feasible (mainly for safety reasons). This legal issue was addressed during the practicum, but it was not discussed with the Psy 360 students.

9. In addition, I had in mind an optimal procedure for each question. The optimal procedure for question 1 was to conduct a reinforcer assessment. The optimal procedure for question 2 was to implement a functional analysis. For question 1, 50% of the Psy 357 students gave the optimal answer; and no Psy 360 student gave the optimal answer. For question 2, 63% of the Psy 357 students gave the optimal answer; and 7% (one student) of the Psy 360 students gave the optimal answer. Although the concept of functional analysis had been dealt with in EPB, the concept of reinforcer assessment had not been mentioned explicitly. In contrast, both concepts were dealt with extensively in BAARD. In addition, some Psy 357 students learned to implement a reinforcer assessment with the child they worked with (see Figure 21).

It is not possible to be certain to what extent the superior performance of the

![Figure 21. Percentage of Students Whose Answer Contained "Functional Analysis" or "Reinforcer Assessment" (The Psy 357 Students Read BAARD and the Psy 360 Students Had Not Read BAARD).](image-url)

Legend: ■ PSY 357 ■ PSY 360
students in Psy 357 is due to their having read BAARD, because they had also read other autism related books, discussed concepts and applied issues during seminars, and received on-the-job training. All these component of the course package may have influenced the test results in addition to the reading of BAARD. Another concern is that no interrater reliability measure was collected on the students' performance.

**Comparative Textbook Evaluations**

The evaluation question comparing the three books (Lovaas, 1981; Bosch & Malott, unpublished; & Maurice, 1993) suggests that the ratings for the ME Book and for BAARD are similar, while Let Me Hear you Voice was clearly superior (see Figure 22).

In addition, although 75% of the students said that they would like to keep all three books as required texts, they also said that if they were to discard one book, they
would discard the **ME Book** (31%) or replace it with a newer version (25%) (see Figure 23).

From the analysis of the students' comments on the evaluation sheets, it appears they find the **ME Book** "outdated", "boring", or "practical", and they find **BAARD** "interesting" or "providing good examples", and also "in need of revisions."

It is not clear why the participants rated individual **BAARD** chapters better than the **ME Book** but rated the overall textbooks similarly. It is possible that the context of the questions affected the ratings.

![Bar chart](image)

**Legend.** ■ Discard □ Updated/revise □ No responses

**Figure 23.** Which Book Would You Replace or Discard?
CHAPTER IV

GENERAL DISCUSSION

This discussion presents my comments on (a) the writing process and (b) the evaluation process.

Textbook Writing

Two of the goals of this dissertation were to produce a textbook that would: (1) help students appreciate the way the concepts and principles of behavior analysis underlie the specific behavior-analytic practices used with autistic children, and (2) be a replacement for Lovaas' ME Book. The goal of producing a concept and principle based autism text was largely achieved. However, there was a change in the goal of producing a replacement for Lovaas' ME Book. Originally, I saw the need to develop an applied behavior-analytic textbook dealing with autism because the ME Book was getting poor evaluations in our practicum. However, across semesters, the evaluations of the ME Book improved to a satisfactory level. In addition, 75% of students who answered the textbook evaluation thought that we should use both the ME Book and BAARD. As a result, I revised the second goal of this dissertation. At this point, the goal consists of producing a behavior-analytic textbook to be used in conjunction with the ME Book rather than a replacement for the ME Book.

In addition, as I began assessing the need for such a text, I realized that there

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was a gap between understanding the principles of behavior and seeing their relevance to a behavioral manual (such as the ME Book). Thus, the goal became to develop a gap-bridging textbook rather than simply an improved ME Book. So the focus of this dissertation shifted from the production of an alternate to the ME Book to the production of a textbook that would fill the gap between EPB and the ME Book, as this gap did not seem to be filled by any other books.

With regard to the first goal, the resulting product was a textbook of approximately 120 pages on 8 1/2 by 11 1/2 inch paper. The textbook addresses the major principles of behavior analysis within the context of developmental disabilities but also addresses topics that are specific to autism and developmental disabilities, like stimulus overselectivity, aggression, and self-stimulation. Combined with other course components, the textbook was effective—as indicated by the student evaluations and the conceptual test. Thus, the system as a whole produced good results.

Although the first goal—of writing the textbook—was achieved and I finished the redaction of the textbook, the ultimate goal of textbook writing falls outside of the subject of this dissertation. Namely, I did not address the process of publishing the textbook. Future dissertations involving textbook writing might address elements of the publication process. Some of these elements are: (a) selecting the publishers, (b) identifying the target audience of the publisher, (c) drafting a prospectus, (d) contacting the publishers, and (e) revising the manuscript based on the publisher's recommendations.
Strategies for Writing Textbooks

In researching and writing, one should conduct a thoughtful needs assessment. One might consider elements such as, the target audience, the novelty of the content, the coverage of other published books, and the audience evaluation of these published books.

Before writing, authors should consider reading a technical manual about writing. However, authors might benefit from re-reading the manual after they have been writing and revising their book for a few months. That is, authors might appreciate more the expertise from a technical writing book in the context of the identified or subconscious roadblocks they have faced for a few months.

After defining the topic of the book and its target audience, authors will define the topics for each chapter or section of their book; and they will research the topics for those chapters or sections by reading other books or articles.

Authors may need to review the existing literature to define each of their chapters. This step may be facilitated if they adopt the topics (as outlined in the table of contents) of the leading books in their field. For example, in the case of BAARD I adopted and adapted EPB's table of contents.

Then authors will select topics to be covered by each chapter. The risk is having a chapter with a myriad of loosely connected topics. To prevent this problem, authors should not collect an exhaustive or large amount of books and articles for each chapter. Instead, the chapter will be more focused if authors identify the top three to five textbook chapters or review articles relevant to the topic for that chapter.
In reviewing books, authors should analyze the features and content common to other books. Topics that are common across chapters of different books are important. Authors should also cover them in detail or provide some explanations if they are not including these topics in their book. If authors choose to cover a topic that has been extensively covered in other book chapters, they need to generate original material.

An original topic or an original chapter is not one that is created ex-nihilo. The source of control is sometime obscured, but it is always present. I have identified two strategies for developing an original chapter or section:

1. Authors can generate original material by looking at recent and/or relevant research articles and analyzing, summarizing, and/or fictionalizing them in the context of the target topic. One may call this "article mutation"—a process of change from article to book content. This process may require much "mutation" to make the research article clear and relevant to their non-professional target audience. Article mutation is a good way to disseminate articles from professional journals.

2. Authors can also generate original material by combining the unique features and content from published chapters. One may call this "book cannibalization"—feeding one's book with other books. If authors choose to recombine existing material in the hope of generating something original, they must be careful not to plagiarize their sources. Cannibalization is not plagiarism. Ideally, each chapter would include contents generated with both strategies (mutation and cannibalization).

Often, authors will encounter material or have ideas for a chapter or a section that they are not currently working on. They should develop a system for collecting
and classifying their ideas, quotations or references so that they will be easily available when writing the chapter or section they pertain to. Until one develops his/her own system, one should consider Skinner’s (1987) writing aids (also read Skinner, 1981). He overlapped note cards and clipped them on a clipboard. Each note card was entitled with one topic (topic-card). As Skinner found interesting quotations or had thoughts, he wrote them on the corresponding topic-card. Later, as he wrote about a topic, he would either use the material listed on the card or move it to another topic-card. It may be possible to develop a form listing the topics, references, ideas, quotes, etc. for that purpose (see Table 1).

I tried Skinner’s system as I started writing, but I stopped using it for reasons that were not clear to me. However, I will use this system again because the response effort is relatively small and it outweighs the cost of losing track of materials that are not relevant for the chapter in progress but that would be relevant for a chapter yet to be written or revised. It may prove possible to design a Microsoft® Word® template that would achieve the same function as Skinner’s note cards, but I found the note cards convenient in places where computers do not usually go (e.g., bedrooms, bathrooms, cars, etc.)

Additional Textbook Development

Future refinements of BAARD and of one’s own book are inevitable. As classroom texts usually provide the bases for testing students, it may prove valuable to develop an instructor’s supplement that would include questions and quizzes based

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on the book. In addition, the instructor's supplement would have the answers to the homework questions (that may be imbedded in the text) along with a brief discussion of the issue, and a bibliography relevant to the answer.

The Evaluation Process

The following section addresses some of the issues that arose as a result of the evaluations and the methods used for conducting those evaluations.

Self-Evaluation

What follows is a brief self-appraisal of BAARD. As such, it should guide the future revisions of this textbook. A self-evaluation should take place for each chapter. It may prove possible to develop a checklist that would assess the chapter contents along dimensions such as breadth of coverage and conceptual errors/ambiguities. The breadth of coverage may consist of: (a) the behavior analytic principles; (b) the topic-specific concepts or phenomena; (c) the topic-specific practices, procedures; and (d) the legal/ethical issues. Alternatively, the careful development of a table of contents (see Table 1) may address potential coverage problems. For example, a detailed table of contents organized into rubrics (e.g., concepts, examples, case studies, etc.) allowed me to see at-a-glance which rubric was not developed for a specific chapter.

An important dimension of a textbook may be its coverage. In its current form, BAARD is lacking coverage. Although most of the major principles and topics
in behavior analysis were covered, some important and relevant topics were left out; for example, token economies and stimulus equivalence were not covered. BAARD is also lacking coverage of some popular methods and treatments. For example, an overview and analysis of the TEAACH program (Schopler, 1989), Gentle Teaching (McGee, 1992), Positive Behavioral Support (Koegel, Koegel, & Dunlap, 1996), PECS (Frost & Bondy, 1994), and Natural Language Paradigm (Koegel, O'Dell, & Koegel, 1987) are not provided in BAARD. In addition, the inclusion of some helpful and practical features like a brief guide to the Individual Educational Plan (IEP), and information on Job Placement may make BAARD more useful to parents and tutors.

In addition to a self-evaluation, future textbook-development projects should also include an expert evaluation (beside the authors).

**Strategies for Evaluation**

I have identified some shortcoming with regard to the evaluation process that future textbook evaluators may avoid if they consider the following suggestions:

1. In the case of BAARD, although the ratings improved across the successive versions for the chapter and section evaluations, it is not possible to say that the revisions were responsible for these improvements. If one wants to demonstrate experimental control, one must minimize the impact of variables that may obscure the effects of the independent variable. In the case of this dissertation, the confounding variables may have occurred at the system level while others occurred at the student
level. At the system level, one should attempt to control for: (a) the instructors' or teaching assistants' behavioral skills, (b) the instructors' or teaching assistants' statements in favor or against one's book or the other books, and (c) the contingencies of reinforcement or punishment for students making positive or negative statements about one's own book or the other books. At the student level, one should attempt to control for characteristics such as: (a) knowledge of the subject matter, and (b) motivation. For example, have random group assignments with a group of students who are not taking one's course. A better evaluation design would have taken necessary precautions to prevent, limit or control the effect of these variables.

2. When using a group design, one should randomly assign students to various versions of one's textbook to minimize systematic variations across groups of participants. For example, one might hand out different versions of the book. In addition, one could randomize the versions of the chapters. In the case of this dissertation, the students were not randomly assigned to the revisions they evaluated, but rather evaluated versions that corresponded to the semester in which they took the course.

3. In an effort to show experimental control—the effect of one's revisions on the student evaluations—one might implement a within subject method of evaluation. This assessment could take place with 4-5 sections only, partly to minimize the aversiveness of reading the same material twice and partly because the rigorous demonstration of the effect of the independent variable for an entire book may not be feasible or cost effective. When implementing a within subject design, a group of the
same students can evaluate different versions of the same section. Evaluators may have two options to achieve this type of evaluation:

1. The evaluator might hand out different versions of the same section (2-3 versions) at the same time and ask the readers to compare and evaluate them. This strategy may be useful if the evaluator truly do not know which of the revised section is better, or if the evaluator wants to increase the effect of the revisions on the evaluation. In other words, with this paired comparison, the reader could bounce back and forth between the versions and perhaps be more sensitive to the revisions. This strategy would yield a truly comparative evaluation because the students would have access to all the revised sections at once.

2. The evaluator might also hand out one different version at a time (e.g., once per week) rather than all the versions for that section at once. This strategy will decrease the effect of the revisions on the evaluation because the reader will less effectively discriminate differences in the versions. However, it may be more practical if the evaluator is still revising the textbook and is under time constrains. In addition, the evaluator might be able to use a control section (a section without changes) by handing out a section that students have already evaluated earlier during the semester. Using a control section may help ruling out confounding variables such as sequence effect and prior exposure to the material.

The use of the same group of students rating successive versions would have yielded a comparative evaluation of the text material for some sections. This means that the ratings (the response of circling a Likert score on the 7-point scale) would
have been controlled by the difference in the versions of the textbook. In the case of this dissertation, there was no such discrimination because each group of students only read one version of BAARD. However, with a within group evaluation, there is a potential for sequential effect of the revisions, so it would be necessary to randomize the order of the revised chapters.

The chapters from BAARD were written and immediately handed to the students enrolled in the practicum course. This evaluative method may not be the most effective when attempting to improve the content of a textbook. Rather, the initial step of a textbook evaluation should consist of either an external expert evaluation or one-on-one trials. With the one-on-one trials, a respondent—representative of the target audience (e.g., a student or a parent)—gives detailed comments about the structure and content of the textbook.

After revisions based on the expert evaluation and the one-on-one trials, the evaluator may conduct a small group trial. There, the practicum students may be adequate evaluators. I have done this small group evaluation, to some extent, but I have failed to take advantage of the data.

After revisions based on the small-group trial, the evaluator may conduct a field trial, as I have done. For example, the evaluator may assign the textbook to practicum students (e.g., Psychology 357 and 397). However, during the field trial, the role of the evaluator should be passive. S/he might attend the classes where the material is presented, but s/he should not intervene, comment, or clarify. Rather, the evaluator should observe the instructors' use of the instructional material and the
problems that might arise from some aspects of the material (and only intervene when
the teaching assistant and the students have exhausted their attempts at clarifying a
difficult point).

In addition, there is another dimension of the field trial that I implemented but
did not collect any data on. That is, during the seminars when I was the TA or when I
was monitoring the seminars conducted by other TAs, I made note of the students' problems with BAARD. When I was not teaching or monitoring the seminars, the TAs occasionally reported the problems during our weekly meetings or via E-mail. This functioned as an additional source of feedback about sections requiring revisions. It may be possible to collect data on the revisions based on this small group evaluation. For example, the data might consist of the number of student problems reported across successive revisions of a specific section or chapter.

Molecular Analysis of a Continuous Improvement Process:
Writing, Evaluating, Revising

I could have evaluated the impact of the textbook more rigorously in terms of
the evaluation tools (the chapter and section questionnaires) and the dependent variables (e.g., preference and conceptual mastery). As a major goal of the project was the development of a textbook, it is easy to lose sight of the desirability of collecting and analyzing the data during the writing process. It is also difficult to bring writing behavior under control of the evaluation data. Some of the following recommendations may help future authors and evaluators in systematizing the process of revisions and increasing the control of the evaluations over their writing:
1. Before starting revising, author(s) should reserve times for carefully reviewing and analyzing the results of the evaluations. This planning step may be arranged by scheduling meetings for that sole purpose. The goal of these strategic "revision planning" meetings would be to increase the control of the evaluation data over the revisions.

2. During the "revision planning" meetings, author(s) should develop strategies for prioritizing the revisions within each chapter and across chapters. For example, during the second revisions of BAARD I revised the chapter sections that received the worst evaluations.

3. To increase the control of the evaluation data over the revisions, the author should revise the material that was discussed during the planning meetings before writing new sections. I found that delays greater than a week, between writing the revisions and Dr. Malott's suggestions for revisions, made it more difficult to recall the issues discussed. If the author foresees that revisions to the text are not feasible shortly after the meetings, a tape recorder should facilitate the revisions. On occasion, Dr. Malott and I used a tape recorder during the review process and it worked well.

4. For quality control, the revised chapters and sections should be reviewed by an external reviewer or the advisor. This review process may be especially important for novice writers who may make errors during the process of post-meeting revisions. For example, in the beginning of this project, I had some difficulties in implementing Dr. Malott's suggestions when they involved conceptual clarifications or

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changes to the structure of the text.

5. With large documents (such as textbooks or dissertations), I found it difficult to keep track of which sections were read or skipped during the meetings. Dr. Malott may have inadvertently read sections that we had previously reviewed. We may also have overlooked sections. So, authors might develop a "revision map." The revision map may be based on the detailed outline of the textbook (see Table 1). Next to each heading in the detailed outline, the author(s) may record the date when that heading was reviewed.
CHAPTER V

SUMMARY AND CONCLUSION

This dissertation consisted of writing and revising a behavior analytic textbook on autism. The process leading to the final product (i.e., BAARD) started with a needs assessment and ended with the completion of the third version of a 120-pages textbook.

In the dissertation, the writing of BAARD was both a dependent and an independent variable. After writing the first version of BAARD, the chapter and section evaluations helped shape the following two versions of BAARD. In turn, the form (style and content) of the revised versions may have somewhat controlled the student evaluations. Unfortunately, the cause of the improvement in the evaluation scores was not clear. However, the textbook was well received by the students.

In considering student learning, the practicum-student performance was compared to the performance of non-practicum psychology students on a conceptual test. The practicum and the non-practicum students tended to use the same amount of mentalistic terms. The non-practicum students made a few more errors in describing or applying the concepts, and the practicum students tended to use more concepts and procedures in their answers. However, the practicum students probably had more knowledge than the non-practicum group because most of them were more advanced in their studies.
In the process of revising the textbook, I developed a system for textbook evaluation that guided the revisions. I have also suggested ways of improving that process for future authors.

Finally, when confronted with the choice of a confounded evaluation and producing a textbook in a timely manner, I chose to produce the textbook rather than to slow down textbook writing to deal with the confounding. As a result, I now have a textbook that is well received by its intended student audience and has been submitted for publication.
Appendix A

Chapter Evaluation Questionnaire
CHAPTER EVALUATION QUESTIONS

1. Compared to the ME book, this reading assignment was

2. The concepts and definitions in this chapter were

3. The stories/examples were

4. The stories/examples described interventions that you may use
Appendix B

Section Evaluation Questionnaire
SECTION EVALUATION QUESTIONS

1. The preceding section was easy to understand.
2. The preceding section was clearly written.
3. The presentation and explanation of the issue was convincing.
4. The preceding section was interesting.
5. The preceding section was informative.
6. The concept or the analysis was valuable.
Appendix C

Description of Revisions
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<th>Rating of 5 or more</th>
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<td>Section 2: Extensive Section 3: Light</td>
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<td>Draft 3</td>
<td>Section 3: Light</td>
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<td>Draft 2</td>
<td>Section 1, 2: Extensive Section 3: Light</td>
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<td></td>
<td>Section 2: 20% Section 3: 20%</td>
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<td>Draft 3</td>
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<td></td>
<td>Section 2: 10% Section 5: 10%</td>
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<td>Section 2, 5: Light</td>
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<td>Section 1, 3: Light Section 2: significant Section 4: Extensive</td>
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<tr>
<td>Draft 3</td>
<td>Typos</td>
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<td>Draft 2</td>
<td>Chapter except sec 2: Light</td>
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<td>Section 3: Light (enter the sandman)</td>
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<td>Draft 3</td>
<td>Section 2: Extensive</td>
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<td></td>
<td>Section 3: Light</td>
</tr>
<tr>
<td>Draft 2</td>
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|           |         |         | Section 1: 14%  
|           |         |         | Section 3: 16% |
| Chapter 13| Draft 1 | Draft 2 | Draft 3 |
|           |         |         |         |
|           |         |         | Section 1 and 3: Light |
|           |         |         | Section 3: 12% |
|           |         |         | Section 1: 15%  
|           |         |         | Section 3: 18% |
Appendix D

Comparative Evaluation Questionnaire
1. Best feature of the practicum

2. Worst feature of the practicum

3. How would you rank the performance of your Croyden TA
   (good) 1  2  3  4  5 (bad)

4. How would you rank the performance of your seminar TA
   (good) 1  2  3  4  5 (bad)

5. Lovaas's ME Book is
   (good) 1  2  3  4  5 (bad)

6. Bosch & Malott's book is
   (good) 1  2  3  4  5 (bad)

7. Maurice's book is
   (good) 1  2  3  4  5 (bad)

8. Should we keep the 3 books?

9. Which book would you replace/discard?
Appendix E

Conceptual Test Questions
Name: ____________________________

Have you had 360: _____
Have you had 460: _____

Provide a thorough and behavioral answer to the questions listed below:

Scenario 1: While Rob is working with Little Delia, she stops responding and gets a "blank gaze" on his/her face. How could Rob have prevented that from happening? (there are at least 3-5 things that Rob might have done differently)

Scenario 2: Little Delia has a history of biting her own hand. Delia's mother tells you that she is very worried and asks if you could help out with that problem. What would you suggest we do to help her out? Give as much detail as you can (write on opposite page if necessary).
Appendix F

Behavior Analysis, Autism and Related Disabilities
Behavior Analysis,
Autism
& Related Disabilities

Sébastien Bosch  •  Richard W. Malott
## Contents

1. Autism and Other Mental Handicaps
2. The Reinforcer & Reinforcement (unlearned/learned)
3. Escape and Avoidance
4. Punishment
5. Penalty and Punishment by Prevention
6. Extinction
7. Differential Reinforcement and Punishment and Shaping
8. Establishing Operations (& Aggression)
9. Discrimination and Fading
10. Complex Stimulus Control: Concept Formation & Imitation
11. Behavioral Chains
12. Maintenance and Generalization Transfer
13. Verbal Behavior

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Overview

This book is based on the style and pedagogy of one of the more successful textbooks in behavior analysis—Elementary Principles of Behavior (Whaley & Malott). Its style is entertaining, motivational and clear, while maintaining rigorous conceptual integrity and an empirical/scientific base. The book presents the latest research on effective treatments in autism and developmental disabilities, with an analysis of the underlying psychological processes, presented in a practical, every-day manner to facilitate on-the-job assessment and treatment. Each chapter explores the relevance of a single behavioral process, such as reinforcement, motivation, and stimulus discrimination. The book also offers guidelines for doing reinforcer assessment and functional assessment. Finally, the last chapter addresses functional language training using B. F. Skinner's taxonomy of verbal behavior.

Features

- **Distinctive organization.** The textbook roughly parallels the structure of Malott et al.’s (1992) Elementary Principles of Behavior. Throughout the textbook, we present various behavioral problems typical of individuals diagnosed with autism and suggest interventions from a behavioral perspective. The text is organized so that relatively simple concepts and techniques are introduced in the beginning chapters (e.g., reinforcement) and then built upon toward increasingly complex and specialized methods (e.g., differential reinforcement, fading, and teaching verbal behavior), allowing for a cumulative and hierarchical learning of the behavior analytic principles (see Table of content—Overview).

- **Structural Components.** The thirteen chapters feature principles of behavior that come from basic behavioral research (see the detailed table of content). Each chapter features fictionalized studies written in a narrative style based on peer-reviewed research articles. It also offers
technical analyses, boxed definitions and explanatory diagrams to complement the analyses and clarifies the behavioral contingencies underlying the everyday life and educational settings. Each chapter presents multiple examples of the principles introduced in that chapter. Within a chapter, each section illustrates a concept by starting with a real-life situation based on an empirical study, followed by an analysis of the concept, additional clarifications, and questions (objectives) specific to that section.

- **Style.** In keeping with the style of *Elementary Principles of Behavior*, we created a narrative text that blends the sophistication of Lovaas' famous *Me Book* and some of the emotional impact of Maurice even more famous *Let Me Hear Your Voice*. Based on the real people in the research studies, we have developed composite, fictional characters (autistic children and teachers) who accompany the reader throughout the book.

- **Unique content.** This text contains special coverage of topics such as functional analysis, reinforcer assessments and verbal behavior not covered in competing textbook such as Lovaas' *ME Book* and Maurice et al. (1996) or Koegel and Koegel (1995).

- **Effective pedagogy** includes:
  - Technical issues are presented in a narrative style. The narrative style contributes to the accessibility of the text material and motivational value of the text. The analysis of the intervention sections clarifies important principles and concepts introduced in the stories.
  - The textbook includes contingency diagrams that clarify the existing contingencies (a contingency diagram describes the causal relation between the behavior and its reinforcing and punishing outcomes). The diagrams do this by showing only the essential components in the contingency. These diagrams are important analytical tools, as the contingencies underlying our daily behavior are often masked by the details or the complexity of our daily lives. The diagram clarifies the contingency in effect, by isolating the variables present prior to and immediately following the behavior. Learning to analyze contingencies is crucial for behavior analysts because behavioral deficits as well as behavioral excesses are maintained by a discrete set of contingencies. In addition, learning to analyze the contingencies is a prerequisite to understanding and defining which variables control our behavior. Finally, our understanding of the variables controlling the target behaviors is a prerequisite to the development of effective treatments for behavioral deficits or excesses.
  - To illustrate many behavioral contingencies, we also used hypothetical, yet practical, examples or actual case studies.
from special education classrooms and home programs in application sections.

- The textbook features *boxed definitions* and *boxed general rules* to increase the discriminability of the important concepts and guidelines for the applications of the concepts.
- The textbook also includes *exercises* and *questions* at the end of each section.

**Target Audience**

- *Behavior Analysis and Autism* is intended for undergraduate and graduate classroom use. It has been field tested over four semesters with undergraduate students enrolled in a university practicum providing services to children with autism and autism spectrum disorders. The book is also intended for caregivers and teachers of children and adults with developmental disabilities. In addition, it is appropriate as a main text or supplemental text for practica, parent training, staff training, and courses such as, Introduction to Psychology, Learning, Abnormal Psychology, Mental Retardation, Analysis of Developmental Disabilities, Assessment and Treatment of Developmental Disabilities, Introduction to Special Education, Concepts in Behavior Analysis, and Behavior Therapy.
- There are no prerequisites for reading and understanding the book. However, the text is also appropriate for students with prior general knowledge of the principles of behavior analysis, because they will learn about the applications of those principles to autism and related problem areas.

**Comparison with Other Textbooks**

- Most textbooks such as Lovaas' (1981) *ME book* and Maurice, Green and Luce's (1998) *Behavioral Interventions for Children Diagnosed with Autism* are designed to help parents teach specific behaviors and decrease inappropriate behaviors. As such, they may be the best on the market. However, neither Lovaas nor Maurice et al. offer a conceptual analysis of the underlying problems or explanations of the treatments.
- Maurice's (1996) *Let Me Hear Your Voice*, is a masterful case study that was not intended to be a didactic text in spite of its effective dissemination of behavior analytic methods. Our book integrates the technical aspects and the programmatic guidelines of Lovaas and Maurice et al., and some of the warmth, emotion and narrative style of Maurice.
- Koegel and Koegel's (1995) *Teaching Children with Autism: Strategies for Initiating Positive Interactions and Improving Learning Opportunities*, presents three intervention strategies (motivation, generalization, and self-management). These strategies are important but are only a small sample of effective behavioral interventions. In addition, the book does not represent the richness of the spectrum of interventions developed via
behavior-analytic methods. Chapters 8, 10, and 12, of our book covers the three strategies presented by Koegel and Koegel, along with the rest of the behavioral interventions in the other chapters.

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Some readers of this book will be quite sophisticated and will have mastered Elementary Principles of Behavior (Malott, Malott and Trojan, 1999); for them, most of the concepts we will introduce will be a review. It's our experience that such review is important. What we will emphasize is the application of those concepts, specifically to the autistic and the mentally handicapped populations.

**Behavioral Theories of Autism**

There are numerous theories on the causes of autism. For example, Ivar Lovaas, one of the most influential behavioral psychologists, developed a theory of autism based on the interaction between the child's physiology and the rearing environment. Lovaas attributed autism to a mismatch between the child's nervous system and the environment. This theory is tenable, but testing its accuracy is beyond the scope of modern investigative technology. The physiological processes invoked by Dr. Lovaas are a bit vague and do not allow further investigation into the causes of autism spectrum disorders.

Sidney Bijou also offered an interesting theory of autism. His behavior interference theory emphasizes the interaction between the child's behavior and the environment (like Lovaas'). Dr. Bijou says that the young child with autism has an "abnormal sensory equipment" that causes the child to avoid touch or noises. As a result of avoiding touch and sounds, these stimuli may never become conditioned reinforcers (you may recall that conditioned reinforcers are stimuli that become reinforcers because they have been paired with already established reinforcers). In turn, the absence of conditioned social reinforcers (e.g., praise, attention, approval) interferes or blocks the development of social, verbal and emotional behaviors. Dr. Bijou hypothesizes that children with autism also engage in stereotypic behaviors to compensate for the absence of social stimulation. This hypothesis may be supported by numerous studies that show that stereotypy decreases as social and verbal behaviors increase. The behavior interference model makes a somewhat counterintuitive prediction: establishing social reinforcers may alleviate much of the problem encountered by children diagnosed with autism. If this holds true, then behavioral programs should invest time and effort in establishing the prerequisites to social and verbal behaviors —social reinforcers— rather than attempting to establish social and verbal behavior in the absence of conditioned social reinforcers.

**Example of problem behavior in special education**

**Paul's hormones?**

The following story may be offensive to some people. We are only trying to make the point that there are no abnormal behaviors per se. What makes a behavior abnormal is the context in which it occurs. The story illustrates this point.

---

1 See Lovaas ?? on how to establish social reinforcers.
Little Paul was six. He attended Big Public School special education program when Christi enrolled in the Professional Psychology Practicum. Once per week the group of practicum students met with their on-site supervisor, Dawn.

Christi looked forward to her weekly supervision meetings. She walked briskly to the conference room. As she turned the corner in front of an open classroom she almost ran into Little Paul. “Oops”, she said a bit embarrassed. Paul had his pants around his ankles. He was masturbating. Paul’s aid briskly walked toward him. She talked in a detached voice. “Paul, pull up your pants!”, then she looked at Christi and said, “He does this at least 10 times a day. You’ll get used to it.”

Fortunately, Christi never got used to Paul’s public masturbation. A few weeks later, she assessed the causes of the problems (she identified the antecedents and consequences for the behavior) and conceived successful intervention. But this is another story, for another time...

Should we conclude that Little Paul is sick and that his behavior is abnormal?

Paul is not sick and the behavior per se is not abnormal. Ninety-five percent of male teenagers masturbate, but because public masturbation is punished the activity is usually carried out discretely. All behaviors displayed by autistic people are learned, and most behavioral problems consist of “normal” behaviors occurring too often, not often enough, or in the improper setting. By normal, we mean that the behavior is in everyone’s repertoire.

1. Is the behavior (masturbation) “normal”?
   a. Yes  b. No

2. Then, what dimensions of the behavior are abnormal? (more than one answer possible)
   a. It’s developmentally inappropriate
   b. It’s occurring too often
   c. It’s morally wrong
   d. It’s happening in the wrong setting

What’s wrong with Little Paul, then?

Little Paul’s behavior is controlled by its consequences. And consequences are found in our environment. Christi’s subsequent investigation revealed that Little Paul’s masturbatory behavior was maintained by the aid’s attention (the consequence). In fact, Paul would masturbate only in the presence of a few people. So, instead of blaming Little Paul or his hormones we should look at his environment. The answer to our problem is often under our nose but we fail to see it. As Paul is undistinguishable from his behavior you may be tempted to blame Paul because of his reprehensible public masturbation. But we know that a behavior is not the possession of a person. It is an interaction between the person and the environment. Change the environment and you’ll change the behavior.

Because typical classrooms are not adequate to produce good learning for people with mental disabilities, educators have developed special environments, like discrete-trial (more details in this chapter), to achieve their goal of having independent and well adjusted learners.

---

Every Learner is Unique
Every Learner is the Same

Before we address some of the specificities of learners labeled autistic, we will discuss some of the common features of all learners.

First, learners are unique because they have unique behavioral histories, repertoires and learned reinforcers. Second, learners are also much alike because consequences affect their behavior in the same way.

Little Paul is unique because, like B.F. Skinner, he is the product of his quasi-unique genetic make up and his unique environmental history. Both genetic and environmental variables determine Paul and Skinner's behavioral repertoire. Roughly, a repertoire is the sum of all that you can do. Skinner and Little Paul's repertoire may affect their learning of new behaviors and their performance of already established behaviors. That is, learners will learn new behavior only if more basic ones have been established. In addition, Paul and Skinner are able to acquire new behaviors because they are sensitive to many reinforcers or aversive stimuli. In this sense, Skinner and Paul are the same.

Why should we care? Because creating and improving repertoires is the business of educators (which includes behavior analysis, psychologists, and social workers....).

3. What type of reinforcer could produce this strong preference for watches?
   a. ____ The tick-tick sound
   b. ____ The proprioceptive stimulation of the cold glass or metal surface
   c. ____ Attention
   d. ____ All of the above

MORE EXAMPLES OF REPERTOIRES

Special children’s repertoires come in all shapes and sizes. For example, four-year-old Sophia is able to read 20 words. She can also label 50 objects but lacks the imitation skills that would allow for more independent learning.

On the other hand, Matt, also four-year-old, can ask for “nuggets and fries” (edibles), and some other tangibles (e.g., toys and other objects). His mom also says that he echoes much of what he hears.

The ability to repeat sounds after hearing them from someone else is important because it is a prerequisite to learning more complex

Definition: Concept
Repertoire
• A set of skills and values.
• that an organism can do.

language. This means that Matt can say a new word (clusters of more basic sound) or sound without the teacher having to shape each new words or sound.

4. Which student shows the more functional repertoire?
   a. __ Matt
   b. __ Sophia

Yes, it’s Matt. He can request what he needs.

**Definition: Concept**

**Anti-Learning Repertoire**

- A set of behaviors
- that prevent the acquisition of
- appropriate behaviors.

Sophia cannot.

5. Can you guess which student is more likely to exhibit behavior problems, e.g., tantruming?
   a. __ Matt
   b. __ Sophia

Yes, it’s Sophia because she does not have language for requesting. When she is hungry and food is out of reach she is more likely to cry or attempt to get it herself.

6. Can you guess which student will make more progress in the next few months?
   a. __ Matt
   b. __ Sophia

Yes, it’s Matt because imitation is a basic behavioral repertoire that is essential to the acquisition of other repertoires. While reading words is more advanced than imitation, it is not a building block for learning more basic language.

7. Matt will progress faster than Sophia, why?
   a. __ Girls’ language processing structures, in the brain, are more developed.
   b. __ Vocal imitation (echoic) is a basic repertoire that is crucial for the acquisition of language.
   c. __ Reading (textual behavior) is a basic repertoire that allows for the acquisition of more advanced repertoires.

Although children with autism sometime have peculiar values and skill deficits, their most noticeable characteristic is often the presence of an “anti-learning” repertoire. This repertoire includes, tantruming, self-stimulation, self-injurious behaviors, and nonverbal requests. These behaviors will interfere with the acquisition of novel and more adaptive behaviors.

1. Make a list of all the anti-learning behaviors for a learner you know.

**Anti-learning Behavior List**

- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
- ✓
Today was Sang Woo’s first day at work. It was also his first time with a child labeled autistic, a 5-year-old boy named Frank. As Sang Woo guided Frank to his chair, the young boy tried to break away and run out of the small study room. Sang Woo firmly pushed on Frank’s shoulders. He sunk in the small yellow chair. Tears cascaded from Frank’s eyes. Large veins adorned his neck. From his throat came a continuous, high pitch, nerve-racking noise. What would Frank’s mother, Florence, think? Sang Woo didn’t want to pass for a child abuser on his first day at work....

“I must quiet him down!” he thought. “Please, pretty please, be quiet, quiet now.” Sang Woo wasn’t sure whether Frank could hear him. “Do you want a piece of cookie…? Here have some cookie.” Sang Woo delicately pushed the chocolate chip cookie in Frank’s mouth. The young boy stopped yelling and started to chew. “It worked! I quieted him down!” exclaimed Sang Woo.

As Frank ate the rest of the cookie, Sang Woo thought, “This is a win-win situation. Frank stopped crying, he must be feeling better, and his mom won’t freak out on my first day. Yep, this cookie soothed him and stopped his tantrum.”

ANALYSIS OF THE EVENTS

Sang Woo implemented a common sense intervention based on widely accepted rearing practices. Often, when an infant cries, nurturing adults attend to the infant’s needs and wants until the crying stops. This is OK for a while. Tiny babies can’t ask for milk and can’t help themselves to the bottle. With proper training, preschoolers labeled with autism or mental retardation can learn to speak or manipulate objects. In fact, the majority of people labeled with autism or mental retardation have no vocal cord dysfunction, hearing impairment, or motor impairment. Although the etiology and the degree of impairment of people labeled with autism or other pervasive developmental disorders and people with mental retardation (determined by an IQ score) may differ, both groups have behavioral deficits and often show excesses in the department of inappropriate behaviors. But remember, every learner is different, but all learners are the same. Tristam Smith and his

1For EPB readers: You have seen examples of this sort in the home and in public schools. However, our experience has been that simply having read about them in these settings doesn’t transfer to people working with children labeled with autism. Therefore, we think that it is important that you actually see this specific example. As you will be working with a child, having seen this example will make it less likely that you will get “sucked” in the sick social cycle.
colleagues have shown that intensive behavioral treatment leads to significant improvement for children carrying either label.

Sang Woo presented a reinforcer while Frank was tantruming. By doing so, Sang Woo unknowingly reinforced Frank’s tantruming behaviors. As a result, in the future, Frank will tantrum more often and longer! Contrary to popular belief, the momentary cessation of the tantrum is not a good predictor of the effectiveness of the intervention.

<table>
<thead>
<tr>
<th>Definition: Concept</th>
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<tbody>
<tr>
<td>Reinforcement Contingency</td>
</tr>
<tr>
<td>- The immediate,</td>
</tr>
<tr>
<td>- response-contingent</td>
</tr>
<tr>
<td>- presentation or increase in</td>
</tr>
<tr>
<td>- a reinforcer</td>
</tr>
<tr>
<td>- resulting in an increased</td>
</tr>
<tr>
<td>- frequency of that response.</td>
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<table>
<thead>
<tr>
<th>Harmful Reinforcement Contingency</th>
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<tbody>
<tr>
<td>1. Fill the reinforcement contingency maintaining Frank’s behavior.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frank yells and cries</td>
<td></td>
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ON TERMS

We have noticed that sometimes people talk about the same things in different ways. This should not mislead you to think that these people have nothing important to say. However, terminology is important because it allows precision and effectiveness. We have gathered a few examples of layman and behavioral terminology to illustrate the point:

In the classrooms, teachers and aids talk of *rewarding* children. What they mean to say is, *reinforcing desirable* behaviors. If you have already learned the behavioral terms and you talk to someone who has not, don’t be too critical. If you have learned the jargon and you can’t keep from using it, you should model its use without alienating your classmates, your supervisors, your peers and the rest of the world.

When you hear: “Rewards help Frank understand that he should raise his hand,” the person is talking about reinforcement. You could translate that with, “The immediate delivery of a reinforcer following hand raising increases the future frequency of that behavior.”

When you are talking about people’s behavior you should avoid terms such as *understand* because they are misleading. These terms place the causes of behavior inside the organism. This internalization keeps us from identifying the real causes of the behavior.

This defective reasoning leads to blaming the failure to learn on the developmentally disabled person. This is akin to *victim blaming*. For example, we heard a teaching aid say, “Christy is in time-out because she made another bad choice today.” That’s victim blaming. As a result of blaming the person, little or no effort may be invested in adapting the learning materials and procedures. Of course, the person
won't change if the environment stays the same.

Rather than engaging in victim blaming and in internalizing behaviors, behavior analysts often say that the occurrence as well as the form (or topography) of a behavior is determined by the interaction between the environment and the current repertoire of the person. This means that a child says, "Hi" rather than "Macaroni and Cheese" in response to his waving classmate. When learning does not occur, or is too slow, behavior analysts tailor the environment to meet the special needs of the learners. This approach is very sensitive to individual differences. Thus, it may be thought of as a humane approach.

One of the most harmful words is the term bored, as in "my child is bored with a procedure." Invariably people mean that boredom is a cause of poor responding. If we observed the child during this procedure, we would see a long response latency (the time between the instruction or the S and the beginning of the response) and an array of escape behaviors (for example, whining, sliding out of the chair, closing their eyes...). Of course, saying that boredom causes behavior problem does not explain anything. In addition, easy tasks per se do not cause boredom, otherwise we would never raise the fork that carries the food to our mouth. What is wrongfully called boredom makes a statement about an ineffective reinforcement contingency. So if you are inclined to talk about boredom look around, look for reinforcers, look for fun or the lack of!

We thought that the terms in the following list may also carry the same explanatory fictions and circular reasoning potential of boredom. Remember, this is not just a theoretical issue, it has very real implications. For example, if you think that a child is testing you, you may have a stronger emotional reaction (e.g., getting angry) than if you knew that extinction momentarily increased the frequency and causes variation in the topography of previously reinforced behaviors (more details in the chapter on extinction).

<table>
<thead>
<tr>
<th>Definition: General Rule</th>
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<tbody>
<tr>
<td>The “don’t say” rule #2</td>
</tr>
<tr>
<td>• With nonverbal children, don’t say</td>
</tr>
<tr>
<td>£ understands</td>
</tr>
<tr>
<td>£ expects</td>
</tr>
<tr>
<td>£ knows</td>
</tr>
<tr>
<td>£ tries to</td>
</tr>
<tr>
<td>£ thinks</td>
</tr>
<tr>
<td>£ tests</td>
</tr>
<tr>
<td>• With any organism, don’t say</td>
</tr>
<tr>
<td>£ wants, chooses &amp; bored.</td>
</tr>
</tbody>
</table>

2. Write a sentence you have heard that violates the “don’t say rule” and give the correct analysis.

Mentalistic talk sounds like...

But it really means...

Example of Plain Reinforcement

Basic Reinforcement

We were hard pressed to find examples of plain reinforcement. That is, reinforcement in the absence of stimulus control. The truth is, most behaviors that increase as a function of reinforcement are also evoked by at least a few
stimuli. For example, when we teach autistic preschoolers to play with their comrades we don’t expect them to keep making initiations for play once their friend has left the building! We say that the occurrence of the play initiation is controlled by the presence of the classmate. That’s stimulus control. In this case, we want to increase the number of play initiations only during playtime, in the playroom and when friends are around. The procedure that leads to the establishment of these play initiations is called differential reinforcement (more details in the chapter on differential reinforcement).

However, with plain reinforcement we want to increase the frequency of a behavior in all settings and at all times. For some children with severe deficits, a few basic behaviors should happen indiscriminately of the place or time: walking and talking. For example, children that have no language and say very few sounds should receive a reinforcer every time they vocalize, regardless of where and when they make the sound. We call these responses free operants because children can respond at their own pace and the response operates on the environment.

Example 1: LOOK WHO IS TALKING!
Imagine you are a green behavioral consultant for Big School. A mother steps in your office and tells Stephanie’s tale:

“Stephanie use to say ‘hi’ and ‘bye’ and cooed while she crawled to greet her Dad. Then, over a brief period of 6 to 8 months she stopped talking. She no longer greeted her Dad at the door. In the end, cooing and babbling almost disappeared.”

Based on this report what would you suggest to begin on the “road to recovery”?

Example 2: LAZARUS GETS UP AND WALKS
Imagine that you managed to keep your job after the recommendations you made for Stephanie. At the end of the school day, you notice a wheelchair bound child waiting for his bus. When you inquire about Lazarus’s condition you find out that he suffers no gross motor impairment. However, he hasn’t walked in a long time and is “a bit rusty”.

Based on this knowledge what would you suggest to begin on the “road to recovery”?

---


4 Of course, our alert students will comment that breathing and other behaviors serving regulatory functions should not be discriminated operants. We agree. Scanning and attending to the environment are also free operants that are the building blocks for more complex learning.
Discrete-Trial applications

Continuous vs Intermittent Reinforcement

Two of the early problems confronting educators and learners are (1) the relatively slow rate of acquisition of new skills and (2) the desire to have the behavior persist in the absence of reinforcement. That is, the behavior should persist when reinforcement only occurs once in awhile because reinforcers are not handy (more details in the chapter on extinction). Lab studies have shown that quick learning occurs when a reinforcer follows every response. In contrast, a behavior is more durable when the reinforcer is only delivered some of the time.

We suggest that until a response is strongly established we should facilitate the acquisition process by reinforcing every occurrence of that response. Let us worry later about losing the response because it is not reinforced on every occasion. Why worrying about misplacing my hundred dollar bill when I haven’t earned it yet?

Once the behavior is established, we recommend that the teacher reinforce the response less frequently; for example every 3 correct response on average. Later, the frequency of reinforcement may be lowered even more. But, you will still need to reinforce some correct responses on occasion. There is no such thing as fading a reinforcer completely!

Concept

BEHAVIORAL CONTINGENCY

There is a contingency between Frank’s tantrum and Sang Woo’ giving the cookie. That is, there is a dependency between the tantrums and the cookie. Getting the cookie depends on the yelling. No yelling no cookie. So a contingency is a dependency or a causal relationship. And to be contingent means to depend on or to be caused by.

Definition: Concept
Behavioral contingency
- The occasion for the response (behavior)
- the response (behavior)
- the outcome of the response (behavior).

Example of a powerful reinforcer

Strawberry Therapy

Frances’ son, Frank, was diagnosed with autism three years ago. Frank is now a six-year-old with a voracious appetite for strawberries. In the last three years, Frank ate approximately 1/4 pound of strawberries per day. He eats 1/8 pound during the three hour morning session and a 1/8 during the afternoon session. Frank receives thirty-six hours of intensive one-on-one training per week. This means that the “little glutton” has consumed over of 130 pounds of strawberries!

“Strawberries don’t cure autism” said Frances in a chagrined voice. I replied “You are right Frances. Strawberries alone won’t do the trick, but until physicians come up with the magic pill your strawberries are doing wonders. Frank would sell his soul for a bowl of fresh, unsweetened strawberries!”

In fact, “strawberry” was Frank’s first word. “Stwo-bewee” was a strong behavior. It would always function as a request. During discrete-trial sessions, Frank would say “stwo-be-wee” and receive one, almost immediately. More extraordinarily, he never seemed to fill up (satiated) during the three-hour sessions.

Strawberries appear to be a very powerful reinforcer. One day I asked Frank to eat a Cinnamon cracker. As the cracker approached his lips he threw himself on the floor, crying and screaming. I said “Frank, sit down, and eat a strawberry.” The statement had an instantaneous effect on him. He diligently sat down and collected his strawberry. I then presented the cinnamon cracker again. This time I held a whole strawberry one-inch behind the tiny piece of cracker. I said, "cracker then strawberry." He opened his mouth, the cracker disappeared beyond the horizon of his lips. I gently pushed in the strawberry. I slowly increased the size of the bites of cinnamon cracker and followed it with a strawberry. After a few minutes, he was gnawing on the cracker “on his own initiative.”

ANALYSIS OF THE INTERVENTION

Before the start of the intervention, the reinforcer was already clearly identified so I didn’t spend much time assessing the effectiveness of strawberries. In general, the presumed reinforcer should be checked before the start of the intervention (more details later).

In this case study, strawberries had two effects. First, the immediate presentation of the strawberry after eating the cracker increased all the behaviors consistent with eating a cracker (holding, opening the mouth, closing the mouth, chewing and swallowing). That is what a reinforcer does.

Second, the pairing of the cracker (an aversive stimulus before the intervention) and the strawberries altered the value of the cracker. In a way, some of the “goodness” of the strawberries transferred to the cracker. As a result the cracker lost some of its aversiveness. How do I know? After the procedure, new “cracker-related” behaviors emerged. Frank would smell or lick the cracker before eating it. Most of all, I couldn’t see the expression of disgust on his face.

Definition: Concept
Reinforcer (positive reinforcer)
- Any stimulus, event, or condition whose presentation immediately follows a response and increases the frequency of that response.

TYPES OF REINFORCERS

Tangible reinforcers (2 types)
1. Food (Edible) reinforcers:
   - Food and drinks... burp...
2. Other Tangibles: toys, books.
   One note of caution: Try to use healthy treats rather than chocolate and salty chips. But in the end, go for what gets you most performance.

Activity reinforcers
Hide-and-seek, speaking, singing, roughhousing, chase games, painting, setting snack table. You can use these reinforcers outside of the more intensive sessions or to reinforce an unusually good response.

Social reinforcers
Praise, attention, approval, smiles, and closeness to others. This one is very important for us, but often not too important for autistic children. At least at the beginning of the behavioral intervention.

Sensory reinforcers
Lights, sounds, smells, tastes, tactile and kinesthetic stimulation. Some people go as far as letting the child self-stimulate (e.g. spinning for 3 seconds) for reinforcement. This practice maybe ok early on, as the child gets used to the intensive intervention and the many demands, but it should be dispensed with quickly.
Mixed reinforcers

Hugs, pats and kisses. We say mixed reinforcer because we cannot differentiate the social from the sensory qualities of the stimuli.

In autistic impaired (AI) and preprimary impaired (PPI) classrooms, edible and praise are the most common reinforcers. As we will see later they are not always the most effective reinforcers.

QUESTIONS

Types of Reinforcers. Using the "reinforcer menu" below, make a list of ten presumed reinforcers (if possible), ranking them in order of your child's preference.

Reinforcer Menu

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

QUICK REINFORCER ASSESSMENT

Remember: before starting working, you must be sure that you have a true reinforcer. Don't make this error:

- Annie is a child and she likes Maraschino cherries
- Little Ryan is a child
- Therefore, Ryan likes Maraschino cherries

DO NOT START A TRIAL UNTIL THE CHILD HAS CHOSEN A REINFORCER!

Another frequent misconception is that once you identify the reinforcer you have all you need. Unfortunately, the reinforcing effectiveness of a stimulus may decrease rapidly (More detail in Chapter 8). This means that, if you use food, your child may get full (satiated). If you use sensory stimulation, like saying "pee-ka-boo", your child's initial excitement may soon turn into indifference (habituation).
Because social reinforcers are often weak or ineffective with children with autism, parents, teachers, and therapists have heavily relied on edible reinforcers (cf. Lovaas et al., 1966)\(^7\). Rightly so, Lovaas and his colleagues pointed out that outside of the training setting you don't always have a piece of food handy to insure that an appropriate behavior won't go unreinforced. Therefore we need to use other reinforcers or establish new ones.

In teaching a stimulus discrimination task to autistic children, Arnold Rincover and Crighton Newsom\(^8\) compared the effectiveness of sensory and edible reinforcers. They found that for the three boys with autistic behaviors, the use of sensory reinforcers produced a higher rate of correct response than did food reinforcers. Using multiple sensory reinforcers (music, jack-in-the-box, tickling, and caressing the neck) maintained responding longer than using a single food item. Finally, satiation for a single food and a single sensory stimulus occurred at roughly the same time.

Rincover and Newsom argue that children learn faster and stay on task longer when presented with sensory reinforcers. They also seem to be happier and appear to enjoy the sensory stimulation.

An additional benefit of the use of sensory consequences over edible is that they promote interactions between the child and the tutor. In turn these interactions may evolve into play (Eason, White, and Newsom, 1982)\(^9\).

We say that while sensory stimuli (we are not saying sensory reinforcers here) may be more effective on average, we should not assume that they would function as reinforcers for a specific child. So, you should keep this fact in mind (i.e., sensory stimuli may be more effective) but, when it comes to reinforcers, you should evaluate all your options.

A. Egel\(^10\) found that another factor may affect performance when it comes to reinforcers. Namely, he found that stimulus variation may play a role in children's learning. Egel measured children's learning and on-task behavior during constant versus varied reinforcer presentation. Results from a reversal design (going back and forth between the constant reinforcer condition and the varied reinforcer condition) showed declining trends in both correct responding and on-task behavior when the same reinforcer was consistently presented. In contrast, varying the reinforcers produced improved correct responding.

These interesting results remind us that sometimes, the novelty of the stimuli may be a reinforcer in itself. So, if you have identified enough reinforcers to go around, mix up! Again, when it comes to reinforcers, you can't assume anything. Novelty may be a reinforcer and it may not. You will have to test it out.

**CLASSROOM APPLICATIONS**

Here are some rules for good uses of reinforcers:

1. As a rule, the longer the delay between the behavior and the presentation of the reinforcer, the lesser the effect of the reinforcer. If you

\[\text{effect of teaching appropriate play to autistic children.} \]

*Analysis and Intervention in Developmental Disabilities, 2, 157-169.*


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wait too long you won't be reinforcing the behavior you want. Which is sometimes worst than not reinforcing anything at all! So, if you follow the Rule 1 you will quickly see an increase in the response that you immediately following by a reinforcer. Remember, the faster the better. We encourage you to develop your own strategies to present the reinforcers as quickly as is humanely possible.

**Reinforcer (S^R):**

**Rule 1 — Immediate Presentation**
- All your reinforcers should be ready for use before the start of each trial.
- If in a bag, take the S^R out of the bag.
- Keep the S^R in your hand, if possible
- Record data after presenting the S^R.
- The presentation of the reinforcer should be almost immediate (0-1 second).

2. When you use food reinforcers, their effect will decrease with increasing numbers of presentations. When your child is not hungry neither the-longest-gummy-worm-in-the-world nor your one pound M&M will reinforce the target behavior. To avoid satiation you need to control its size and keep the reinforcer as small as possible as you can and still be effective.

**Reinforcer (S^S):**

**Rule 2 — The 10-cent Rule**
- The size of food items should not exceed the size of “half a dime.”

3. Sometimes teachers and tutors start a trial while their child is eating or playing with the reinforcer. This incorrect practice makes discrete trials not so discrete because the child eats continuously. Most of all, the reinforcer is still around when the child answers incorrectly. That's very counter-productive!

**Reinforcer (S^R):**

**Rule 3 — The 5-second rule**
- For tangibles, limit access to 5s.
- Restrict access to training session (to avoid satiation).
- For food, wait until your child swallows.

4. The fourth basic rule for giving a reinforcer has to do with intonation. New tutors find it awkward and unnatural to vary their voice intonation during the course of the trial. They are told that they should smile and sound happy when reinforcing a correct response. They are told to say “Woow, That's Greaaat!!!” even when the child is only performing some seemingly mundane action, like putting his shoes on. Who would even dignify a 4-year-old with attention and much less praise for putting his shoes on? Well, we do. It may be awkward at first but it is important. The pairing of the happy voice with tangibles, edibles or activities will convert the neutral stimulus (the happy voice) to a reinforcer.

**Reinforcer (S^S):**

**Rule 4 — Use your best jovial voice**
- You may be establishing a new S' and
- The sound of your happy voice will also improve your colleagues' quality of life!
5. **Present tangibles in a playful way.** This means that when you use a toy as a reinforcer you should present the toy in a relevant way. For example, when the “car” is the reinforcer, its delivery should be consistent with car related stimuli. You can push the “vroom-vroom” car toward your child. Or, when you use a toy animal, like a miniature lion, the lion should roar and jump toward your child.

Presenting the tangible in a playful way may make them better reinforcers. It may also provide a model for how to play with the toy.

---

*Example of trainer’s reinforcer*

**Clever Little Andrew**

Andrew was a tall, handsome, African-American boy. He was six years old and had been in the public school system for four years. Stan was his tutor. Dawn was Stan’s supervisor.

**Stan:** He really is a fast learner!

**Dawn:** What do you mean? Last time I checked he could only sign for four or five of his favorite things.”

**Stan:** I know. But we started a color discrimination procedure this morning and he can already point to blue when I say “point to blue.” I don’t even need to help him with a physical prompt! Watch this.

Stan placed a red square and a blue square on the small desk. Andrew tapped the desk.

**Stan:** Andrew, quiet hands! Andrew point to BLUE.

Andrew looked at Stan and placed his hand on the blue square. Immediately Stan handed him a fish cracker.

**Stan:** Good!

He waits a few seconds. Time for Andrew to swallow his cracker.

**Stan:** Andrew, look at me ... . Good...

Andrew, point to BLUE.

Again, Andrew briefly looked at Stan and placed his hand on the blue square. Stan gave eight more trials. Andrew gave eight more correct responses.

**Dawn:** That’s amazing, let me try.

Dawn sat in Stan’s place, scattered the items on the desk and started the trial.

**Dawn:** Andrew, quiet hands! Andrew point to BLUE.

Andrew briefly looked at Dawn, gazed at the table, looked up again and down in a rapid succession. Five seconds elapsed. Dawn had no response to record. Andrew was staring at her face.

**Dawn:** What am I doing wrong? (whisper) Andrew point to BLUE.

Still no hand motion.

**Dawn:** The cards.... . Are they upside down? (thought).

As she looked down on the table Andrew finally pointed. He touched the red card.

**Dawn:** Holy *$#@!! all this time he was waiting for a sign. Look Stan, look!

Dawn took a one-dollar bill and a twenty-dollar bill out of her wallet and placed both bills on the table.

**Dawn:** Andrew, point to George Washington.

---

As she looked at the one-dollar bill Andrew's hand swiftly touched the bill.

Dawn: Great! Nice pointing to Washington.

Dawn carried out five more trials and turned to Stan.

Stan: So sorry. I swear I wasn't doing it on purpose. I didn't even realize it until you asked for the bills.

Dawn: That's OK. But this time, Andrew put the move on you!

ANALYSIS OF THE PROBLEM

We have talked about how reinforcers work with children. It also works with behavioral technicians and teachers. And sometimes it can be counterproductive: At first Stan looked at the correct item by accident and this initial response (his looking at the correct item) was reinforced by Andrew's correct responding. In fact, seeing Andrew answer correctly was a strong reinforcer for Stan. Ultimately, Stan reliably glanced at the correct stimulus before every trial. That's because of reinforcement. At that precise time, Andrew looked at his eyes and Stan's big hazel eyes always told the truth... Educators beware!

QUESTIONS:
1. Be able to state the basic rules for delivering the reinforcer.

2. Fill in the contingency that reinforces Stan's glancing at the stimuli on the table.

3. Generate an original example with some appropriate or inappropriate behavior of the trainer that is reinforced by the child.

The most important thing to remember, when it comes to teaching, is that you should never start working with a child without having identified the reinforcing stimuli. And the reinforcers may change as soon as you've put your finger on it. In the end, there is no learning without the reinforcer.

Also, you should be aware of your own reinforcers in order to understand and maybe control your own behavior. Know thou self, said the wise guy...
"Look at me!"... "Hey, Melody! Look at me!" said Stan in a thunderous voice. Meanwhile, Melody's eyes rolled in the back of her head and her body contortions would have made a yoga master envious. "Melody, Look at me!" Stan repeated and Melody's eyes kept wondering.

Stan was a big shot in grad. school. He had read Malott's *Elementary Principles of Behavior*¹, and Catania's *Learning*.² He had spent countless hours successfully shaping thousands of lever presses with hundreds of rats. Stan also had a prodigious ability to recall authors' names and article references. Although Stan was up to date in the field of experimental behavior analysis he had little experience in the applied arena. Stan had enrolled in the 3-months practicum at the Big School for Developmental Disabilities to help children and gain some applied experience.

"What now? ... I couldn't get her attention if my life depended on it!" Stan thought. He had been struggling with the *attending* procedure for fifteen minutes. The discrete-trial procedure was intended to teach some basic attending skills, such as looking in the direction of the person saying, "Look at me."

Stan thought, "That's just great.... not only is this kid not attending when I say, 'Look here', but she is trying to get away from me. I think I'll try to work through these inappropriate behaviors until she gives in."

Stan sat facing Melody. He wrapped his legs on each side of the child's legs and gave the instruction again. He spoke loudly and this time he leaned toward Melody until their noses almost touched. "Melody, look at me! LOOK AT ME!!" The harder he tried the crankier she got.

"May I make a suggestion?" said Jamon, the discrete-trial supervisor, who had been observing the scene from a distance. "Please, I need all the help I can get!" Stan said. His voice conveyed deep desperation.

"Ok, as soon as Melody approximates the correct response, back off buddy," Jamon said. (Jamon called everyone buddy or buddy-boy.) Melody's inappropriate behaviors decreased rapidly within the first session and remained low for the rest of the semester.

---

Jamon’s suggestion had two effects: First, Melody started to look at Stan for the first time. Second, Melody stopped rolling her eyes and her body contortions.

ANALYSIS OF THE INTERVENTION

An untrained observer may have concluded that Melody was frustrated and that she performed poorly because of her frustration level. The problem with the term “frustration” is that it leads to a circular kind of reasoning. That is, Melody won’t work because she is frustrated. How do we know she is frustrated? Well, she is not working. Frustration is an explanatory fiction.

Instead, Jamon noticed that physical proximity was an aversive condition for Melody. When Stan got close to her she would get restless. When he touched her she would whine and squirm until she broke free.

Jamon’s intervention made use of a basic principle of behavior-reinforcement by the removal of an aversive condition or escape. For Melody, the removal of physical contact and physical proximity reinforced the looking behaviors. The tendency to escape tactile and auditory stimuli seems to be a common feature of children with autism. Temple Grandin, who claims to have "recovered" from autism, writes "My early reaction to touching was like a wild animal. At first, touching was aversive." Some survey research seems to confirm that some sounds may be a source of discomfort. Drs. Rimland and Edelson reviewed 17,000 parents questionnaires and found that 40% of the surveys reported that autistic children were unusually sensitive to sound.

1. Analyze “Melody is frustrated” using proper behavioral English.

<table>
<thead>
<tr>
<th>Definition: Concept</th>
<th>Escape contingency</th>
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</thead>
<tbody>
<tr>
<td>Escape contingency</td>
<td>• the immediate response-contingent</td>
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<tr>
<td></td>
<td>• removal or reduction of an</td>
</tr>
<tr>
<td></td>
<td>• aversive condition resulting in an</td>
</tr>
<tr>
<td></td>
<td>• increased frequency of that response.</td>
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</tbody>
</table>

2. Generate an original classroom example of escape behavior (either your behavior or your student’s behavior).

3. Diagram your original example of escape contingency.

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Concept

**aversive condition**

An aversive condition is one we tend to minimize contact with. The use of aversive stimuli, and events raises ethical concerns. Nevertheless, in some cases they may be the most effective consequences.

Demands, restraint, physical exercise, certain sounds and loss of reinforcers are aversive events that are commonly used in schools and in the homes of children with autism and developmental disabilities.

**definition:** concept

**aversive condition (negative reinforcer)**

- Any stimulus, event, or condition
- whose *termination* immediately
- following a response, increases the
- frequency of that response.

In addition, water mist, aversive tastes, and aromatic ammonia are other aversive stimuli that are sometimes used in homes but that are never used in the schools. Also, because they are often potent aversive stimuli, their use is always brief, so they are not used in escape contingencies.

4. Diagram the dubious escape contingency using potent aversive event.

**escape contingency**

Before | Behavior | After

If water mist, aversive tastes or aromatic ammonia were used as in an escape contingency, the stimuli would be present until the child makes a correct response. Such a procedure would be hard to justify.

**Self-Injurious Behavior (SIB) and Aversive Conditions**

Self-injurious behavior (SIB) has been observed in 7 to 17% of normal infants and young children and disappears around the age of five\(^6\). For these children, the most common SIB is mild head banging. In contrast, severe SIB almost exclusively occurs with people with autism or other developmental disabilities. Approximately 5 to 15% of these populations display self-injurious behaviors\(^7\).

In a effort to determine the causes of SIB, Brian Iwata and his colleagues\(^8\) systematically manipulated antecedents and consequences for SIB. These ingenious researchers compared how often they observed the SIB across 10 minute sessions. Each session (also called condition) consisted of presenting a specific consequence after each SIB.

In one condition of the experiment—the *tangible condition*—Dr. Iwata delivered social, and food or tangible reinforcers immediately after the occurrence of the SIB. If you see an increase in SIB during this condition, it means that the SIB may be maintained by access to food, tangibles or socials in the everyday environment.


In another condition—the escape condition—the child is given a task (e.g., a skill the child is currently working on). Contingent on the occurrence of the SIB, Dr. Iwata immediately stopped the task. If you see an increase in the SIB during this condition, it means that the SIB may be maintained by getting out of a situation.

Finally, during the play alone condition Dr. Iwata examined the role of built-in reinforcers (also called automatic reinforcers). That is, in the absence of demands and of reinforcement, the frequency of SIB can only be explained by automatic reinforcement. Which is a type of reinforcer that comes from the behavior itself.

After running all the conditions, Dr. Iwata compared the frequency of the SIB during the tangible and the escape condition to the play-alone condition to determine the causes of the problem behavior. If the rate of SIB is elevated in the tangible or the escape condition when compared to the alone condition, chances are the consequences associated with that condition are controlling the SIB.

Dr. Iwata et al. found that of the 152 persons referred to them for self-injurious behavior, escape from demands was responsible for 58 cases (38.1%). Thus, they concluded that escape from demands is the predominant cause of self-injurious behavior and they speculate on the origins of escape maintained SIB:

Regardless of the specific cause, it appears that current instructional programs do not generate high levels of motivation on the part of some individuals and instead may produce escape behavior, which is gradually shaped to the point at which SIB and aggression become the most effective means of terminating ongoing activity.

Question: How will I know that the SIB is maintained by an escape contingency?

Answer: If the problem behavior occurs while your are working but not in the playroom, you are probably dealing with an escape behavior. But, the cause of the behavior can only be determined with a functional analysis. The functional analysis is an assessment process for looking at the relationships between the environment and the behavior of people with developmental disabilities. However, there are other ways to assess the function(s) of behaviors. We shall briefly review three assessment strategies for identifying the variables that may control a behavior.

Note that all the different procedures for identifying the variables controlling behavior are called assessments—the generic name for the evaluation process—but the different procedures are not all called analyses. The term analysis is reserved for the experimental

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9 Automatic reinforcers arise from tasks (e.g., games) that carry their own reinforcer(s). This means that playing some games produce stimuli that are reinforcers for playing these games, independently of socially mediated reinforcers.
manipulation of the variables surrounding the behavior. The experimental manipulation allows us to make statements about causal relationships (e.g., screaming is reinforced by getting out of an unpleasant task).

In contrast, an assessment, based on a caregiver's interview or on observing the behavior in its natural environment, yields only correlational data (e.g., when screaming occurs, task termination often follows).

Warning: Behavior analysts use the term functional assessment when they refer to all the methods designed to investigate the relationship between a behavior and its environment, but behavior analysts also use the term functional assessment when they talk about direct observation (as opposed to the functional analysis and its experimental manipulations. Tricky….

### Three Strategies for Collecting Functional Assessment Information

1. **Behavioral Interview:**
The process of collecting data regarding the conditions in which a behavior occurs by talking to people that are close to the child

2. **Functional Assessment:**
The process of collecting data regarding the conditions in which the behavior occurs by directly observing the child in the natural environment.

3. **Functional Analysis:**
The systematic manipulation of the variables that may be responsible for the problem behavior (also called Experimental analysis or analogue observation)

### OVERVIEW OF THREE FUNCTIONAL ASSESSMENT STRATEGIES:

1. **The behavioral interview** consists of talking to people that have direct contact with the person. The major role of the interview is to gather data about the maintaining factors and start looking at broad patterns of behavior. The interview is useful to identify problem behaviors and to roughly estimate severity and frequency. An advantage of the interview is that it is relatively easy to gather the data by talking to the parents or the teacher. On the down side, the information from the interview is not always accurate and does not reveal causal relationship between the behavior and a consequence. So, the degree of certainty regarding the relationship is low.

2. **The direct observation** According to some researchers, direct observation “...is the best method to determine the frequency and severity of...behaviors and their antecedents and consequences.” (p. 349) 10. Here, the observer uses a coding sheet and records the occurrence of the target behavior as well as what is happening before and after the behavior. Direct observation is a more accurate assessment method than interviews but it is also more effortful. With direct observation, you have to gather enough data to see the trends in the variables that are most often happening along with the behavior. Often times, the interpretation of the graphs derived from the coding sheets is difficult because of the sheer number of events occurring shortly before and after the behavior. In addition, there is some evidence that suggests that the descriptive assessment is not sufficient to identify the reinforcers for problem behavior. Dorothea Lerman and Brian Iwata compared the conclusions of descriptive assessments and functional analysis11. They wanted to determine whether the descriptive assessment yielded similar findings than the functional assessment

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**Footnotes:**


regarding the variables maintaining the SIB of six adults with profound mental retardation. Drs. Lerman and Iwata found that the descriptive assessment was only able to identify whether the reinforcers were social or non-social (i.e., automatic). This means that the descriptive assessment can not determine whether a behavior is maintained by a positive reinforcement contingency or by an escape contingency! This is a serious limitation because the two conclusions lead to different treatments.

3. The functional analysis also looks at the frequency of the problem behavior (e.g., throwing stimulus material). It does so across different conditions that are designed to test whether the behavior is sensitive to a particular type of consequence. In each condition (described in more details in the next section) a particular consequence follows each instance of the problem behavior. So, across each condition, the same problem behavior produces different outcomes that are previously determined by the behavior analyst. The experimental analysis yields a causal relationship between the behavior and the variables maintaining it. The functional analysis is the most accurate method for identifying the sources of the problem. The analysis of the data is usually easier than that of the data coming from direct observation because the functional analysis isolates a set of variables and keeps much "noise" out of the analysis.

Guidelines for a Brief Functional Analysis

The following instructions may provide you with some guidelines for conducting a functional analysis in your home or at school setting. The functional analysis may take place over a few days. The conditions comprising the analysis (play, attention, and escape) should last 10-15 minutes and occur consecutively, with a five minute break between the conditions. You should reserve one hour per day to conduct the analysis. This will give you time to set up your material calmly before starting each condition. You may also consider wearing a different color shirt or cap for each of the conditions. This may help in bringing your child's behavior under stimulus control faster by making the conditions more discriminable. Lastly, if the behavior occurs as often across all conditions after 5-6 sessions, you may have a non-social maintaining variable. For example, your child may yell because she enjoys the vibrations it produces in her throat. This type of reinforcement is called automatic reinforcement (think about it as non-social reinforcement). To find out whether the response is maintained by automatic reinforcement you should place your child in a room with no toys and no attention. If the behavior occurs more often in this bare environment than in the other conditions, chances are you are dealing with a non-social reinforcer for that behavior.

Condition 1—Tangible/Attention Condition

- Record the frequency of the behavior while your child is playing with a toy.
- Read a magazine while sitting next to your child.
- Follow the target behavior with attention. E.g., “please, don’t break the pretty toy.” or “Stop, don’t do that,” or "I'm here if you want to play with me,” along with a toy or food.
- Do this for 15 minutes
- Take a 5 minute break and start condition 2
9. Fill the contingency for the "attention/tangible condition"

Before | Behavior | After
--- | --- | ---
| | Jimmy bites his thumb | |

**Condition 2—The Play/Alone Condition**

- Record the frequency of the behavior while the child plays in a playroom.
- Do not intervene, regardless of the occurrence of the problem behavior.
- Do this for 15 minutes
- Start condition 3

8. Fill the contingency for the "play alone condition".

Before | Behavior | After
--- | --- | ---
| | Jimmy bites his thumb | |

**Condition 3—The Escape/Demand Condition**

- Record the frequency of the behavior in the work room while sitting at the table.
- Implement an effortful or difficult task involving tangibles (e.g., puzzle completion, or object identification procedure).
- After each instance of problem behavior (e.g., throwing), remove the stimulus material from the table for 10 seconds.
- Do this for 15 minutes.
- Stop the functional analysis for the day

- Tomorrow (session 2 on figure 1.) start with Condition 2, then 3 and 1.
- The day after tomorrow (session 3) start with condition 3, then, 1 and 2.
- Conduct at least 5 sessions, cycling through the order of the conditions.
- Plot your data (see Figure 1.)

10. Fill the contingency for the "escape/demand condition".

**Condition 2—The Play/Alone Condition**

Before | Behavior | After
--- | --- | ---
| | Jimmy bites his thumb | |

Figure 1. Hypothetical data for a person whose behavior is maintained by contingent escape from demand.

**Functional Analysis**

<table>
<thead>
<tr>
<th>Sessions</th>
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<tbody>
<tr>
<td>Play</td>
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12 The standard functional analysis implements the alone condition and the play condition separately. However, if you are conducting a brief analysis you may dispense with implementing the two conditions separately if the child is not sensitive to attention or if the tangible reinforcer is as effective as attention.
Intervention Utility of the Functional Analysis

The data revealed by the functional analysis is used to choose the most appropriate intervention.

For example, when behavioral problems are maintained by an escape contingency, extinction of the escape behavior is an alternative to using a punishment procedure. This means that the adult working with the child will keep presenting the demand (interaction or prompt) that initiated the escape behavior. This type of extinction is also called working through.

In other words, with a procedure consisting of the child pointing to his/her nose after the teacher says "touch your nose," the technician keeps repeating the instruction (every 5-10 sec) and physically prompts the correct response. To decrease the frequency of the escape-maintained response, it is imperative that the teacher keeps repeating the instruction even if the child cries, hits, closes his/her eyes, or spits...

Definition: General Rule

Escape Contingency
- With an escape contingency
- never use time out.
- This will increase the frequency of
- the problem behavior.
- Instead use the "work through" procedure.

Discrete-Trial Applications

Sid's Seminar:

Question: My child gets agitated when I guide her through the correct response after she answered incorrectly. She often whines and turns away from the worktable. What should I do?

Answer: Your child may show aggressive or escape behaviors because a good correction procedure is slightly aversive. For example, you may use a stern voice, physical guidance, and no reinforcers. As a result, your child may attempt to get away from this aversive situation. You should repeat the correction procedure as long as your child is "off task". Then, once your child is attending, repeat the instruction and praise the correct response. Immediately move on to the next trial where your child will have an opportunity to earn a reinforcer for the correct response.

Diagram of Problem Behavior during Correction Procedure

11. Fill the diagram for the correction procedure. (Remember you want to decrease the escape response).
Effective Inappropriate Contingency

12. Not attending during instructions is also a common problem. Please diagram the contingency that may be maintaining an escape response of your choice.

Example of avoidance
Discrete-Trial training

Adam's Gaze

For the fiftieth time today Stan repeated "Adam, look at me." Adam's head gracefully tilted upward until his big hazel eyes met Stan's eyes. Their eyes locked for 2 seconds and Adam received a fresh unsweetened strawberry. Success at last! Stan thought.

Earlier that day, Adam didn't set his eyes on Stan. He repeated, "Adam, look at me" and Adam would look at his hands or roll his blinking eyes. After 5 seconds or so, Stan implemented the correction procedure. He would say, "Adam you did not look at me" in a stern voice. Then, he said "up." As Adam did not respond within 1 second, Stan would place his hands on Adam's cheeks and gently-but-firmly moved his head in an upright position. After Adam held the position for 15 seconds and Stan would say "down." When Adam did not respond, Stan guided Adam's cheeks down, until his chin met his chest. Another 15 seconds would pass. Then Stan would say, "straight" and move Adam's head its natural resting position. At times, when Adam followed the instruction, Stan didn't use physical guidance.

For the fiftieth time today Sang Woo repeated "Adam, look at me." Sang Woo held a strawberry near his eyes hoping that Adam would look at the strawberry. Adam kept bouncing on the chair. Under his closed eyelids his eyes moved rapidly and erratically, a bit like the eye movement you see during REM sleep. Sang Woo waited five seconds and placed the strawberry back in the bowl. After 10 seconds he picked up the strawberry lifted it a few inches from his eyes and asked again, "Adam, look at me." Adam looked at his hands and blinked his eyes.

Sang Woo's Reinforcement Contingency

Before Behavior After

Adam has no strawberry. Adam looks at Sang Woo. Adam has a strawberry.

Sang Woo was desperate. He had seen Adam's graphs for this procedure. It looked like Adam worked better with Stan. When he worked with Stan, Adam responded correctly 95 percent of the time. Meanwhile, Adam never got above 50 percent of correct responses with Sang Woo.

Then, Sang Woo reported the difference in performance to Marianne. The next day she observed Stan's session and Sang Woo's session. Turns out Sang Woo got sick on the same day Marianne revised Adam's procedure.
She trained Stan on the new correction procedure but forgot to train Sang Woo upon his return.

ANALYSIS OF THE INTERVENTION

Some say that the eyes are the windows to the soul. The eyes may be indicators of people’s emotions. In other words, eyes may say something different from what we are speaking. The eyes may also convey approval or disapprobation. Thus, the expression "if a look could kill" tells that a certain type of gaze may be a punisher for a particular response.

The fact that people can infer things from looking in other people’s eyes is not the most remarkable features of these incredibly complex organs. Singularly, our eyes also allow us to see!

Sometimes, children labeled autistic are said to avoid eye contact, as if someone else gazing into their eyes was aversive. We’d rather say that some children labeled autistic have poor attending skills.

Looking at or scanning your environment is a prerequisite to more complex skills including labeling objects and following instructions. Thus, this repertoire (a broad class of response) should be taught first.

This intervention used the principle of avoidance of the presentation of an aversive stimulus to improve eye contact.

**Definition: Concept**
Avoidance contingency
- The immediate,
- response-contingent
- prevention of
- an aversive condition
- resulting in an increased frequency of that response.

QUESTIONS
1. The correction training produced better results than the straight forward reinforcement of eye contact. Why?
2. Avoidance—define and give an example.
Example of punishment in an inpatient setting

No Mist Ache!

Four-year old Terry sat quietly behind a small desk. Terry was a full time student at Big School for Developmental Disabilities. He had been attending the Big School for Developmental Disabilities since he was one and a half years old. He was partially deaf since birth and had grand mal seizures.

Terry and his discrete-trial tutor, Yokiko, worked on behavioral acquisition procedures four hours each day. Terry’s program included labeling objects, requesting favorite items, learning his address and phone number, and answering to other simple questions.

During the discrete-trial sessions, Terry’s hands often remained hidden under the desk. There, he constantly pinched, scratched and rubbed the small area of skin between his thumb and index finger. His little thumb was pink and red from the constant pinching. Terry also squeezed his bottom lip between his thumb and index finger. Part of his lip was swollen and bits of skin were torn. Terry’s parents and teachers were very concerned but uncertain about how to deal with the problem.

Before the intervention, Big School for Developmental Disabilities staff had observed Terry’s scratching and picking, and recorded the frequency in 10-sec intervals. They used a partial interval observation procedure; this means that they recorded whether or not scratching and picking occurred during each 10-sec interval. During this baseline, he scratched and picked in 80 to 90% of the intervals.

In the past, Yokiko said “No,” a mild aversive stimulus, to stop the scratching and picking. Unfortunately, “No” wasn’t cutting it any more. Yokiko needed a slightly more aversive stimulus. She opted for a fine water mist. Water does not hurt, it is easy to use, and it is inexpensive.

The intervention started. Each time Terry scratched or pinched, Yokiko sprayed his face. Pshh, Pshh.... Then she would wipe off the water and resume working. During this intervention, the percentage of intervals with scratching and pinching immediately decreased to near zero percent. Later, when Yokiko stopped using the mist, Terry’s scrubbing and pinching returned to pre-intervention (baseline) levels. Finally, she started using the mist again and Terry’s pinching and scratching dropped to near zero. This is what a punisher does. When you have an effective punisher you get less of the behavior that preceded the punisher.

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2 Seizures involving the interruption of motor and cognitive functions.

3 This recording procedure may overestimate the actual frequency of responding because the time interval is marked after the occurrence of one response, regardless of duration or the frequency.

4 Wipe off the water to prevent chapping.
TIPS FOR WATER MIST USERS

Using the water mist is a safe procedure. Yokiko made it even safer by taking the following precautions: First, she dried Terry's face after each squirt. This minimized Terry's discomfort. Second, to prevent any chapping of the skin, she used a "surface treatment" (e.g., Vaseline) before and after each session. And third, she used water at room temperature and sprayed from a sufficient distance to avoid hurting Terry but at the same time she made sure she covered enough of the child's face so that it felt mildly aversive.

Now-a-days, such a procedure would probably be unacceptable in most public institutions, but might be appropriate at home when supervised by the child's parents and a trained behavior analyst.

1. Please fill in the diagram for the water mist punishment contingency

   ![Diagram of Water Mist Intervention]

   Water Mist Intervention

   Sessions

   Baseline  Mist

   Percent of Intervals with SIB

   0 5 10 15 20 25 30

   Concept

   PUNISHMENT CONTINGENCY

   In the first chapters, we talked about increasing appropriate behaviors with the reinforcement contingency. Now we are concerned with decreasing behavior that interferes with learning — by using the punishment contingency.

   Definition: Concept

   Punishment contingency

   - The response contingent
   - immediate presentation of
   - an aversive condition
   - resulting in a decreased frequency of
   - that response.

   The basic principle of punishment works with every child (and everything with a nervous system). Paradoxically, autistic children are often described as fearless, or resistant to pain. Does this mean that punishment doesn't work with children with autism? Some parents' report seems to confirm this notion.

   Karen writes that her daughter, Jenny, can sit on a radiator for a few seconds, while barely touching it burns Karen's hand. Another mother says that the day her son got third degree burns on his hands, after getting too close to the kerosene heater, he simply said: "Look Daddy, I burned my hand." One parent of a child with a broken ankle accurately says that her child probably feels the pain but simply can't describe it in the way we do.

   These observations raise the concern that some children may be less sensitive to different sorts of stimulation. After all, we would not question individual differences when we are dealing with reinforcers. No one doubts that some of our children work diligently for chocolate milk but melt to the floor at the sight of dark chocolate. We've met some children that will work for French fries but only if they are McDonald's© French fries!

Because we know that reinforcers vary for each child, we carefully determine which stimuli will function as reinforcers when we design interventions aiming at increasing behavior. We should do the same in designing interventions whose goal is behavior deceleration. The only way we know that an aversive stimulus functions as a punisher is by observing a decrease in the frequency of the response that immediately preceded it.

**Example of Punisher Assessment in the Treatment of Pica**

**BIBS FOR SIBS**

The following is the story of Beth Janitor who worked on Truman's case as part of her clinical internship duties. Truman had a long history of pica. To date, every attempt to treat the problem had failed. Beth wanted to find an innovative intervention that would wipe out the life threatening problem caused by pica. She new too well that people that eat things that are not meant to be eaten are at risk of perforating their intestine, or getting poisoned. So, Beth went to Big University Library and found that Dr. Wayne Fisher developed an assessment to identify punishers for a given child. Some folks may argue that pin pointing a true punisher is not worth the stress that it puts on their child. While it is true that the assessment procedure may be somewhat uncomfortable, it also has several advantages. The identification of a true punisher (like that of a true reinforcer) is essential to having a brief and effective intervention. Because a punisher assessment prevents the unnecessary use of aversive stimuli with no punishing value, the child won't be exposed the whole arsenal of presumed punishers. This is especially critical when dealing with dangerous behaviors.

Beth thought that Dr. Fisher's assessment might be of some value for Truman. As we said earlier, Truman engaged in a life threatening self-injurious behavior (SIB), called pica. When he was not carefully monitored Truman would eat broken light bulbs, insects, cigarette butts, grass, string, tile adhesive, rocks, wood chips, feces, and dirt. In Truman's cases, a trial and error approach to finding punishers would be unsafe and unethical because the identification of an effective stimulus would take too long and Truman might choke, or sustain internal wounds in the process.

Beth used the same procedures that Dr. Fisher used at The Kennedy Kreiger Institute. She tested the punishing effectiveness of the basket hold time out, tidiness training, chair time-out, water mist, facial screening, contingent demands, contingent exercise, hands down, and quiet hands. To identify the punishers, Beth followed the two steps procedure suggested by Dr. Fisher and his colleagues. First, she started with the stimulus avoidance assessment and second, she moved on to the punisher assessment.

The avoidance assessment consisted of identifying stimuli or activities that were least often approached or that evoke more escape behavior when they were presented. After collecting the data from the avoidance assessment, Beth conducted the punishment assessment.

For the punisher assessment, Beth chose three tasks that evoked low, medium and high levels of negative behavior (e.g., yelling) during the avoidance assessment. Before the punisher assessment Beth baited the floor with white bread to simulate the non-edible objects Truman usually ate (e.g., cigarette butts). During assessment she examined how facial screening, contingent exercise, and watermist, affected Truman's licking objects and eating food from the floor. For example, to test whether facial screening was a punisher, Beth

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8 Screening consists of blocking the child's vision for a brief period of time.

9 You can find the operational definition of these procedures in Fisher et al. (1994). Also, the chair time out is a penalty contingency. We'll talk about penalty in chapter 5.
placed her hands over Truman’s eyes for 30 seconds every time he licked an object or placed something in his mouth. During another session she used the water mist every time Truman licked or ate some food from the floor. In the end, she was able to display all the sessions on a graph. There, she could clearly see the different frequency of pica behavior across the different aversive procedures. The lower the frequency of the behavior the more effective the punisher. Based on these results she used a facial screen.

**Example of Punishment in a Discrete-Trial Classroom**

**Overcorrection for Hand Flexion**

Billy was a 6-year-old boy with an unobtainable IQ score because of his severe language deficits. Billy was diagnosed with mental retardation and labeled emotionally disturbed. At the age of two, Billy fell off his high chair. When his head hit the hard floor, his mom cringed and cried. Billy was left with a traumatic brain injury.

Bill attended the discrete-trial classroom at Big Valley School since he was three. About 200 times per day his hands and fingers took on a life of their own. Billy slightly extended his arms and spasmodically opened and closed his hands, with his fingers and thumb touching the palm of the hand. This constant hand flexion seriously interfered with Billy’s instruction. After reviewing Billy’s progress chart, the discrete-trial classroom teacher, Marianne, decided that an intervention for the self-stimulatory behavior was overdue.

Marianne took a look at the various publications available at Big University’s library. She found many unacceptable techniques.

Among the outdated, unacceptable techniques were that proposed by Dr. Hollis who recommended the use of loud sounds. Marianne rightly thought that the noise would also affect other children in the classroom. Drs. Bucher and Lovaas slapped the children on the thigh. This treatment was not...

**QUESTION**

1. *Punishment contingency* – Find and diagram an example pertaining to the everyday life of a people with developmental disabilities.

**Description:**

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


11 This is the description of a relatively rare form of self-stimulation called hand flexion.


acceptable in public school. Besides, Marianne couldn't stand the idea of slapping children. Dr. Risley used reprimands along with shaking children. That was just too much. Marianne chose a procedure developed by Drs. Richard Foxx and Nathan Azrin—overcorrection. With this procedure, the person is required to make right what was done incorrectly. Then, they rehearse the correct response (also called positive practice).

As Billy worked on various discrete-trial procedures he started his hand flexion. Marianne said, "stand up". She physically prompted him if he took too long. Then, she asked him to move his hands into three positions. "Billy, hands in front." Billy moved his hands toward Marianne. He held the pose for 15 seconds. Next Marianne said, "Billy, hand over head". Billy didn't move. She took his hands and firmly held them over his head. His fingers started to jerk and close on his palm again. Marianne kept cool and blocked the spastic movements by holding all Billy's fingers straight out. After another 15 seconds she said, "Billy, hands down on your side". Billy assumed the martial stance typical of the review of the guard. Again, the pose lasted 15 seconds and Billy sat down to resume his regular discrete-trial session. Billy's self-stimulatory behavior nearly disappeared within a few days.

**Definition: Concept**

**Overcorrection**
- A contingency on inappropriate behavior
- requiring a person
- to engage in an effortful behavior
- that more than corrects
- the effects of the inappropriate behavior.

**ANALYSIS OF THE INTERVENTION**

Overcorrection works because it is a punishment procedure. That is, the effortful physical activity involved must be aversive enough to decrease the behavior that preceded it.

In Bill's case, he had to "hold the correct pose" with extended fingers (opposite of flexing) for awhile.

**QUESTION:**

Diagram Billy's overcorrection:

---


15 This special type of overcorrection is also called *functional movement training*.
Example of Punishment in an Outpatient Setting

OVERCORRECTION VS. PLAIN PUNISHMENT?¹⁶

Because overcorrection is a socially accepted way to do punishment, some researchers have tried—unconsciously, of course—to make good ol' plain punishment procedures pass for an overcorrection procedures. Do not let some intervention deceive you! The following account illustrates how a plain punishment procedure maybe made to look like an overcorrection procedure.

After many successes with the use of overcorrection, Drs. Foxx and Azrin decided to compare the intervention with other well established techniques used to decrease behavior.

Sam was an 8 year-old boy who mouthed all the objects in his reach, including furniture. When nothing else was available, he shoved his hand in his mouth. The researchers compared the effectiveness special punishment procedure¹⁷, non-contingent reinforcement, a slap, a distasteful solution¹⁸ and the overcorrection procedure.

During the so called overcorrection procedure that took place after Sam mouthed an object, a day care assistant immediately brushed his gums and teeth with a toothbrush soaked in antiseptic mouthwash and wiped his mouth and lips with cloth dampened in antiseptic. Foxx and Azrin called this overcorrection and reported that the procedure reduced the inappropriate behavior more than all the other procedures previously tried.

ANALYSIS OF THE INTERVENTION

There are different types of overcorrection procedures. One type of overcorrection is called Restitution, that involves the person repairing his or her damage and then some. Another type of overcorrection is called positive practice, where the person practices doing correctly what was done wrong.

Foxx and Azrin argued that the brushing procedure was a type of overcorrection. They said that mouthing introduced many germs in Sam's and that brushing the child's mouth reduced the "germ count" to levels below those prior to mouthing. This is consistent with restitutinal overcorrection. However, Sam did not engage in an effortful response, so the procedure is more kin to a sophisticated and socially valid form of punishment.

In addition, a tooth brushing intervention may be difficult to implement because of possible delays between the behavior and the aversive consequence. That is, this intervention may be difficult to implement in a classroom or in the home because of all the necessary tools (brush, mouthwash and cloth) and the manipulations.

Finally, you should be cautious in using overcorrection procedures. Like many punishment procedures they often result in escape behaviors at the beginning of the intervention. You shouldn't use overcorrection with young Hercules and adults unless you are stronger or you have enough staff. Lastly, IF THE AFTER CONDITION ALSO PRODUCES A STRUGGLE, OVERCORRECTION WON'T WORK!

---


¹⁷ The punishment procedure is called punishment by prevention of the presentation of a reinforcer. Each occurrence of the undesirable behavior delays the presentation of the reinforcer.

¹⁸ They painted a bitter tasting solution on the hand.

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4. The diagram is an example of what contingency? ______________ Why?

5. Overcorrection procedures are often very elegant and socially acceptable. Design a true overcorrection procedure for Sam.

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<th>Before</th>
<th>Behavior</th>
<th>After</th>
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6. Design a procedure for the application of overcorrection to everyday undesirable behaviors in the classroom or in the home. Do your example with a child that is wiping objects off the work table, spitting, sliding off the chair, taking toys from peer, running away from work area, or any behavior that interferes with learning.

(Be careful, positive practice doesn’t mean fun time!)

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<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
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7. Diagram an overcorrection procedure (Be careful so that you don’t just have a plain punishment procedure?)

<table>
<thead>
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<th>Before</th>
<th>Behavior</th>
<th>After</th>
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Example of Discrete-Trial Application
Best Practices for Visual Screening

Visual screening maybe a socially acceptable form of punishment because, unlike water spray or holding, it has a low potential for physical harming people being punished. The screening procedure involves placing a cloth or hand towel over the face and eyes of the behaver. As a result, the student is momentarily “in the dark.” However, this momentary blinding of the student is not the only explanation for the effectiveness of the procedure. In fact, facial screening is also effective with blind children with developmental disabilities. So the feel of cloth over the face may function as a punisher, in addition to blocking of the field of vision.

If you use visual screening, a few techniques will make the intervention more effective (by effective we mean that the target behavior will decrease more and faster). The following components are necessary to achieve the best results:

- Visual screening should be contingent on the inappropriate response.
- Facial screen (e.g., bibs) should be opaque rather than translucent.
- Bibs and blind folds produce the same results, but bibs are easier to use.
- One minute of contingent screening produces the best results (some studies show good results with only 3 seconds).
- Screening in various settings insures that the inappropriate behavior won’t occur in novel settings and in a setting where the intervention is not implemented (e.g., in the car or the grocery store).

---

• As with any punishment procedure, it is very important that you closely monitor the effects of the intervention to insure its effectiveness and its brevity.

8. Diagram a contingency using your new behavioral tool.

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Example of Penalty in a Home-Based Program

Helping a Family Decrease a Teen's Severe Self-Injurious Behaviors

James was a striking 13-year-old. At 6 feet and 2 inches he was the tallest boy in his Junior High. As a young child, James had met the diagnostic criteria for autism. James' early intervention program emphasized language. As a result, James had good language skills and he could read at the second grade level. However, he could not tie his shoes or bathe himself.

After months of hoping they would go away, James' mother, Alice, finally reported some serious incidents involving aggressive and self-injurious behaviors. Bridget Galor, James' teacher, appeared surprised when she heard Alice's account. She had never seen any of the extreme behaviors Alice reported. These behaviors included headbanging, handbiting, and aggression toward people and object. Bridget thought the structured classroom may have prevented these behaviors. Then, Bridget thought of a relatively simple plan.

During a meeting with Alice and her two older teenage sons, Ryan and Austin, Bridget explained and demonstrated the details of her plan. Bridget explained that James would have a certain number of "treat-tickets," which were actually magnets on the refrigerator, at the beginning of each day. During breakfast, they reminded him he could


bake with Mom or listen to the radio (some of his favorite activities) if he had some tickets left at the end of the day. Each time James engaged in an aggressive behavior, they would tell him about his loss and would remove a "treat ticket" from the refrigerator door into an envelope marked with the relevant label.

James pulverized a fine china plate by throwing it on the floor. "James, you've lost a treat-ticket," said Ryan, James older brother. Ryan proceeded to remove a rectangular piece of paper that was held on the fridge door with a magnet. Then, he placed the "treat-ticket" inside an envelope marked "Aggression Toward Objects." A total of four envelopes adorned the refrigerator door. Each envelope label indicated a different violent behavior. The first and second envelope said "Headbanging," and "Handbiting" while the third and fourth envelope said "Aggression Toward Others" and "Aggression Toward Objects."

During the first week of the "treat-tickets" treatment, James received 30 "treat-tickets" at the beginning of the day. He didn't earn them but he could lose them. Bridget and Alice decided on 30 tickets based on James' average number of violent behaviors per day before the start of the intervention. This meant he could lose 29 and still receive a treat at the end of the day. After 18 days James had not lost his end-of-day treat.

As the days passed, Alice reduced the number of tickets available at the beginning of the day. After 18 days she placed 25 tickets on the refrigerator. This means that James could lose 24 tickets and still get his treat. A few days later, Alice reduced
the number of tickets to 20. The number of daily tickets gradually decreased from 30 to 3 over a 5-week period. As a result, James rarely lost his end-of-day treat and the china was safe again!

**ANALYSIS OF THE INTERVENTION**

Bridget Galor designed an intervention using a **response cost contingency**. That is, when James engaged in the target behavior he lost a treat ticket (a conditioned reinforcer).

**RESPONSE COST CONTINGENCY**

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>James has all his tickets</td>
<td>James is aggressive</td>
<td>James loses one ticket</td>
</tr>
</tbody>
</table>

At the beginning of the intervention, Bridget allowed James to engage in fairly high frequency of problem behaviors and still get the end-of-day treat. Gradually, she decreased the amount of aggressive behaviors James could perform and still get the reinforcer. Another way to say this, is that she changed the response criterion. This gradual change in criterion helped James adjust to the new contingencies and minimized the number of times he lost the reinforcer. As a result, James performed without making any errors.

A criticism one could make of this intervention is that it is not a function-based intervention. Bridget did not attempt to identify the variables controlling the self-injurious behaviors (SIB) and the other aggressive responses. Although the intervention was effective in decreasing the rate of the target behaviors it may have been more aversive (for James, his mother and siblings) than the intervention that a functional assessment would have suggested. However, this response-cost intervention is easy for parents and siblings to implement. This high acceptability increases the chances that parents or guardians will implement the intervention. That's a good point for response-.

---

1. How would you test the nature of the maintaining variables in James' home(see Chapter 3 for a review on functional assessments)

---

2 Function-based treatments are linked to the results of a functional analysis. This class of intervention attempts to address the function of the problem response rather than overpowering the contingency maintaining the problem response with unrelated contingency.

3 It might be possible to interpret the effect of this procedure differently, but that's another story, for another day.
PENALTY CONTINGENCY

In Chapter 4, we saw how you can decrease behavior with the presentation of an aversive consequence. Now let’s talk about punishment by the loss of a reinforcer—the penalty contingency.4

A penalty contingency is a type of punishment. With penalty, behavior decreases as a result of the immediate loss of the reinforcer following its occurrence. In other words, if Jimmy sees his soup taken away each time he spits (we assume that Jimmy is hungry and that the soup functions as a reinforcer), in the future, he will spit less frequently in his soup. When things get worse after a response, that response tends to happen less and less frequently until it disappears.

One day when Jimmy and I were laboriously working on a reciprocal question5 program, he vehemently manifested his discontent. I would ask, "What’s your favorite food" and Jimmy would say, "Mom." I would correct the answer by saying "apple." Then, I would ask again "What’s you favorite food" and he would say "apples. Then, instead of asking back "what is your favorite food" to me, he would say "What is your favorite color?" Because Jimmy asked the wrong question I would make him repeat the correct question, "Jimmy, say: what... is... your... favorite... food" pausing between each word to give him enough time to repeat. After what seemed to be an eternity of repeating the questions and answers, Jimmy made one correct response. I immediately gave him a gummy bear and told him to take a break. He stood up hastily and violently pushed the wooden worktable, which slid in my unsuspecting abdomen. Ouch. As Jimmy walked by, ignoring my pain, I breathed hard and collected enough air to move my index finger. I reached in his mouth and performed a "finger swipe", as it’s known in the business. With the half chewed gummy bear stuck to my finger, I said "sit down!" This is how Jimmy lost his candy and his break all at once. Penalty? Maybe. I’ll have to see how often Jimmy shoves the table into my stomach next time he gets a chance.

PENALTY CONTINGENCY

Before: Jimmy has a gummy bear
After: Jimmy loses his gummy bear

All this seems harsh, but things could get uglier if the loss of reinforcer didn’t suppress aggression or carelessness. It is not always possible to ignore attention-maintained aggression or to work through escape-maintained aggression, because you might get hurt before the aggressive behavior decreases. Aggressive behaviors also "carry" their own reinforcers—the aggression reinforcers. Because these reinforcers are coming from the feelings associated with aggression, the aggressive behaviors may be very hard to knock out using extinction procedures like withholding attention or working through the problem. So, if it wasn’t for Mr. Punishment we may unnecessarily extend the “life-time” of aggressive behaviors and their associated hardship.

By the way, the loss of reinforcers in a penalty contingency need not be the same as the reinforcer that maintains the penalized response. Often, a concurrent (two contingencies working at the same time) contingency is operating. In this concurrent contingency a reinforcement relationship maintains table-pushing while the penalizing relationship weakens it.

---

5 The child answers the question and asks the same question or a variation of the original question. E.g., Therapist: "How old are you?" Child: "I'm five. How old are you?"
QUESTIONS

1. Look at the reinforcer maintaining Jimmy's table-shoving behavior. Is it the one that is removed in the penalty contingency?
   a. Yes
   b. No

   Usually the penalty contingencies commonly used as performance management situations involve a different reinforcer from the one maintaining the penalized behavior.

2. The principle of punishment by the loss of a reinforcer—state it and give a couple of examples.

3. Must the reinforcer removed by the penalty contingency be the same as the one maintaining the behavior? Yes/No (circle one)

4. Now, although the reinforcer removed in a penalty contingency need not be the same as the one maintaining the target behavior, diagram an example of penalty contingency where the lost reinforcer is the same as the one maintaining the penalized behavior.

---

Example of penalty

Behavioral Special Education

Difficult Transitions

Eighteen year old Mike has Down's syndrome and a severe language deficit. Mike communicated with signs (American Sign Language), and rarely uttered a word. At school, transitioning from one activity to the next was always a problem. Leaving the classroom or walking to his school bus were especially stressful times.

Because of his size, he had to be carried off by three, sometimes four staff. It is during some of these struggles that Mike severely injured his parents, his teacher, and some students. After one of his most violent episodes, where he bit another student, he got a one-week suspension.

"First things first," Dawn thought. "Mike is not aggressive until someone touches him." Dawn had observed his noncompliant behavior for a few hours each day through out the week. She saw that, just before transition periods, he would sit on the floor and refuse to move. During these transition periods little or no reinforcement was available.

---

Dawn decided to add some "excitement" to the walk by giving Mike some oatmeal cookies every few steps, and praised him continuously. If Mike sat down at any time, Dawn turned away and waited 5 minutes. During this time Mike could not access his favorite cookies and did not receive any praise or eye contact. After 5 minutes, Dawn verbally prompted him to get up. Again, if he refused, she would walk away for another 5 minutes.

After 2 weeks of intervention Dawn started to notice an encouraging decrease in the number of "sittings". After eight weeks the "sittings" were becoming infrequent and they completely disappeared by the end of the semester.

ANALYSIS OF THE INTERVENTION

This intervention used time out from opportunities for reinforcement. In some cases, gaining something rather than escaping or avoiding a demand motivates children and adults. Dawn used a non-exclusionary time out. That means that Mike was not removed from the environment in which the problem behavior occurred, but he went through a short period during which he could not access any reinforcers.

Although the intervention was a success, the preparation of the study presented a major limitation. What would the experimenter do if Mike got up before the 5-minute time-out ended? We doubt the school staff would attempt to keep him from moving on to the next activity. Thus, although the authors conceptualized their intervention as a time-out contingency, they may have implemented an intervention based on the differential reinforcement incompatible behavior. Because walking is incompatible with sitting.

**Definition: Concept**

**Time out contingency**

- The immediate,
- response-contingent

---

Dear reader, this interpretation of the methodology is only speculative because the authors did not provide sufficient details regarding the details of the intervention.

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This type of time out (the non-exclusionary type) can be carried out during a discrete trial session. The tutor simply turns his/her head away from the child and waits 20-30 seconds before moving on to the next trial (the opportunity for reinforcement). People working in their home can implement exclusionary time-outs. These time-outs would consist of sending the child to his/her room. We have met some creative parents that sit the child in the bathtub for brief periods of time for time-out. The bathtub may be a pretty boring place (void of reinforcers). In general, the location of the time out should contain less reinforcers than location where the problem behavior occurred.

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**ANALYSIS OF THE INTERVENTION**

This intervention used time out from opportunities for reinforcement. In some cases, gaining something rather than escaping or avoiding a demand motivates children and adults. Dawn used a non-exclusionary time out. That means that Mike was not removed from the environment in which the problem behavior occurred, but he went through a short period during which he could not access any reinforcers.

Although the intervention was a success, the preparation of the study presented a major limitation. What would the experimenter do if Mike got up before the 5-minute time-out ended? We doubt the school staff would attempt to keep him from moving on to the next activity. Thus, although the authors conceptualized their intervention as a time-out contingency, they may have implemented an intervention based on the differential reinforcement incompatible behavior. Because walking is incompatible with sitting.

**Definition: Concept**

**Time out contingency**

- The immediate,
- response-contingent

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stay in the “low reinforcer” environment results in some sort of habituation. At this point, the child may get used to low levels of reinforcement or may even find some reinforcing activities or stimuli. For example, Adam appeared to enjoy the time out area; he would lie down and pull strands of fiber out of the carpet.

- Will time-out upset my child?
Like all effective interventions, time-out procedures present some risks when they are misused. Often, the child will protest when we momentarily remove the access to the reinforcers. With the repetition of brief time outs the protest may grow into a tantrum. At this point some parents or educators may be tempted to stop the procedure. By stopping the penalty procedure early, old problem behaviors may make a come back and the removal of the time out may reinforce the protesting and tantruming. Therefore, it is of the utmost importance that time-out procedures be applied with rigorous consistency.

- Where is the time-out implemented?
If you decide to remove your child from the situation in which the problem behavior occurred—exclusionary time-out—the time-out environment should be somewhat bare of reinforcers, or contain less reinforcers than the environment in which the problem behavior occurred. For this reason, sending a child to his bedroom which contains all his toys, including a TV and an entertainment system may be, at best, a weak punisher. You should design a time-out room or an area with little or nothing to do. For example, you have your child sit in the chair, with the chair facing the wall.

When you use inclusionary time-out, you will often have to listen to your child talking to you and asking for attention or other reinforcers. There, you must to ignore (with the exception of severe SIB) the attention-seeking behaviors to preserve the efficacy of your time-out. If you give-in and attend to some behaviors that occur during time-out from positive reinforcement, your attention may function as a positive reinforcer.

Hence, when you have reinforcers available during a time-out, you don’t have a time-out anymore.

**Concept**

**Punishment by the Prevention of the presentation of the reinforcer**

The punishment-by-prevention contingency involves the non-presentation of an event that was scheduled to occur. For Jimmy, the loss of the playtime arrived before he started playing or he got to the playroom. In effect, Jimmy had lost the opportunity to play before he started playing. Is this really punishment (by the prevention of the presentation of a reinforcer)? Only future will say. We will have to look at whether Jimmy shoves the table in my rib cage.
**Example of Punishment by Prevention**

**Behavioral Special Education**

**Helping a teenager with assaultive and inappropriate sexual behavior**

José had been a concern to his parents and the school for the last five years. Time and time again he attacked students and teachers by rushing toward them and pushing them the way a Sumo wrestler would do. His teachers often found him masturbating in public areas or attempting to force a classmate into a sexual interaction.

José was 13-years-old yet he had the skill and the language repertoire of a 3-year-old child. José was born with an extra chromosome on the 21st pair of chromosomes. This condition is called Down's syndrome.

When José transferred to Marianne's classroom, she decided that it was time for him to "learn some manners." Soon, Marianne noticed that José liked praise and attention. She instructed the classroom staff to copiously praise José every 3-5 minutes if he didn't hit, masturbate or molest anyone during this brief period. If José was being inappropriate during the interval the classroom staff would praise another child.

This intervention did not produce the results that Marianne had hoped for. During the observation period prior to the intervention, Marianne caught José masturbating 13 times per day, on average. After the intervention, José's masturbation averaged 10 times per day. Similarly, aggression and interpersonal sex decreased from 7.5 times per day to an average of 4.3 times per day. While there is a small decrease in the problem behaviors after the intervention, and this decrease is statistically significant, the clinical significance of the intervention is minimal. That is, the frequency of José's inappropriate sexual behaviors is still too high to make him a safe classmate.

**Limited effectiveness of punishment by prevention (DRO) interventions**

**ANALYSIS OF THE INTERVENTION**

Marianne's intervention consisted of preventing the presentation of a presumed reinforcer (we are not sure that praise functioned as a reinforcer because she did not perform a preference assessment) if the target responses occurred during a specified interval. Thus, if José engaged in the target responses (the responses Marianne wanted to decrease), he would delay the presentation of the reinforcer. However, it did not matter if he danced, shook, laughed or stood still, he still received the reinforcer at the end of the interval, as long as he did not engage in the target behaviors.

The results of this intervention illustrate the weakness of this special type of punishment. The figures show the modest effects of this contingency. It is possible that the relationship between the behavior and its consequence is ineffective in decreasing the rate of responding.

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because the contingency lacks discriminative stimuli. Or because there are no environmental changes between the before and the after condition. Thus the individual is not experiencing a stimulus change as a result of the target response or any other responses. So, this contingency may not adequately control behavior.

**Definition: Concept**  
**Punishment-by-prevention-of-a-reinforcer contingency**  
- the immediate,  
- response contingent  
- prevention of  
- a reinforcer  
- resulting in a decreased frequency of that response.

This intervention may have failed for yet another reason. The function of the praise was not clearly established. Were they reinforcers? We are not sure. A reinforcer assessment would have done the trick! (See chapter 2 for more details on reinforcer assessments).

Finally, the intervention did not clearly identify the controlling variables for the problem behaviors. Attention, escape from task, and/or automatic reinforcement could account for the inappropriate sexual behavior. This intervention did not address the function of the behavior. If escape and/or automatic reinforcement maintained the response, the loss of the opportunity to receive attention should have little or no effect or may be contraindicated.

**Seminar note:**  
Behavioral articles that use interventions based on the prevention-of-a-reinforcer contingency usually call their interventions **Differential Reinforcement of Other behaviors** or DRO. Although the intervention is the same, the DRO analysis is wrong. As we have seen in chapter 2

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reinforcement increases behavior. However the focus of DRO intervention is the reduction of a specific response. The people that use DRO often say that the reinforcement procedure decreases the problem behavior. That's a conceptual anomaly!

**QUESTIONS**

1. What may happen if you prescribe a contraindicated intervention?

2. Please diagram the punishment-by-prevention of the presentation of a reinforcer contingency:

![Diagram](Before_Behavior_After)

**Example of a Penalty and Punishment Package in a Special Education Classroom**

**Ruth's Learns to Play**

Fluid built up in Ruth's brain. Ruth was blind, and profoundly mentally retarded. She also had hydrocephaly, which was shunted, and porencephalic cysts. She was 4-year-old. During playtime, Ruth crawled within the boundary markers, in a corner of the play area. The boundary markers, a 5 inch high wooden rail, kept

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11 A procedure which renders the treatment inadvisable because it may aggravate the problem.
Ruth in and her peers out. Surprisingly, she could be constrained with a 5 inch high rail. This boundary was necessary because Ruth bit. She bit a boy's chin, and she also bit another little boy's nose. In both cases, she bit hard enough to break the skin and to draw blood. So, until a more suitable solution was found, Marianne Allman, the classroom teacher, and Jane, Marianne's aid, decided that she should be kept within a small play area.

The school's staff was implementing an intervention designed to control Ruth's aggressive outbursts. The intervention consisted of reinforcing Ruth's play behaviors. When Ruth touched a toy, she received a nice massage. It made her smile and coo. The massage would continue as she played nicely. The intervention also directed staff members to move away for one minute after an attack.

One day, as Marianne walked in the playroom to observe the implementation of the intervention, she saw Ruth grab Jane's hair with her left hand. Ruth's right arm was almost useless because of right-sided hemiplagia. As Jane struggled to break free, she moved a hand near Ruth's mouth. Ruth's teeth sank into the soft skin. Marianne and two more staff members rushed to Jane's rescue. The two staff held Ruth down while Marianne worked on opening the fist that clinched Jane's hair.

After this violent episode, Marianne decided to muscle up the existing intervention. A few days later, Marianne peeked in the playroom to observe the implementation of the beefed-up intervention. Within the boundary markers, Ruth and bandaged-Jane played music on a toy piano. When Ruth's hand moved toward Jane's face—a prelude to eye scratching—Jane said, "No touch" and lowered Ruth's hand onto the keyboard. As Ruth raised her hand again after the initial warning, Jane laid Ruth's face down on the mat. She would hold Ruth's arm beside her body while she would secure Ruth's legs between her own feet and knees. This was the new component of the intervention: a sixty-second restraint period. When Ruth was still struggling after sixty seconds Jane prolonged the restraint for another 10 seconds. The release-criterion was 10 seconds of no struggling after a 60-seconds minimum restraint. At times, the restraint episodes were intense, but Jane was always able to manage. She had learned to remain cool under pressure by attending workshops on the use of restraints. She was also certified in the use of restraints.

After sixteen restraints administered over nine sessions, Ruth began to play more appropriately and the aggression declined. Yet, the low frequency attacks were still a major concern because of their severity. Marianne insisted that the staff members keep reinforcing appropriate play. She also lengthened the restraint time. After issuing a warning like "No bite," the staff would restrain Ruth for five minutes instead of one minutes.

With a few additional sessions, aggressive behaviors disappeared. This was cause for celebration. Marianne removed the boundary markers and a staff volunteered to lie next to Ruth and vocalized, as would a defenseless peer. Ruth crawled toward the sounds and touched the staff member without scratching, pinching, or using any other form of aggression.

Two months later, Ruth played with her peers and family. No further problem with aggression occurred. This was a huge achievement. Ruth moved from quasi isolation to a rich social environment. The decrease in aggressive behaviors allowed Ruth to access new opportunities, new reinforcers, and new people. These conditions are all necessary for learning and socialization.

**ANALYSIS OF THE INTERVENTION**

The first phase of the intervention blends differential reinforcement of alternative behaviors (DRA), punishment by the prevention of the presentation of a reinforcer and penalty. When Ruth played nicely (e.g., interacted with toys

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16 Paralysis of one side of the body
without throwing, playing next to Jane without being aggressive….), Jane provided tactile stimulation (massages). At this point, the behaviors that were reinforced by the massages occurred more often that the aggressive behavior. Then, when Ruth was aggressive, Jane moved away. By doing so she either withheld the presentation of massage or removed the reinforcer when the massage had already started.

Ruth has no massage

Ruth plays nicely
After Ruth gets a massage

Ruth hits and bites
After Ruth looses opportunity for massage

Penalty or Punishment by prevention

This diagram illustrates the differential consequences for playing nicely and biting.

Even though these differential consequences decreased the frequency of the attacks, it wasn't enough. With dangerous behaviors the target frequency is "Zero rate."

The second and third phases of the intervention retained the DRA and replaced the punishment by prevention with punishment by the presentation of an aversive stimulus. During these phases, physical restraint immediately followed aggressive behavior.

**Definition: Concept**

**The differential punishment procedure**
- punishing one set of responses
- and allowing another set of responses to recover.

The second and third phases of the intervention used a more intrusive form of punishment. Being restrained is fairly uncomfortable and aversive. This means that the approval of a special review board is necessary to implement the procedure in school settings. As a result, although these aversive procedures are effective, they are not often used in schools because of all the distractive hurdles you have to go through.

In the end, public schools usually implement differential reinforcement procedures or blends of differential reinforcement and penalty or punishment by the prevention of the presentation of a reinforcer because they pose less ethical, legal, and political concerns (see Chapter 4 for a review on this punishment contingency).

The initial intervention that used reinforcement, may have failed because playing and aggression may have been compatible. They may even belong to different response classes. This means that the reinforcers for playing were different then the reinforcers for aggression. Thus, reinforcing play behaviors might have increased play but it wouldn't have decreased because the reinforcers for aggressions were elsewhere. Because no functional analysis was performed, we can only speculate on the reasons for the failure of the first intervention. In the end, the heavy duty restraint (an unlearned aversive procedure) decreased the aggression, but a functional analysis might have revealed the reinforcers maintaining the aggressive behaviors. Based on the results of a functional analysis, an intervention combining DRA, and penalty or punishment-by-prevention may have taken care of the aggression.

**QUESTIONS (write on opposite page)**

1. **Differential punishment**—Define it and give an example.

2. For Ruth differential reinforcement increased which behaviors?
Behavioral Clinical Psychology: Example of Extinction of Positively Reinforced Behavior

Overcoming Sleeping Problems

Sleeping problems are common among children with mental handicaps as well as with normal children. They may have a hard time falling asleep or they may wake up during the night. Dr. Clements and his colleagues found that 34% of the 155 mentally handicapped children they surveyed showed sleeping problems.

Elsewhere in the country, Dr. Didden and his colleagues found that many of children's sleeping problems could be addressed with extinction of parental attention. This is the story of 4-year-old Joris who had Prader-Willi syndrome and was severely mentally handicapped.

Joris' mother would put him in bed around 8 p.m. each night. Immediately, Joris would cry and call for his mother. After a period of time, his parents would take him out of bed, soothe him, and take him into their bed for the rest of the night.

INTERVENTION AND ANALYSIS

Biological conditions are sometimes responsible for insomnias and they should be ruled out first. Dr. Didden obtained the above information during an interview with Joris' parents. During the course of the interview, he hypothesized that the sleeping problem may be maintained by contingent attention. Thinking that the sleeping problems were maintained by a reinforcement contingency suggested a trait forward intervention. Dr. Didden told Joris's parents to stop the "soothing technique" they were using. Instead, he recommended that they should put Joris in bed by 8 p.m. (his usual bed time), kiss him good night, and only return to the room in the morning, no matter how much he cried and called out.

EXTINCTION PROCEDURE

Although the rule, "put him in bed and don't return," seems simple, it is hard to follow. Parents often want to check on their crying children. That's part of the parents' role. In addition, the temporary stopping of the crying reinforces the soothing behaviors. When parents sing, hug or walk into their...
Behaviors. When parents sing, hug or walk into their child’s bedroom and the aversive stimulus (e.g., crying) stops, they tend to do it again, and again.

We call this a sick social cycle. It’s a cycle because the parents’ escape behaviors (taking Joris out of bed and hugging him) are maintained by the termination of the aversive stimulation (no longer hearing their child’s cry). And the parents’ escape behavior also reinforces their child’s crying.

This cycle is all too common in homes and in schools. Parents and teachers often attend to children to get them to stop disrupting or to start complying. The attention reinforces the inappropriate behavior, and the momentary cessation of the inappropriate behavior reinforces the caretaker’s attending behaviors. This is what clinical psychologists call a “dysfunctional relationship” or a “dysfunctional family.”

**The Sick Social Cycle**

1. Joris cries
2. Caretaker hugs Joris
3. Joris stops crying
4. Caretaker does not hug Joris

Note that the dashed arrow means that the next event follows the preceding one but is not necessarily caused by it.

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**Definition: General Rule**

The sick social cycle

- Aversive behavior frequently occurs at a high rate
- because such behavior is often reinforced
- by producing attention, approval, or compliance by someone else.
- In turn, the temporary relief form that aversive behavior
- reinforces the giving of that attention, approval, or compliance by the other person.

**QUESTION**

1. **Sick social cycle** – define it and give an example with an autistic or a language delayed child. (Use the sick social cycle diagram)
Chapter 6. Extinction

2. Diagram an extinction procedure for crying reinforced by contingent attention.

Before  | Behavior | After

3. Diagram the escape contingency that is maintaining Joris’s parents’ behavior

ESCAPE CONTINGENCY

Before  | Behavior | After

As we have seen in chapter 1, reinforcement increases the frequency of the behavior that immediately precedes it. In this relationship between the consequence and the response, the contingent delivery of the reinforcer is responsible for the increase in the response. In contrast, no reinforcer, no increase. For Joris, no attention, no crying and calling out. That’s the result of a well-implemented extinction procedure. But it’s hard to do.

**Definition: Principle**

**Extinction**

- Stopping the reinforcement or escape contingency
- For a previously reinforced response
- Causes the response frequency to decrease.

As we have seen chapters 4 and 5, you can decrease behavior using a punishment or a penalty procedure. Yet, when you know what reinforcer maintains the behavior, you should probably use extinction because extinction is more socially accepted. Even though with the extinction procedure it may take a bit longer to get rid of the behavior and there is a good chance the caregiver(s) will be inconsistent with the implementation and will end up intermittently reinforcing the undesirable behavior, making it even more persistent.

**Two notes of caution**

First, although Dr. Didden and his colleagues reported a rapid decrease in the crying and calling, extinction usually does not affect the rate of responding as fast as punishment. So, if you are dealing with severe aggression or self-injurious behavior you need to consider the possibility of having to deal with the behavior while it is being extinguished. This may be dangerous.

Second caution, like all effective interventions, the extinction procedure presents some risks when it is misused, even with the best of intentions. Often, the child protests when we stop delivering the habitual reinforcers. The protest may grow into a full-blown tantrum (this is called an extinction burst). At this point some parents and educators may be tempted to stop the extinction procedure. By aborting the extinction procedure, you will reinforce the now-more-vigorous protesting and tantruming, in addition to the other behavior you had tried to decrease. Even worse yet, you may also reinforce the more forceful and inappropriate tantrums versus less forceful tantrums. As a result of aborted attempts with the extinction procedure, parents and educators sometimes say, “we tried extinction and it didn’t work.” We say “Don’t give extinction a try. Do it right. Do it all the way, or don’t do it at all!”

Doing extinction all the way means that you will deal with the behavior as long as it takes for that behavior to decrease to zero. When children have a long history of performing the behavior that you are trying to extinguish, an extinction session may last a
long, long time. For example, Beth worked with Frank, who would pinch his mother's forearms and cheeks. As a result, mom would say, "Don't do that! What do you want?" Then, Frank would point to a toy or to the fridge and mom would diligently fetch the item. Beth decided to "tough it out" and endure Frank's pinching. So, she allowed Frank to pinch her without delivering the usual consequence (getting attention and tangible reinforcers). During the extinction session, Franck played in his room while Beth read a journal. Frank strolled toward her and grabbed the skin of her forearm between the tip of his fingers and his palm. It hurt her a bit, but she kept reading as if nothing happened. Beth did not look at him nor did she talk to him. Frank pinching went on for a few minutes. Then he stopped! Beth sighed in relief. Suddenly, Frank dropped on the floor, in front of her. He kicked his feet widely and shrieked. Beth carried on reading the paper and seemingly ignoring him. The kicking and shrieking lasted and eternity... 25 minutes! But Beth stuck to her guns and carried out the extinction session for as long as it took for the pinching and the other behaviors to decrease. She did it right, by doing it all the way.

A day later, for the second extinction session, Beth took on the role of an observer and encouraged Frank's mom throughout the session. Beth thought that is was very important to get mom on board with the extinction procedure. Beth knew too well how difficult it is to carry out this procedure. She had seen children whining, kicking, spiting, throwing, head banging, vomiting and more during the initial extinction sessions. In reviewing videotaped sessions from her clients, she had seen so many people giving up prematurely during the session. Although Beth always told tutors and parents to keep working (when children tried to leave or stopped the task) or to ignore (when children tried to get attention or tangibles) the inappropriate behavior until it stopped, she often saw people that started to hesitate, slow down the requests or showed concern*. And aborted the session. Usually, they told Beth that they didn't think the behavior was ever going to go down. Then, Beth shows them the tape of Frank's pinching and yelling for 25 minutes. That's usually helpful in understanding that the length of a session is not an issue. Rather, the decrease in the problem behaviors determines the end of the session.

So, remember, if you don't go all the way, then you are occasionally "giving in". This means that you are reinforcing the behavior on an intermittent schedule of reinforcement. And we know from basic and applied research that behaviors that are reinforced once in a while become extremely resistant to extinction. That is, they can maintain in the absence of reinforcers for a long long time. Some call this stubbornness others (we are amongst these) call it resistance to extinction.

General Rule 1
An extinction session is not over until the inappropriate behavior stops or substantially decreases.

QUESTION
1. The principle of extinction—define it and give an everyday example.
2. Compare and contrast extinction and penalty (see chapter 5 for a review on the penalty concept).
3. How will calling someone stubborn may affect your perception, and that of the parents? Why is it better to say resistant to extinction? (see chapter 1 for a review on the problems caused by the use of labels). Give your answer in the box below.

The problem with labels is...

* We are not saying that you should not be concerned, but rather that you should not show your concern during an extinction procedure because you will then attend to the inappropriate behavior that is positively reinforced and/or you will slow down the task if you are doing a working through a tantrum or another escape behavior.
Chapter 6. Extinction

Example of Extinction of Escape in DTT

Tantrum on Demand

"Amy, point to the car." With a swing of her arm Amy knocked a dozen items off the table and onto the floor, including the car. Her tutor, Bob, promptly picked up the items and placed them back on the table.

"Amy, point to the red block." Amy picked up the block and Bob started to say "Good ji..." but Amy threw the wooden block. The hard cube hit Bob on the ridge of his nose. He fought to hold back the tears and to hide any sign of distress. He rapidly picked up the block and asked again, "Amy, point to the red block," at the same time he guided Amy’s hand toward the red block. Bob could feel her trying to pull away, but he held on tightly, and they completed the pointing response together. After five 10-min sessions Amy’s disruptive behaviors decreased to near zero.

Dr. Richman and his colleagues were concerned with Amy’s disruptive behaviors. Twenty-seven year old Amy was a non-verbal autistic resident at the Kennedy Krieger Institute in Baltimore. A brief functional analysis revealed that escape from task demand maintained the screaming and pushing away the task items.

EXTINCTION OF ESCAPE BEHAVIORS

This graph shows that during the functional analysis, Amy did not throw things or scream while she played alone, or in company, and she was not disruptive when people attended to her disruptive behaviors. However, during the "demand" condition, when Bob prompted Amy to complete a task and allowed her to escape when she complained, there was a high frequency of disruptive behaviors. This high frequency of disruptive behaviors during the demand condition, and not during any other condition, tells us that Amy's behavior is maintained by an escape contingency. So, once Dr. Richman determined the cause of the disruptive behaviors with the functional analysis, he designed a functional intervention targeting the escape contingency that supported the disruptive behaviors.

Principles

EXTINCTION BURSTS AND SPONTANEOUS RECOVERY

The extinction process may involve extinction bursts—initial increases in the response frequency and magnitude or intensity. While you shouldn’t be surprised when you see one, extinction bursts occur in only 24% of the extinction-based intervention procedures. For instance, when Bob kept presenting the demands after Amy pushed the items off the table she started to scream and throw objects more often and harder than before the start of the intervention. During the first session Amy disrupted twice as much as in the escape condition during baseline. This initial increase results from the failure of the less aversive behaviors to produce the usual effect (stopping or slowing down the demanding task).

The renewed strength of Amy’s tantrum could have spooked Bob to the point where he gave in and


stopped his demands. Fortunately, Bob worked through the tantrum rather than reinforcing its renewed intensity by withdrawing the demands. Then, with each additional presentation of the demands, Amy's aversive behaviors gradually decreased until they disappeared. Not quite... After a few sessions, the screaming and throwing returned "full force." What happened? Spontaneous recovery. After the initial extinction of Amy's tantrums they reoccurred during the first part of each session that followed the first extinction session. Again, Bob's persistence saved the day and Amy's tantrum extinguished for good.

**Definition: Concept**

**Working Through**
- A procedure used to extinguish
- behaviors previously maintained by
- an escape contingency.
- The teacher presents the task or request
- until the escape behavior disappears.

**General Rule 2**
Work on a behavior that is easy to physically prompt until the escape behavior(s) stops. Then, go back to the procedure you were working on when all that mess started.

**General Rule 3**
When you doing a working through procedure, do not use reinforcers until the escape behavior stops, then work some more and use reinforcers. After 3-5 responses without escape behavior take a short break from the task and come back to it.

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**Principle**

**EXTINCTION FOLLOWING AN ESCAPE CONTINGENCY**

While simple to understand, the working-through procedure is difficult to implement. The bravest teacher or parent may be tempted to give up or to "back off." While this is understandable, it is not good practice. Eventually, the child will escape any request and will be very resistant to repeated demands because of a long history of winning the fight of attrition.

The work-through procedure—extinction of escape—should be thought of as a behavior deceleration procedure that is an alternative to a punishment procedure. During the work-through procedure, the request is presented time and time again until the child complies. Some parents and educators may take offense at these statements. Indeed, they may seem harsh and inconsiderate. But securing a minimal compliance repertoire is essential to learning in structured environments, like schools, and in unstructured environments, like playgrounds.... Some initial hardship may be a lesser evil, considering the potential life-long skill deficits due to missed or escaped learning opportunities. Remember, extinction is often seen as a less aversive and stressful procedure than a plain punishment procedure. This is not quite right; in fact, extinction can be aversive and stressful for both the child and the trainer. And it may require many sessions to achieve the sought after effect. In addition, the problem behavior may return from time to time. This is called spontaneous recovery. When the problem behavior "recovers",

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7 Some parents refer to discrete-trial training as harassment therapy. You can now understand how this unflattering name was earned.
the extinction procedure should be implemented again. This time around, the problem will dissipate quicker and may never occur again as long as it is not gradually reinforced.

The most important thing to remember when you are starting to extinguish a behavior is that, first the frequency of the response will decrease. Next, the duration of the problem behavior will shorten, and finally the intensity will drop. The intervention is not over until the three dimensions of the response (frequency, duration, and intensity) have decreased to zero.

Often, once the frequency and the duration of the response have dropped, the child may have strong (but occasional and brief) tantrums. These outbursts have a strong emotional impact on trainers and parents. They might say that the extinction procedure is not working and stop its implementation. Only making things worst in the end.

QUESTIONS:
1. Does extinction usually feature extinction bursts and spontaneous recovery?
2. What are some risks involved in the implementation of an extinction procedure?
Functional Communication Training in the Home

Softening Ben’s Demands

Jackie dreaded the Sunday outing with Ben, her son. While they sat in the car, Ben would ask Jackie to hold her head sideways. She often went along with the insistent requests. When they’d go to a restaurant, Ben would ask her to sit on the other side of the table and eat her food with a spoon, even when a fork was necessary. So, Jackie would eat her salad with a spoon. After lunch, Ben always asked for a coloring book. Jackie often gave in. While they browsed the bookstore, Ben demanded that Jackie make animal sounds. Hearing cuckoos, the bookstore clerks would give her funny looks. Jackie often felt like a puppet-on-a-string but, as she said, “it appeases Ben.” Lately, if she didn’t comply fast enough, Ben would lash out at furniture, cars, dishes, books, and other breakables.

Ben was a 15-year-old boy diagnosed with mild mental retardation. He also had severe seizures that required the removal of a portion of the left side of his brain.

Jackie’s desire to seek professional advice had increased since Ben started breaking things to get his way. She was referred to Dawn, a local clinical psychologist who specialized in behavioral interventions. After an interview with Jackie, Dawn observed Jackie and Ben in their home and during a Sunday outing. Based on her observations, Dawn guessed that attention and tangible reinforcers were at the source of the problem behavior.

During a home visit, Dawn laid out some rules. She asked Jackie to say, “No, we can’t do this” to Ben’s unreasonable demands. This got her out of doing goofy things. And, Dawn told Ben to ask, “Mom please, play my way” when he wanted his mother to play a game. They agreed that Jackie would play with Ben only when he had a reasonable demand (no goofy requests) and when he asked appropriately—without hitting a car door or kicking a chair.

DIFFERENTIAL REINFORCEMENT

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>Ben has no attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>After</td>
<td>Behavior</td>
<td>Ben makes a reasonable demand</td>
</tr>
<tr>
<td></td>
<td>Extinction</td>
<td>Ben has no attention</td>
</tr>
</tbody>
</table>

Immediately after the start of the intervention Ben stopped his unusual demands and started asking appropriately.

The graph below shows that during the initial baseline and the return to baseline, aggression was high and functional communication responses were not happening.

![Graph showing Functional Communication Training (FCT)](image)

**ANALYSIS OF THE INTERVENTION**

This study illustrates that you can get quick changes even when the student misbehaves for years. A combo of contingencies and rules can get this quick change.

This study also shows how to replace inappropriate requests with more acceptable ones. This is called differential reinforcement of alternative responses because Ben's mother extinguished unreasonable requests and destructive behaviors and reinforced reasonable demands. Then, as the functional communication training (FCT) responses (i.e., requests) increased, the aggressive responses decreased. This effect happened because the destruction of objects served the same function as the vocal request. Thus, when Jackie complied with the destructive behavior (see baseline) Ben aggressed. But, when Jackie complied with appropriate requests only, and ignored the destructive behaviors, aggression disappeared.

This intervention is often called differential reinforcement of alternative behaviors (DRA). That is, the inappropriate requests and aggression stop receiving reinforcement while more reasonable requests\(^2\) (e.g., play thumb-war) contact reinforcers.

Although not reported by Bowman and colleagues, this study may have included more than a reinforcement and an extinction condition. What would happen if Ben kicked the car door while politely asking, "Please, play my game"? In this case, mom would probably withhold the reinforcer. Then, punishment (rather than extinction) is responsible for a decrease in the aggressive behavior. This punishment procedure is called punishment by the prevention of the presentation of a reinforcer. (See Chapter 5 for a review on punishment by the prevention of the presentation of reinforcers).

\(^2\) The appropriateness of the request really depends on where it is occurring. So when Ben asked to play "hide and seek" at home, Jackie usually played with him. However, when Ben asked to play "hide and seek" in a restaurant, Jackie would reply "No, we can't do this."
hungry. Pointing to the juice and saying "juice" are different response topographies.

Children that use spoken language make requests in different ways. For example, some children ask politely and say, "May I have some tapioca, please?" Most children ask more directly, "Can I have the tapioca." Many children use commands like "I want tapioca" or "give me some tapioca." Finally some children (infants or children with language deficits) may just say "tapioca." Regardless, of how children ask, they are naming their reinforcer: the tapioca pudding. Again, we call the difference in the way they ask differences in response topography. Here, unlike pointing and speaking, the difference in topography is small because it involves a few coordinated movements of the vocal cords, the tongue and the larynx!

Again, if you point toward the tapioca pudding because you had no food for a few hours, you are using another response topography. And, your pointing response serves the same function as the speech responses. We say that the different ways you are asking for tapioca pudding are part of the same response class. In other words, different responses that have the same effect or function are said to belong to the same response class.

Besides topography, other response dimensions include force or intensity (e.g., the loudness of speech), latency (e.g., the time between your saying "touch your nose" and your child touching his nose), duration (e.g., the length of time it takes your child to complete a puzzle).

Latency is the time between the presentation of the tapioca pudding and the child saying, "I want the tapioca." The latency between each bite is called the inter-response time. The latency between each discrete trial you deliver is called inter-trial interval.

1. What is the time between a child's correct response and the delivery of the reinforcer?
   a. Duration
   b. Latency
2. What is the length of time it takes your child to consume the reinforcer?
   a. Response duration

---

**Definition: Concept**

**Response topography**
- The sequence (path of movement),
- form,
- or location
- of components of the response
- relative to the response of the body
- or the rest of the speech organs.

**Definition: Concept**

**Latency**
- The time between
- the signal for a response
- and the beginning of the response.

**Definition: Concept**

**Duration**
- The time from
- the beginning
- to the end
- of the response.
Intensity or force refers to the magnitude of the response. For example, intensity can be measured in decibel or joules. Sometimes, children labeled with autism talk in an inaudible voice. Thus, an intervention differentially reinforcing loud speech addresses the intensity of the response.

**Definition: Concept**

**Intensity**
- The level of energy
- of the response.

Topography, latency, intensity, duration are examples of response dimensions. They are physical properties of the response. For example, when Sam engages in self-injurious behavior (SIB) he bangs his head (topography) against hard surfaces a few seconds after the nurse walks in (latency) and the wall shakes (intensity).

**QUESTIONS**

3. Give an example of the following concepts
   a. response dimension
   b. response duration
   c. response latency
   d. response topography

4. Give an example of responses that vary across the following dimensions:
   a. topography
   b. force
   c. duration
   d. latency

5. Give an example of responses that differ along various dimensions but have the same functions

---

**THE PROCEDURE OF DIFFERENTIAL REINFORCEMENT**

With differential reinforcement, we can reinforce a response along all the different dimensions. We can reinforce one topography and extinguish another one. For example, we can reinforce speaking and extinguish pointing.

**DIFFERENTIAL REINFORCEMENT OF RESPONSE TOPOGRAPHY**

**Reinforcement**

Before
Sam has no juice

After
Sam has juice

Before
Sam points to the juice

After
Sam has no juice

**Extinction**

We can also reinforce short duration and extinguish long duration. For example, we can reinforce completing a puzzle in 10 seconds and extinguish the response that takes longer than 10 seconds.

**DIFFERENTIAL REINFORCEMENT OF SHORT RESPONSE DURATION**

**Reinforcement**

Before
Sam has no praise

After
Sam has praise

Before
Sam completes the puzzle in less than 10 sec

After
Sam has no praise

Extinction

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We can reinforce short response latency and extinguish longer response latency. For example, we can reinforce sitting when a child sits immediately after being instructed to do so, while extinguishing sitting responses that occur after a few seconds of the instruction.

DIFFERENTIAL REINFORCEMENT OF SHORT RESPONSE LATENCY

![Diagram showing reinforcement and extinction scenarios]

Finally, we can reinforce higher intensity while extinguishing lower intensity of a specific response. For example, we can reinforce loud speech and extinguish murmurs.

DIFFERENTIAL REINFORCEMENT OF LOUD RESPONSE INTENSITY

![Diagram showing reinforcement and extinction scenarios]

Notes of Caution: Extinction is an essential component of the differential reinforcement procedure. If you reinforce the alternative behavior and you do not terminate the reinforcement contingency for the problem behavior, you increase the frequency of the problem behavior. Dr. David Wacker and his colleagues showed that the frequency of handbiting increased when extinction was omitted from the functional communication training. Melissa Shirley and her colleagues found that FCT was neither effective in teaching new alternative manual signs nor reducing SIB until the extinction component was added for the SIB.

Example of Differential Reinforcement in Incidental Teaching

Learning Language during Playtime with a Little Help from our Friends

The free-play period lasted from 11:00 to 11:45 a.m. During this time Adam played with wooden blocks or with trucks. He usually played alone. Then, Beth Jantor—who had been supervising Adam's in-home program—designed an intervention to increase Adam's use of language and his interactions with the normally developing children in his classroom.


Beth taught Adam's peers to deliver an incidental teaching interaction.

As Adam reached for the fire-truck, Jed, his peer tutor picked up the fire-truck and said "say truck." Adam, immediately said, "duck." Jed repeated "say truck." This time Jed emphasized the "tr" sound at the beginning of truck. Adam repeated "truck," and Jed handed him the red fire-truck.

Finally, Jed required Adam to ask for the toy with a full sentence. For example, Jed prompted Adam to ask "I want the block" and stopped reinforcing the telegraphic ways to ask for toys. Soon Adam asked in full sentences, with no prompts.

As Adam learned to ask for his favorite toys with one-word requests, Jed taught him to ask with two words.

Adam sat on the floor of the playroom. He was building a bridge with the large wooden blocks. Jed held one block in front of Adam's face. He said "Adam, say want block." Adam repeated "want block" and he finished his construction with the last block Jed handed to him.

With Beth's watchful supervision, Jed reinforced increasingly more complex elaborations and extinguishing shorter ways to request for toys.

Incidental teaching is an effective way to teach language because the interaction—or the learning unit—is focusing on what the child wants. So, when a child reaches for a truck, or says "truck" or "want truck," he is calling his reinforcer. Thus,
incidental teaching procedures are effective ways to teach language because they usually have effective reinforcers built-in the interactions.

As we said in chapter 1, incidental teaching procedures are led by the learner and the number of trials is usually lower than the number of trial you could get in a mass discrete-trial setting, where the interaction is led by the teacher. In the end, learning should take place in both settings, and both have their pros and cons. Discrete-trial training and incidental teaching are not incompatible. Teachers may conduct discrete-trial programs and use incidental teaching procedures during breaks, lunch and other daily activities. This may prove to be a great practice to promote stimulus and response generalization.

DIFFERENCES IN DIFFERENTIAL REINFORCEMENT PROCEDURES

The formal or procedural descriptions of the different types of differential reinforcement tell about the contingency in effect for the presence or the absence of the target behavior. Here is a list of the procedural variation of differential reinforcement.

Differential Reinforcement of Alternative Behavior (DRA)—This procedure consists of reinforcing responses that are different from, but not necessarily incompatible with, the response you are trying to reduce. Thus, the response dimension that we are differentially reinforcing is the topography of the response. For example, when a child screams and tries to run away from the work table, we typically teach that child to say "I want a break" as an alternative to yelling and running off.

Differential Reinforcement of Incompatible Behaviors (DRI)—This procedure is similar to the DRA procedure. However, the alternative response must also be incompatible with the response targeted for reduction. This means that when the child performs the incompatible response he will not be able to engage in the problem behavior. For example, if Sam hits his teacher while they are sitting at the work table, we could teach him to sit on his hands. This would prevent teacher-punching. But, DRI interventions are based on the selection of topographically exclusive behaviors, and this approach may be outdated because it omits the function of the response.

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DIFFERENTIAL REINFORCEMENT OF INCOMPATIBLE BEHAVIORS

Differential Reinforcement of Low Rates of Responding (DRL)—Sometimes, we don't want to decrease the response to zero rate. Rather, we want to increase the time between the instances of the behavior. Low rates of behavior are desirable when we eat. Eating slowly insures that we chew our food (which facilitates digestion) and that we don't cut the appetite of other guests. With eating, DRL would consist of reinforcing taking bites that followed the preceding bite by at least some minimum delay. Usually, with DRL the response that is selected for reduction is also blocked.

DIFFERENTIAL REINFORCEMENT OF LOW RATE BEHAVIORS

Differential Reinforcement of Other Behaviors (DRO)—DRO is not a differential reinforcement contingency. It is a type of punishment, where the child does not get the reinforcer if the target behavior occurs during a specified period of time. Let's forget about the term DRO. (We addressed DRO in chapter 5)

THE PROCEDURE OF SHAPING WITH REINFORCEMENT

Shaping with reinforcement and differential reinforcement are similar procedures. In fact, shaping is a special type of differential reinforcement. Shaping involves successive instances of differential reinforcement of responses that more and more closely resemble the desired response. In teaching children with developmental disabilities we usually shape response along the same response dimension when the terminal and desired dimension does occur at all before the intervention. For example, Stan taught Melody proper sitting. First, Stan precisely defined the terminal response, the goal of the intervention.

Definition: Concept
Terminal behavior
- Behavior not in the repertoire
- or not occurring at the desired rate;
- the goal of the intervention.

Then, Stan started to reinforce Melody’s standing one foot away with her back to the chair, the initial behavior. Unlike the terminal behavior, the initial behavior must occur with a minimal frequency or be more likely to occur without struggle when it is prompted. Stan reinforced standing back to the chair until the frequency increased. Often the first phase of the intervention involves prompting to get the behavior to occur at a high frequency.

Definition: Concept
Initial behavior
- Behavior that resembles
- the terminal behavior
- along some meaningful dimension and
- occurs with at least a minimal frequency.
Then, Stan chose a new behavior. He differentially reinforced this behavior until it occurred frequently, while extinguishing standing next to the chair without touching it.

Next, Stan differentially reinforced sitting responses where Melody's behind rested on the chair and her back got closer and closer to the back panel, while he extinguished sitting on the edge of the chair, the **intermediate behavior**.

**Definition: Concept**

**Intermediate behavior**
- Behavior that more closely approximates
- the terminal behavior.

The initial and intermediate behaviors were prerequisites for the next behavior in the chain. For instance, standing close to the chair was a prerequisite for, sitting on the edge of the chair; and sitting on the edge of the chair was a prerequisite to fully sitting in the chair. Stan reinforced *successive approximations* of sitting. He *shaped* the terminal behavior.

**SHAPING WITH REINFORCEMENT**

![Diagram of shaping with reinforcement](image)

**Summing up**: Use the procedure of shaping with reinforcement when you want to bring about new responses. To shape with reinforcer, you must identify an initial behavior that resembles the terminal behavior along some meaningful dimension. Reinforce the initial behavior until it occurs frequently or reliably, then abandon that response and differentially reinforce a response that more closely approximates the terminal behavior. Continue this procedure until the terminal behavior—target behavior—occurs reliably.

**Classroom Application of the Shaping Procedure for Teaching Word Imitation**

As we have just seen, shaping consists of reinforcing responses that are closer to the terminal behavior, while providing less reinforcement for responses that are further from the terminal behavior.

Deciding what to reinforce and what to stop reinforcing, as approximations get closer and closer to the target behavior, is often tricky business. Let’s review a strategy that you might use in shaping speech.

**Shaping Step 1.** Give a preferred reinforcer for any response that resembles the terminal response. Once that behavior is consistent at that reinforcer level move to step 2.

**Shaping Step 2.** Only give preferred reinforcer for a response that is closer to the terminal response. For responses that were reinforced with the preferred reinforcer during step 1 use a less preferred reinforcer intermittently. This is a difficult task because it requires your own judgment, so be careful. Once you have received a closer approximation of the terminal behavior consistently, move on to the next step.

**Shaping Step 3.** Now you will give the preferred reinforcer for a response that is even closer to the terminal response. Stop reinforcing re-

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Echoic behavior is the technical term for word imitation. With echoic behavior the verbal behavior of the imitator is under control of the verbal behavior of the model and match the behavior of the model along all response dimensions.

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response that were reinforced during step 1, and reinforce Step 2 response with less preferred and intermittent reinforcement.

Although we outlined three steps, you might have many more steps depending on the complexity of the behavior you are teaching. In any case, you just need to remember that each time you move up a step you should decrease or stop delivering reinforcers for responses that were reinforced during previous steps.

Let's use an example to clarify these guidelines:

Let say you want to teach your child to say "Mommy" after hearing you say "Mommy." For each shaping step, model saying "Mommy" and reinforce the approximations specific to that step.

|   | Initial "mmmm" | Best reinforcer until consistent. | Intermediate 1 "mamaaahh" | Best reinforcer until consistent. | Intermediate 1 "mmmm" | Best reinforcer until consistent. | Intermediate 2 "maamma" | Best reinforcer until consistent. | Intermediate 1 "mamaaahh" | Best reinforcer until consistent. | Intermediate 1 "mamaaahh" | Best reinforcer until consistent. | Initial "mmmm" | No reinforcement | Terminal "Mommy" | Best reinforcer until consistent. | Intermediate 2 "maamma" | Best reinforcer occasionally. | Intermediate 1 "mamaaahh" | Best reinforcer until consistent. | Initial "mmmm" | No reinforcement |
| 1 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 2 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

In times of slow progress, you might have to move back to a previous step so that intermediate or initial response do not extinguish. But don't despair. Consistency in implementing the procedure and the number of trials you implement every day, are the key to any effective training!

**QUESTIONS**

1. Define and give an example of the following concepts:
   a. terminal behavior
   b. intermediate behavior
   c. initial behavior

2. **Shaping with reinforcement**—state this principle and give an example. In your example, include:
   a. the terminal behavior
   b. the initial behavior
   c. the intermediate behavior
   d. the response dimensions
   e. the reinforcer
   f. the results

**Example of a mixed differential punishment and reinforcement procedure**

**Requesting the removal of unwanted stimuli: Learning to say "No, thanks"**

Jimmy's preferences for toys and food changed frequently during the teaching sessions and throughout the day. Sometimes, rather than running a reinforcer assessment with many objects on the table (see chapter 1 for a review of the reinforcer assessment procedure) Jimmy's tutors presented only one or two items and asked him to pick one of the items. Sometimes, Jimmy pointed or named the item he wanted. More often, Jimmy would shove the toy or the food out of the way and whimper. As a result, the tutors would select one or two different objects and ask Jimmy what he wanted again.

While we want to identify reinforcers, we don't want reinforce shoving and whimpering by removing the unwanted stimuli (the toys and food). We implemented a procedure that combined differential punishment of the inappropriate behavior and differential reinforcement of an alternative behavior.

Every time Jimmy shoved the stimulus out of the way or whimpered, instead of removing the

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stimulus, the tutor moved the toy or he food closer until it stood a few inches from his face. Then, the tutor said "No thanks" and removed the stimulus after Jimmy repeated "No, thanks." As the tutors faded the prompt (more details on prompt fading in chapter 9) Jimmy learned to say "No thanks" when he wanted an item removed from his sight.

The combination of contingencies of reinforcement and punishment improves the learning of an alternative response when compared to a simple differential reinforcement procedure because the punishment procedure decreases the inappropriate behavior while the differential reinforcement also extinguished the same inappropriate behavior and reinforce the alternative response.

When children are showing escape behaviors during the initial stages of treatment, the treatment places too many demands too soon.

In other words, the new program started too abruptly. Too many hours, not enough play instead of a gradual build up.

In addition, children showing escape behaviors after a few months in treatment may indicate that the procedures are too difficult or the procedures are adequate for the child, but the trainers are not delivering enough reinforcers during the course of a session. As a result, the child wants to leave the worktable or runs away from the trainer.

Frequent reinforcement decreases children's motivation to escape. Do balance the access the reinforcers so that there are as frequent within the session as they are in the child's natural environment. You might also reinforce good attending in general, even when your child is not very successful with the specific procedures.
It was ten more minutes 'til lunchtime. A continuous roar escaped from Galen's empty stomach. Galen looked at Stan Gelium, a graduate student completing his practicum requirements at the Big School for Developmental Disabilities. Stan pushed a small wooden block through a hole large enough for the block to drop in a bucket and said, "Galen, do this." Twenty-five year old wheelchair bound Galen was diagnosed with profound mental retardation. Galen followed simple instructions and could articulate a few requests in short sentences. In addition to his gross motor disability, Galen had a hard time with fine motor tasks. Every time Galen fitted a block through the small hole, the block dropped in the bucket and Stan placed a potato chip on the comer of the work-desk. Galen would rapidly pick up the chip and eat it. Meanwhile Stan recorded the occurrence of the response on his data sheet. Stan recalled Galen's laborious start with the "block-in-bucket" procedure. In fact, during some sessions, not a single block would drop in the bucket. At that time, Galen couldn't (or wouldn't) place a single block through the hoop.

For the next hour, Stan graphed feverishly Galen’s performance. Except this time, he graphed the morning sessions first and then the afternoon session next. This is what he found:

The intervention Stan and Marianne developed was simple. Galen ate small lunches and ate the difference of what he used to eat during lunch during the discrete trial sessions. Contingent on correct response and good behavior. This way Galen maintained a good diet.

QUESTION
1. Can you guess what’s responsible for the difference in performance during a.m. and p.m.? (Don’t be shy. Write your guess in the space below)

ANALYSIS OF THE ANALYSIS
Galen’s performance fluctuated throughout the day. The important variable controlling the fluctuation happened around lunchtime. We infer this because Galen’s performance seemed to decrease after lunch.
Stan noted that briefly before lunch Galen had not eaten for at least four hours. In this context, Stan thought that this was equivalent to being food deprived. In effect, the time between Galen’s breakfast and his lunch was similar to a four-hour period without eating.

To tease out the effect of eating lunch Stan had to separate the data points obtained before lunch from the data points obtained after lunch. The differentiation (i.e., the visible difference in frequency) between the two sets of data points (before and after lunch) suggested that Galen worked better when he hadn’t eaten for awhile.

Stan’s data analysis revealed one of the two effects associated with satiation. This effect alters the performance of a previously learned behavior.

Concepts
DEPRIVATION AND SATIATION
Galen and Stan’s story illustrated one of the two effects of deprivation, i.e., its uncanny ability to increase the frequency of all the behaviors that have been reinforced with the deprived reinforcer. Being hungry (i.e., being food deprived) helped Galen in the following way:

- Food deprivation increased the frequency of Galen’s performance of the behavior he had previously learned with food as a reinforcer. In Galen’s case, more blocks are dropping in the bucket. He is behaving faster.

In addition, being hungry (i.e., food deprived) also helped Galen in yet another way:

- Food deprivation improved Galen’s learning of new behaviors with food reinforcers. We could have taught Galen to ask for more blocks or more food.

2 Here we are not talking about deprivation as if someone withheld food from anyone. We are simply referring to a period of time where no food was ingested.

3 By deprivation we only mean a temporary absence of the stimulus or event. In our context, deprivation does not refer to a history of neglect that may, in some extreme cases, have an effect on the physical development of children.
However, the learning effect is not illustrated in Galen's story because he had already learned the behavior of dropping the block in the bucket and no new responses were taught.

**Definition: Principle**

**Deprivation**
- Not contacting or consuming a reinforcer
- Increases relevant learning and performance.

---

**Discrete-Trial Application of Deprivation and Satiation**

Let's use the concept of deprivation and satiation in a typical teaching session. Because the teacher used food reinforcers (unlearned reinforcer, see chapter 2 for a review), the session took place when Galen was hungry (a little food deprived). Even this minimal deprivation makes it more likely that the food will function as a reinforcer.

### DEPRIVATION

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galen has no food</td>
<td>Galen drops block in bucket</td>
<td>Galen has food</td>
</tr>
</tbody>
</table>

Deprivation

| Galen has had no food in 4-hours |

### SATIATION

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galen has no food</td>
<td>Galen drops block in bucket</td>
<td>Galen has food</td>
</tr>
</tbody>
</table>

Satiation

---

The above diagram is relevant to Galen's performance, not his learning, because previously he had learned the block-dropping behavior. Now let's look at a learning session rather than a performance session.

The *learning* session consists of teaching a new response, for example, Galen's touching his ear on Stan's request. So if Galen were a little hungry he might quickly learn to touch his ear with food as a reinforcer. But if he were satiated, maybe right after he had lunch, he might be pretty slow in learning to touch his ear.

We can find out how well Galen learned the new behavior during the training day by asking him to touch his ear *a day later*, on the testing day. Suppose he is very hungry on the testing day, but suppose he had not been hungry on the training day. Then, he would not have learned the ear-touching response on the training day when he was food satiated. So now, on the testing day, he won't be able to perform the response no matter how hungry or food deprived he was. This leads us to say that when there is no learning there can be no performing.

2. Please complete the following diagram:

---

*We have boxed the three-contingencies and the procedure used to achieve the state of deprivation and satiation to indicate that the establishing operation has an effect on all the components of the three-term contingency. Note that the EO also affects the evocative power of the $S^t$. But we are not addressing the $S^t$ here....*
Of course, the corollary to the principle deprivation is the principle of satiation. Satiation has an opposite effect to that of deprivation. For example, after a larger meal, both performance and learning reinforced with food will be poor.

Note that the effects of satiation (say-shun) are temporary. But, soon hunger returns and evokes the behaviors reinforced with food (looking for snacks or eating utensils, asking for food...), as food becomes a reinforcer again.

QUESTIONS

1. The principle of deprivation—define it and give an example.

2. The principle of satiation—define it and give an example.

3. What is the decrease rate of blocks dropping in the bucket an example of? __________

4. What is the increased value of food reinforcer an example of? __________

5. In the story, Galen's deprivation shows itself in an increase in? Learning / Performance (circle)

Application of the Establishing Operation to Verbal Behavior

A good learning procedure always involves the relevant establishing operations. For example, you might have to limit access to food prior to the session, or you might have to prevent access to a toy. Deprivation is an establishing operation that will make the food an effective reinforcer and/or will create the occasion for the request (also called mand) "food".

When you are teaching the mand for candy you have to make sure that the child has not had candy for a while and has no candy in his hand.

In the case of edibles, we must deprived the organism for some time before it can function as a reinforcer (for him to want it—to be mentalistic) and in all cases it must be withheld form the organism, in a sense not for it to be a reinforcer, but for there to be a need to respond. With toys no deprivation is required. Now that the child wants the toy, we have to make sure that they don't have it in order for them to logically do something to get it. Taking the toy away doesn't make the toy more desirable.

You have probably noticed that the speed of a child's learning shows much variability from day to day, hour to hour, and even minute to minute. And you have also probably noticed that the reliability of his performance of what he as learned also varies greatly from time to time. Similarly, some of this variation may be due to changing EOs as time goes on. One way to decrease the variation in children's learning and performance is to make sure that a relevant establishing operations is in effect, for example, to make sure the child has gone for a while without candy, if we are using candy as the reinforcer.

The following examples of verbal responses and their specific establishing operations may help you generate strategies for contriving and manipulating establishing operations. However, the establishing operations we propose in the table below are only examples. So, the specific establishing operation may vary across children in the sense that you may teach the word "push" with a swing or with a bicycle, depending on the child's preferences or what is available to you at the moment. We will give you more information on the details of teaching the target responses in our chapter on verbal behavior (Chapter 13).
TARGET RESPONSE | POSSIBLE ESTABLISHING OPERATION
---|---
"Cookie" or any food items | No cookie or other food for 2 hours and small bites during the session.
Juice or any drink | No liquids 1 hours before the session and short sips during the sessions.
Car or any toy | When the child is playing with a car, move the car away.
Down | Lock the child in his/her high chair or hold him/her at the top of a slide.
Up or Jump | Pick up the child rapidly and put him/her back down.
Shoe or any garments | Take the child's shoe off
Push | While in the swing pull the child all the way up and hold.
Tickle | Tickle and stop
Play, TV, or video | Turn off the tape-player, the TV or hold a video tape out of reach.

EFFECTS OF THE ESTABLISHING OPERATION ON LEARNING AND PERFORMANCE.

We understand that it is sometimes difficult to keep track of the effects of establishing operations. Sometimes they improve performance once the behavior is learned and sometimes they improve the learning of new behaviors. They may affect performance of known responses or learning of new ones... What a mess. We hope that the table below will help you appreciate the subtle effects of satiation and deprivation on new behaviors and previously learned behaviors.

<table>
<thead>
<tr>
<th>concept</th>
<th>THE ESTABLISHING OPERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>satiation and deprivation are procedures that affect learning and performance. Both satiation and deprivation are common examples of establishing operations (EO). So, the establishing operation also affects learning and performance. We will discuss other types of establishing operations later (e.g., aversive stimulation, sleep).</td>
<td></td>
</tr>
</tbody>
</table>

QUESTIONS

1. Establishing Operation—define it.
2. Give two examples of deprivation as an establishing operation, showing how it affects both learning and performance with your child.
3. Do the same for satiation.

Concept: Procedure
Establishing Operation
- a procedure that momentarily affects learning and performance
- with respect to a particular reinforcer or aversive condition.
Example of Establishing Operation in Behavioral Clinical Psychology

Enter the Sandman

Usually, children with sleeping problems have either problems falling asleep or they fall asleep but keep waking up throughout the night.

Not only did Ann have difficulties falling asleep but she also frequently woke up during the night. "When morning comes, Ann falls asleep; and Bud and I are exhausted," said Ann's mother, Marie. The girl's parents, Marie and Bud, had recently used medication with Ann (Halcyon and chloral hydrate) but it didn't cause her to fall asleep more quickly nor prevented her from waking up in the middle of the night and traipsing to her parents' bed.

During their first meeting at the Behavioral Clinic, Dawn told Marie and Bud to keep track of Ann's daytime sleep. First, they collected a little baseline data to see if the intervention would have an effect. So, they kept a detailed account of Ann's naps. When Ann fell asleep during the day, they let her sleep and woke her up only for meals, therapy sessions and daily care. At night, they would put Ann in bed by 8 p.m., and she would cry for awhile. Later, she would stroll out of her room and Bud or Marie would tell her to get back to bed. They also made a graph of the number of night awakenings.

After one week of careful observation, Marie and Bud returned to the Behavioral Clinic and reviewed the intervention with Dawn.

Marie entered Dawn's office looking haggard and sleep deprived....

Dawn: Show me your graphs and tell me what you have found.

Marie: She got out of bed 10 times this week! From 8 p.m. to 6 a.m! On four nights, she was up all night! She also ended up in our bed EVERY night.

Dawn: At what time is she usually falling asleep?

Bud: Around 10:30 p.m.

Dawn: It looks like she is sleeping so much during the day that she is not sufficiently sleepy (sleep deprived) when she goes to bed at night. It's important that you don't let her dose off in front of the TV or nap during the day. Now, here is the secret weapon: if Ann is not asleep 15 minutes after you put her in bed, take her out of bed and keep her awake for one hour.

For a start, tonight don't put her in bed before 11:00 p.m. Then, if she falls asleep quickly, after 10 or 15 minutes, move her bedtime to 10:30 p.m. tomorrow night.

Marie: Are you saying that every night that she falls asleep quickly after we tuck her in we should advance the following night bed time by 30 minutes?

Dawn: Exactly!

Bud: What should we do while she is out of bed for an hour?

Dawn: Let her chose her activities. Don't give her too much stimulation; just make sure that she doesn't fall asleep during that time. When the hour is up, put her in bed and give her 15 minutes to fall asleep.

Marie: We could stay up the whole night!

Dawn: Maybe, at first. But Ann already wakes you up very often. This intervention will help all of you get more sleep in the long run.

The first week of the intervention Ann woke up 4 times (that's half of the baseline frequency) and also she would rapidly fall back to sleep. The night awakening decreased steadily. Dawn scheduled an appointment with Marie and Bud one-year later. They had nothing to report. All

was well and the sandman came early every night for Ann, Bud, and Marie.6

**ANALYSIS OF THE INTERVENTION**7

Before the intervention, Ann would nap throughout the day. So, on a typical day, Ann's daytime naps contributed to her poor night sleep (performance). At night, she often got out of bed and remained awake for most of the night although her parents would take her into bed with them. These are facts.

**SATIATION**8

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann has no attention</td>
<td>Ann cries or goes in parents' room</td>
<td>Ann has attention</td>
</tr>
</tbody>
</table>

By keeping Ann awake during the day and keeping her awake until late, they were insuring that she would be sleepy when she went to bed. In other words, they were insuring the being awake would be fairly aversive (its aversive to be awake when you are sleepy). By doing so, they increased the likelihood that Ann would do the *presleep* behaviors that allow her to fall asleep. Thereby escaping the aversiveness of being awake (this presleep behaviors include, lying down and closing her eyes). As a part of the same intervention package Dawn added a 1-hour sleep deprivation if Ann failed to fall asleep.

**DEPRIVATION**9

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ann has bed</td>
<td>Ann cries or goes in parents' room</td>
<td>Ann has no bed</td>
</tr>
</tbody>
</table>

With Dawn's help Marie and Bud used a basic principle of behavior called *Establishing Operation*. The *Establishing Operation*—a procedure that momentarily affects learning and performance with respect to a particular reinforcer or an aversive stimulus. With Ann the establishing operation was sleep deprivation. Keeping Ann awake makes it more likely that she would fall asleep as soon as she went to bed. And it also made social stimuli less valuable. For instance, you can imagine that getting attention or holding a conversation loose some of its appeal when you are sleepy. Actually, if you are very sleepy a drawn out social interaction may become an aversive event, even though you usually are a social butterfly.

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6 Many parents read, sing, or softly talk to their child as part of a "bedtime ritual." These behaviors are perfectly compatible with the present intervention, as they would facilitate the monitoring of sleep onset.

7 Students that just learned of the concept of establishing operation are often confused with its two distinct effects on learning and performance. In an attempt to dissipate this common confusion we made parenthetical notes after each example of the EO effect on learning or performance throughout this section.

8 Here sleep deprivation is related to the reinforcing effectiveness of the parental attention. When Ann naps during the day, attention is more reinforcing at night. Note that the term satiation is better fitted for food and drinks than for sleeping. So we are using the term loosely. We only mean that Ann was able to sleep before night time and that this operation decreased the reinforcing effectiveness of attention.

9 This is really a penalty contingency that has an effect on Ann's sleep because it manipulates establishing operations. Being kept awake for an hour increases the reinforcing effectiveness of lying in bed and of the behaviors that previously preceded getting ready for bed.
This intervention also broke a sick cycle. That is, Ann cries, parents take Ann in their bed, Ann stops crying. With the sick social cycle, parental attention reinforces Ann's crying and the momentary cessation of the crying reinforces parental attending behaviors.

**The Sick Social Cycle**

- Sue and Bud ask Ann to go to her bed.
- Sue and Bud take Ann in their bed.
- Ann does not cry.

QUESTIONS

1. What happened after Ann was kept awake for an additional hour? (hint: two EO effects and one punishment effect)
2. What variable decreased the value of attention? Sleep satiation / Sleep deprivation (circle one).
3. The decreased value of attention illustrates an EO effect on? Learning / Performance.
4. The increase in crying illustrates an EO effect on? Learning / Performance.
Forty-year-old Lenny had mental retardation, cerebral palsy\(^2\) and hypothyroidism\(^3\). His language repertoire was tiny. Lenny could follow simple commands and used a few gestures. Dan, Lenny’s roommate, was a 23-year-old man with profound mental retardation, cerebral palsy, and growth retardation. Dan followed a few simple commands and made the gesture for food and drinks with the help of a staff member. Dan also required total assistance with self-help skills.

During a fire alarm inspection the local fire chief recommended that the residents learned to walk out of the house within 2 minutes of the sound of the fire alarm. As he put it, “That fancy alarm won’t do no good, if your boys don’t know it means ‘time to go’.” Although Dan and Lenny had problems walking, the Good Neighbor Group Home staff was confident that Dan and Lenny could walk out of the house within 2 minutes, but it never happened.

The smoke detector activated the bell. The distinct high frequency sound raced through the house. The television was on but the alarm masked its sound. Lenny calmly sat in the living room, unaware of the possibility of imminent danger. In a few minutes, the fire could have engulfed the house.

Fire drills could prevent this catastrophic scenario. One such house drill was in progress at the Good Neighbor Group Home.

Ten seconds after the alarm started ringing, Beth Jantor and Bridget, a group home staff, ran into in the living room. “Com’on guys, stand up and get out!” Lenny got up. Dan remained seated. Bridget gestured Dan to stand up. He didn’t move so she tapped his elbow. Because Dan did not stand up she pulled him to his feet.

Once both roommates were standing up, Beth and Bridget left the room and waited in hiding to see whether Dan and Lenny would walk out of the house independently.

Dan and Lenny slowly shuffle toward the front door, out the house, and stopped by the flowerpot 20 yards from the porch.

Immediately, Beth and Bridget ran out, showering the two men with praise and handing out their favorite things: Two remote-controlled fire trucks.

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\(^2\) CP is a neuromuscular disability, maybe due to brain damage at birth, that results in a lack of muscular coordination (e.g., speech or gross motor movements).

\(^3\) An insufficient activity of the thyroid gland that results in a reduced rate of metabolism, lethargy and weight increase.
ANALYSIS OF THE INTERVENTION

This intervention reinforced a walking-out-of-the-house response in the presence of the fire alarm. Each time Lenny and Dan walked out of the house with no prompts they received a reinforcer. As a result, in the presence of the fire alarm Lenny and Dan's walking responses will occur more frequently.

**Discrimination Training**

<table>
<thead>
<tr>
<th>Discriminative stimulus ($S^D$)</th>
<th>Discriminative stimulus ($S^A$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A stimulus in the presence of which a particular response will be reinforced or punished.</em></td>
<td><em>A stimulus in the presence of which a particular response will not be reinforced or punished.</em></td>
</tr>
</tbody>
</table>

It is crucial to understand that this definition of $S^D$ implies that there is an $S^A$ in the presence of which that response will less frequently be reinforced or punished.

Notice the following properties of our diagram of discriminative contingencies.

- They are really two contingencies, an $S^D$ and an $S^A$-contingency.
- The before condition is the same for both contingencies.
- The response is the same for both contingencies.
- The $S^A$ contingency is always extinction or recovery.

Beth and Bridget used a **discrimination training procedure**. This procedure involves reinforcing one behavior in the presence of one stimulus, $S^D$ (the sound of the fire alarm), and extinguishing the behavior in the presence of another stimulus, $S^A$ (the absence of the fire alarm). When the response finally occurs more frequently in the presence of the $S^D$ than the $S^A$ we say *stimulus control* or *stimulus discrimination* has occurred. This is what happened with Beth's **discrimination training procedure**. Stimulus control began to develop until it was perfect. At the end of the training, Dan and Lenny always hurried out of the house at the sound of the fire alarm.
Definition: Concept

Prompt

- A supplemental stimulus
- that raises the probability of a correct response.

Beth and Bridget also used a prompt hierarchy. **Hierarchy** means that the prompts are gradually more intrusive as the learner fails to respond with a less intrusive prompt. Usually, the hierarchy escalates from a verbal or auditory prompt (e.g., "stand up"), to a gestural or visual prompt (e.g., gesturing "up" by moving one's hand and arm or modeling going outside), light or partial physical prompt (e.g., one touch or gentle push on the elbow or shoulder blade), and a full physical prompt (the least amount of physical contact necessary to get an individual to stand up).

**Definition: Principle**

The prompt hierarchy

- A teacher raises the probability of a correct response
- by using prompts that are
- gradually more intrusive
- First, the teacher uses a verbal/auditory prompt.
- Second, the teacher uses a gestural/visual prompt.
- Third, the teacher uses a light/partial physical prompt.
- Finally, the teacher uses a full physical prompt, if
- the student did not respond to less intrusive prompts

This intervention establishes the fire alarm as a **discriminative stimulus**—a stimulus in the presence of which a particular response will be reinforced. This is an unusual function because a fire alarm, usually functions as a **warning stimulus**—a stimulus that precedes an aversive condition and thus becomes a learned aversive stimulus. This also means that the onset of the warning stimulus establishes its offset as a form of reinforcement. Usually, when the fire alarms rings any behavior that results in removal (e.g., flicking the switch in the case of a "false alarm" or running out of the house if need be) will increase in frequency. This is not the case with the current intervention.

**QUESTIONS**

1. Define the following concepts and diagram an example:
   a. discrimination training procedure
   b. $S^D$
   c. $S^A$

2. **Stimulus discrimination**—State the principle and give an example, showing how it illustrates the principle.

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4 The warning stimulus also establishes its own removal as a reinforcement contingency. That is, after its onset, the stopping or removal of the warning stimulus will reinforce the response that preceded it.
AN ALTERNATIVE TO DISCRIMINATION TRAINING: THE CONDITIONED ESTABLISHING OPERATION

As we said earlier the fire alarm usually functions as a warning stimulus—a learned aversive stimulus whose removal functions as a form of reinforcement. How is the alarm becoming a learned aversive stimulus? With verbal people, the verbal pairing between the word alarm and fire is sufficient to cause the sound of the alarm to become an aversive condition. In other words, if you tell a child "the alarm means that a fire is near," the child will probably respond to the sound of the alarm as if it had been paired with real fire. We may call this an analogue to pairing (see Chapter 8 for a review of learned establishing operation).

Some people's language deficit prevents this analogue pairing from occurring. Must you use a real pairing? Well, not quite. Burning Dan and Lenny to teaching them to exit the house at the sound of the alarm would be unethical. To bring the response of exiting under control of the sound of the alarm, you could either pair the alarm with a middle aversive stimulus or reinforce walking out in the presence of the alarm. For example, the former intervention may consist of, spraying Dan and Lenny with water mist as long as they remain in the house while the alarm is on. However, such interventions meet relatively low social approval. At first, Dan and Lenny will exit the house to escape the aversive water spay. After awhile the onset of the alarm may function as a warning stimulus (see chapter 8), warning Dan and Lenny that the aversive water mist is about to come on.

Under these purely hypothetical conditions the fire alarm will become a learned aversive condition. This means that walking outside will be more reinforcing (escape) when the alarm is on than when it is off. Of course, this procedure is very controversial because it uses aversive stimulation. Schools will not use it and most parents won't approve of it. Rightly so.

QUESTIONS
1. Warning stimulus—Define and give an example.
2. S^D—Give an original example of a training that establishes a S^D with a stimulus that usually functions as a warning stimulus.

Example of Discrimination Training in the home

Helping Adam help others

Adam was turning seven years old. His mother, Erin, had invited the neighborhood children to the birthday party. Some came, all ate and none played with Adam. For the short time they attended the party, the children talked and laughed boisterously. Not Adam. He ate his chocolate cake quietly, next to the large cake tray. During the party, a child who was out of reach of the cake tray, held up his plate to say he wanted more cake. Adam stared at him and kept eating his piece of cake. The child frowned in incomprehension and distress.

Erin observed the pitiful absence of interaction. She painfully witnessed Adam's failure to help his friend in need, his lack of spontaneity, and his apparent insensitivity.

A few days later, during the weekly program update with Beth, Erin reported the birthday fiasco. "He just stared at him! The kid obviously wanted help, and he just stared at him," she lamented. Beth recalled reading a study

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from the Journal of Applied Behavior Analysis. 
There, Dr. Sandra Harris and her colleagues successfully trained youths labeled with autism to offer assistance. Beth decided to use Dr. Harris' study as a guide for the intervention with Adam.

Before starting, Beth made sure that Adam could imitate the key phrase "Can I help you?"

Beth sat in front of Adam and said "Adam, say 'Can I help you?'"

"Can I go outside" said Adam.

Beth repeated the key phrase. Each time Adam said "Can I go outside." After 5 minutes Adam imitated correctly and got a break, outside. Beth also selected some activities that Adam could imitate, or already performed on his own. She selected activities such as screwing on (or off) a jar top, putting a tape in a tape recorder, opening a cabinet door, tearing off a piece of tape and many other common activities.

The training started with Erin holding a coffee can and saying "I can't get this top off." As Adam looked puzzled, Beth prompted him to say "Can I help you?" "Yes, thanks a lot. Please take the top off," said Erin. Adam peeled the soft plastic top off the coffee can. "Thank you" said Erin.

As Adam improved at asking if he could be of help and providing assistance, Beth and Erin faded and delayed the prompts. Their plan consisted of first giving an immediate and full prompt. Beth said "Adam. Say 'can I help you?'" immediately after Erin's request help. Second, when Adam got the hang of the full and immediate prompt, Beth used a delayed and full prompt. The delay was 5-sec. For example, Erin would struggle putting a tape in the recorder and say "I can't get the tape in the recorder." Before prompting Adam's assistance, Beth waited 5-s. Then she would say "Adam, say 'can I help you?'" Finally, Beth would wait 5-sec and give a delayed and partial prompt consisting of saying "Adam..." and looking at him with an expectant look.

Later, Beth got rid of all prompts. For months following the intervention, Beth closely monitored Adam around his family and friends. She wanted to insure that Adam used his new skill (asking people whether they needed help) in different setting with different people and tasks.

On Adam's eighth birthday, he and Erin invited the neighborhood children. Some came, some ate and all enjoyed the party.

A groan came from the boy sitting next to Adam. He struggled with the top of a lemonade bottle. "Can I help you?" calmly asked Adam. "Sure, can you take that top off" say the boy. Adam picked up the bottle, twisted the cap between his thumb and index finger and poured the liquid inside the extended paper cup. "Thanks Adam" said the boy. "Welcome," said Adam. A tear of joy rolled on Erin's cheek.

**ANALYSIS OF THE INTERVENTION**

In normal circumstances, the act of helping someone—an assistance response—would come under the control of specific establishing operation. "Can I help you" typically functions as a request (technically called a mand). We will see in Chapter 13 that the mand is controlled by an establishing operation (e.g. satiation or deprivation). When "Can I help you" functions as a mand, it is controlled by a conditioned establishing operation which is the sight of the person in need of help.

However, for unknown reason the establishing operation was not conditioned with Adam. We know this because Adam never asked "Can I help you?" In other words, the sight of someone in difficulty fails to evoke a "helpful" response. Then, why is this story appearing in the chapter on discrimination then? Because our technology is more advanced at bringing responses under SD control than under EO control. The intervention described in this section established the sight of the person in difficulty as a discriminative stimulus rather than a conditioned establishing operation. Characteristically of discriminative stimulus control, the response
(asking if someone needed help) was controlled by stimuli that are usually followed by generalized reinforcers (e.g., approval, praise) and that are not specific to the response6 (i.e., Adam was not directly asking for approval). We say that, if an EO evoked the response, the removal of the sight of the person unable to complete the task, would reinforce the response. However, if a SD evoked the response, the delivery of the praise and the social interaction would reinforce the response. In our case, the sight of the person unable to complete the task functioned as a SD. This is not a point of detail because the mechanisms responsible for the maintenance of the target response are different. In our case, intermittent social reinforcement is necessary.

In Adam’s case, we suggest that the sentence "can I help you" is not controlled by an EO (as it usually is for most people) but rather by a SD. The point is that this sentence does not really function as a request but rather as a label (technically called tact). This means that in this story, "Can I help you" is roughly equivalent to saying "I see you have problems" with no intent to provide help until the person having difficulty asks for assistance.

Beth and Erin used a prompt delay7 to increase the frequency of independent responding. If you always used a prompt immediately after the SD you will deny your child an opportunity respond independently. Worse, your child may so heavily rely on these prompts that the appropriate response is under their sole control. The delay procedure gives your child an opportunity to respond independently, before the use of the prompt. Why should that work? We hypothesize that the faster response (the response that occurs before the prompt) avoids the correction procedure (sometimes a mild aversive) and results a more immediate reinforcer. Thus, the delay procedure weakens the initial dependence on the prompt and the response may gradually come under the control of more natural variables.

Beth and Erin also used prompt fading to achieve independent responding. Fading a prompt means that you gradually provide less guidance for the response. The goal is to shift the control, over the response, from the prompt to the relevant stimuli that normally controls the response. An easy mistake to make is to withdraw the prompt rather than fading it. When you withdraw a prompt (i.e., abrupt re-

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6 Remember that with the EO is not correlated with availability of reinforcement. Being hungry doesn’t make it more likely that food is in the fridge, but only evokes food-seeking behaviors.

moval), no fading occurs. As a result, responding accuracy plummets. The trick is to get rid of the prompt very slowly so response accuracy doesn't drop (see table 1 for an example).

**Definition: Concept**

**Prompt Fading Procedure**

- At first, the SD and the SA differ along at least two dimensions.
- The difference between the SD and the SA along all but one dimension is reduced until there is no difference along the reduced dimension.
- Then the SD and the SA differ along only one dimension.

Finally, we should attribute the success of this intervention to the collaboration between mother and therapist. The closeness of the partnership often determines whether the intervention will or will not be implemented. Many great interventions collected dust because they were not ecologically sound. This means that an intervention must fit the value and skills of the parents and other implementers of the intervention. In many cases, the parents are solely responsible for the implementation of an intervention. This means that they should actively participate in the design of that intervention. Of course, before choosing or designing anything, they should be informed of the nature and implications of various treatment options and their existing empirical support.

**QUESTIONS**

1. How did Adam learn to offer help? Is it similar to the way most of us learned? Explain.

2. *Delayed Prompt*—Give an original example.

3. *Prompt Fading*—Give an original example

4. When should you not use prompt in general?

5. When should you not use physical prompts?

**TYPES OF PROMPTS**

Prompts are absolutely necessary for learning. No prompts, no gain! However, although prompts are useful for acquisition they should never be a permanent solutions. When the response occurs reliably with a prompt, it's time to fade that prompt. Interestingly, mothers of normally developing children tend to wait longer for their child's response than mother's of children with Down syndrome. While this trend doesn't explain children with Down syndrome's language delay it's not helping them either. In some cases, the mother's failure to delay the prompt may prevent the learning of new behaviors. This findings tells us that educators and caregivers should stop anticipating children's needs and wait a bit before jumping to their rescue.

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As a note of caution to those of you designing, evaluating or implementing program, if the acquisition criterion is too high (e.g., 5 consecutive sessions at 95-100%) you may increase the risk of prompt dependency.

Here is a list of the various prompts you may use with your child. We discuss each prompt in terms of is strengths and limitations and the how to fade it once it served its purpose.

- **Verbal Prompt**—the teacher helps the student by giving a "verbal hint." They are two major types of verbal prompts. The *directive prompt*, tells the students what to do. Example, “Sam, put on your jacket". And the *echoic prompt*, tells the student what to say. For example "say, 'my name is Sam'". You should fade directive prompts by using the prompt delay technique and by gradually omitting parts of the prompt. For example, in teaching a child to put on his jacket you should delay saying “Sam put on your jacket” and gradually remove parts of the directive prompts starting with the last word. In the end, you just say "Sam...." Then you start delaying the prompt "Sam" by a few seconds, until Sam grabs his jacket before you have time to say his name. The following table shows how to teach a child to answer to the question "What is your name?" using delayed prompting and prompt fading at the same time.

- **Gestural prompts**—The teacher helps the student by giving a "non-verbal" prompt. This prompt usually consists of pointing toward a stimulus. Sometimes, when you are teaching following directions (e.g., jumping on command) or object manipulations you can use a *modeling prompt* which consists of demonstrating the task.

<table>
<thead>
<tr>
<th>Phases</th>
<th>Response criterion</th>
<th>Delay and Fading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>Ask &quot;what is your name?&quot;, rise your eyebrows (do this through phase 8) and immediately say &quot;Say, My name is Sam&quot;</td>
</tr>
<tr>
<td>2</td>
<td>The child responds reliably to full echoic prompt</td>
<td>Ask &quot;what is your name?&quot;, raise your eyebrows and delay saying &quot;My name is Sam&quot; for 2-sec</td>
</tr>
<tr>
<td>3</td>
<td>The child says &quot;Sam&quot; before the echoic prompt</td>
<td>Ask same question. Delay saying &quot;My name is ...&quot; &amp; delay &quot;Sam&quot; 5-sec.</td>
</tr>
<tr>
<td>4</td>
<td>The child says &quot;is Sam&quot; before you do</td>
<td>Ask same question. Delay saying &quot;My name is ...&quot; &amp; delay &quot;is Sam&quot; 5-sec</td>
</tr>
<tr>
<td>5</td>
<td>The child reliably says &quot;name is Sam&quot; before you do</td>
<td>Ask same question. Delay saying &quot;My ...&quot; &amp; delay &quot;name is Sam&quot; 5-sec.</td>
</tr>
<tr>
<td>6</td>
<td>The child reliably says &quot;yyy name is Sam&quot; before you do</td>
<td>Ask same question. Delay saying &quot;Mmm ...&quot; &amp; delay &quot;yyy name is Sam&quot; 5-sec.</td>
</tr>
<tr>
<td>7</td>
<td>The child reliably says &quot;My name is Sam&quot; before you do</td>
<td>Ask same question. Delay raising your eyebrows 5-sec and delay saying &quot;Mmm ...&quot; 5-sec.</td>
</tr>
<tr>
<td>8</td>
<td>The child reliably says &quot;My name is Sam&quot; before you raise you eyebrows</td>
<td>At this point your child reliably answers &quot;my name is Sam&quot; to the question &quot;what is your name&quot; and no other prompts.</td>
</tr>
</tbody>
</table>

10 Echoic The learner repeats the same sounds than the model.

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11 This table only describes the delay and fading procedure but does not mention the criterion for reinforcement. You can deliver a reinforcer as long as your child answers, regardless of the prompts you used. You should deliver a bigger or better reinforcer when the response occurs with the minimum prompt schedules for that phase.
• **Physical prompt**—The teacher moves the student's body into the desirable position. At first the teacher uses a *full physical prompt*. This means that the teacher prompts the response from beginning to end. When the response occurs with a full prompt without resistance, the fading work can start. Their the teacher only guides parts of the response and gradually decreases the intensity of the physical guidance (e.g., from firm grasp to light touch).

• **Within stimulus prompt**—The teacher inserts an extra stimulus dimension (by altering or exaggerating) within the target stimulus. For example, if you are training discrimination of facial cues (also called facial display of emotion) and the instruction "point to Mr. Happy" fails to evoke the correct response; you may make the relevant part of Mr. Happy's face more noticeable by highlighting Mr. Happy's mouth in red. Then, you should gradually fade the color until Mr. Happy looks like a man again.

Within stimulus prompting is an excellent procedure because it draws the learners' attention to the critical stimuli composing a complex stimulus, like the face, for example.¹³

**Proximity Prompt**—During discrimination training consisting of pointing to an object on command, the teacher helps the student by placing the correct stimulus closer to the student compared to the other stimuli. Proximity prompts have shown to be effective but may direct the child's attention to an irrelevant property of the stimulus, the distance.

• **Involuntary prompt**—They could be any of the prompts listed above if you bomb the fading procedure or if you are unaware of some extraneous stimulus present during training and that stimulus come to control the response. The fading of various prompts can be a challenging task. It is important to be aware of all cues we might give. It is common to see inexperienced behavioral technicians leaning forward ever so slightly when giving instruction such as "hug me," or placing their hand closer to the object they are requesting.

**QUESTIONS**

What is the goal of fading the prompts and why is it important?

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¹² Tactil prompting, is yet another type of prompt that relies on physical contact. This time the response is verbal. For more details see Taylor, B. A., & Levin, L. (1998). Teaching a student with autism to make verbal initiations: Effects of tactil prompt. *Journal of Applied Behavior Analysis, 31*, 651-654.

Adam's steady progress made his parents proud. He had started attending a regular education classroom in the morning and continued receiving discrete-trial training in his home during the afternoon. A few weeks ago, he scored a 94 on the verbal section of the Wechsler Intelligence Scale for Children (the revised version). Yet, he was still an odd child. His mannerisms and the way he contorted his face at the most inopportune moment made him different. Adam could maintain a conversation, especially about video games and the ex-Yugoslavia (we are not sure how he learned so much about this country), but his eyes, his face and the sound of his voice seemed to act independently of the situation. Adam moved his eyes from the upper left corners to the upper right corners of his orbits in a rhythmic fashion similar to that of a lizard on the look out. Often during a conversation, the muscles of his face and mouth contracted at once as if he was experiencing agonizing pains. Of course this was not the case. Finally, Adam usually pronounced vowels in a harsh and dragging voice which made him sound like an alien or a robot.

Beth had read an article by Dr. Robert Koegel and Dr. William Frey that addressed children's behaviors during a social interaction.

Beth decided to concentrate on Adam's speech and to monitor his eye gaze and his facial expressions. This means that the initial discrimination training (that included modeling and imitation) only targeted Adam's voice and Adam only monitored his voice during the training. During the discrimination training Beth would model a robot voice, and ask Adam to imitate the voice and to say whether it was appropriate or not. Then, she would speak in a normal voice and would ask Adam to imitate her and to say whether the voice was appropriate or not.

**DISCRIMINATION TRAINING**

2. Most children score 100 points plus or minus 10 points. So Adam falls "within the norm."
Later, once the discrimination was solidly established the self awareness training started. Adam received a digital watch with a countdown alarm (preset to ring every 10 minutes). Adam also received a sheet of paper with numbered boxes. He was told to make a check mark on the sheet each time the alarm sounded and he had engaged in the "outlawed" behavior during the last ten minutes.

The following conversation between Adam and his mother, Erin, illustrates the features of the intervention. The training took place at a Mall near a game room. For every interval with a correct mark on the sheet Adam got one quarter for the video game of his choice.

Erin: Did you have fun in the game room?
Adam: Yes, mom.
Erin: Are you hungry?
Adam: Yyyeees I wannaat foood noow.

Two minutes passed and the alarm on Adam's wrist beeped. Adam looked at the recording sheet. He did not check the numbered box, did not get a quarter and did not play another round of video game. He recalled talking like a robot most of the time.

Erin: Tell me about your day at school
Adam: Not bad. I played blocks. I wanted to play Nintendo® but the teacher said "wait until you get home."
Erin: You waited nicely. You'll play a game soon.
Adam: When the watch goes "ding-ding?"
Erin: Yes

The alarm rang and signaled the end of the 2 minute interval. Adam made a check mark on the sheets of paper and Erin gave him a quarter. Then Adam walked to the game room across the hall and played a video game. After 5 minutes he returned the bench where Erin sat.

As Adam gradually stopped mocking a robot, the time intervals on the alarm became longer. The number of check marks to earn a quarter also increased. By the end of the intervention Adam earned one quarter for appropriately speaking for five 7-minutes intervals.

What's even more encouraging, is that his inappropriate facial expressions and eye movements also changed during the course of the intervention. In the end, Adam did the right thing at the right time. He looked in the eyes of people that talked to him and he stopped contorting his face in public.

ANALYSIS OF THE INTERVENTION

The generalization of the results across responses (voice, gaze, and facial expressions), indicates that the responses were part of the same response class. That is, the same reinforcers maintain the responses. This story also illustrates concept formation. The concept being appropriate pronunciation.

Note that to get the quarter, Adam had to put the check mark in the square in addition to behaving appropriately. This means that Adam observed and recorded his own behavior. We may think of this as self-awareness. Two contingencies are acting on two complex response classes—pronouncing words correctly and mispronouncing words. While good pronunciation is reinforced, mispronunciation is punished. The mispronunciation prevents the delivery of the conditioned reinforcer (i.e., the checkmark). Thus, a differential punishment by the prevention of the presentation of the reinforcer is in effect at the same time that the reinforcement contingency is in effect.
DIFFERENTIAL PUNISHMENT AND REINFORCEMENT PROCEDURE

Before
Adam will have a quarter

Reinforcement
$S^D$
Socially appropriate
to appropriate
behaviors

Behavior
Adam make a check mark

$S^A$
Socially inappropriate
to inappropriate
behaviors

After
Adam has a quarter

After
Adam has no quarter

Punishment by prevention

QUESTIONS

1. What was the training procedure?
2. What were the results of the training?

Definition: Concept

Oversselective stimulus control
- An single or small number of di-
mension stimuli
- controls a response that is usually under
- conceptual stimulus control.

Beth and Erin also used a concept training procedure to teach Adam to identify instances of the concept of appropriate pronunciation. Thus, Adam's checkmarks were under the conceptual control of a class of responses collectively called appropriate pronunciation. This is a large response class. There are many ways to speak that would be considered "appropriate." This conceptual control is more complex than the control established with simple a discrimination procedure. The simple discrimination procedure involves one $S^D$ and one $S^A$. However, instead of two individual stimuli, the concept training procedure involves two stimulus

---

classes—appropriate vs. inappropriate pronunciations.

A stimulus class consists of a set of stimuli that all have some common properties. Stimulus class also means concept. The notion of stimulus class parallels that of response class. A response class consists of a set of responses that all have some common property.

Adam's training comprised both response classes and stimulus classes. One set of response had the common property of being appropriate pronunciation. And this response class had another behavioral property: It was also a stimulus class, whereby in the presence of his own appropriate pronunciation Adam made a checkmark and got a quarter.

We know that conceptual stimulus control is occurring when two conditions are met:

1. The observer responds in a similar way to all the stimuli in ONE STIMULUS class.
2. But the observer does not respond that way to the stimuli outside OF THAT class.

When the observer responds in a similar way to different stimuli, we say stimulus generalization (see chapter 12) is occurring. Beth and Erin reinforced checking the numbered boxes in the presence of various appropriate pronunciations. Before that, Beth and Erin also reinforced identifying a specific inappropriate pronunciation. The effects of reinforcement generalized to novel situations with novel inappropriate pronunciations. So conceptual stimulus control consists of generalization within a concept or stimulus class and discrimination between concepts or stimulus classes.

Conceptual control may be difficult to establish for at least two reasons. First, conceptual control involves the simultaneous occurrence of numerous and subtle stimuli that control one response. Second, simple stimulus control may replace or prevent conceptual control when one salient stimulus reliably precedes the reinforcer or when a previously established SD is present.

In any event, rather than blaming autism for overselective stimulus control, we are saying that overselective stimulus control may occur because of problems with the training or the history of reinforcement.

**REMEDIAL INTERVENTIONS FOR OVERSELECTIVITY**

Some techniques may help remediating overselectivity. These techniques include within stimulus prompting and multiple cue training. These techniques were addressed during Sid's seminar.

**Sid's Seminar:**

**Sid:** How do we know someone is sad or happy?

**Max:** According to Drs. Reid and Green happiness is a hypothetical construct or a private event, because happiness is either not observable, because it's private or doesn't exist. I think we can not study it and we should not talk about it.

**Stan:** I'm sorry, but as behavior scientists we shouldn't run away from difficult concepts. Emotions may be hard to study because they are happening inside people, but there are other indicators that coincide or accompany the private behaviors. For example, how could I tell that my brother was surprised on his 21st birthday? Well, he was not expecting the party and the cream pie in the face when he got home. In roughly the same situation I have felt surprise. So, I may assume that he is also surprised. Also, there is a typical "surprise face." You stiffen you neck and jerk it back, your eyes pop out of their sockets, you gasp and your body

---

*The common property maybe topographical (i.e., the responses look alike) or functional (i.e., produces the same outcome)*
jerks. All these are common public indices\(^5\) of surprise. They are behaviors that make us say that someone is surprised.

**Sid:** Right on, Stan! Emotional behavior is really complex, and children with autism have a hard time tuning into the subtle changes that take place on the face when we are emotional. How would you help a child attend to a relevant component of a complex stimulus, like the face?

**Stan:** I would give him a rule like, "pay attention to the mouth and the eyes!"

**Sid:** OK, but let's pretend your child does not speak and does not respond to spoken words.

**Sang Woo:** We could point to the relevant parts of the face, couldn't we? Then, couldn't we fade the pointing prompt, could we?

**Sid:** That's not the best option. Dr. Scheibman\(^6\) showed that children have a hard time transferring the correct response from the teacher's pointing finger to the relevant stimulus material. So, even though the children responded well in the presence of the gestural prompt, the stimulus that was pointed at did not become an S\(^D\). That's a problem. Who has another solution?

**Stan:** How about highlighting the mouth and the eyes with a red marker?

**Sid:** That's an idea! With within-stimulus prompts.... Rather than attending to the finger—the extra-stimulus prompt—the child attends to the crucial stimulus because it is more striking than the other surrounding stimuli. Once the child points to the big-red-mouth, what do you do?

**Stan:** I guess we would have to gradually withdraw the within stimulus prompt. We might erase parts of the mouth, still insuring that the child points to the correct complex stimulus.

**Sid:** Bingo!

**QUESTIONS**

1. What can you do to avoid the development of stimulus overselectivity?

Example of Differential Reinforcement in Symbolic Matching Training

**House of Style\(^7\)**

Betty waited for the bus. Aside her, a group of rowdy teenagers stood under the weather shelter. They were loud and obnoxious but they weren't minding her. It hadn't always been this way. After spending eighteen years in the state psychiatric hospital Betty found it difficult to fit in the society. Kids were especially merciless. Betty was an endless source of teasing and jokes. She heard the bad jokes so often that she could repeat them without effort. She was told, "You are dressed in season: like an Easter egg or a Christmas tree". They teased her, "Your hat looks like it made a forced landing on your head" and, "You are as up to date as a 1940 calendar...."

Betty left the psychiatric hospital after being a full time resident for ten years. She could carry on a simple conversation and she had enough self-help skills to live on her own, yet she lacked some skills that singled her out in a crowd. For example, she couldn't coordinate the clothes she wore.

When she came in for the initial screening for Deborah Nutter and Dennis Reid's study she

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\(^5\) Indices refer to stimuli that are typically indicative of the broader stimulus class. For example, gasping may be an indices of surprise.


wore pink denim dress with a striped blue and green blouse.

Before the start of the study, Nutter and Reid needed to know how people dressed and matched. They observed over 700 people in a mall (the normative sample). Once they had a good idea of what was socially acceptable they started the intervention.

Nutter and Reid used cutout dolls and stick-on clothes to train the clothes coordination skill. Prior to the intervention, they assessed Betty’s matching skills by giving her a doll dressed with a skirt and three choices of tops. One top was fashionable, the other two tops did not match the bottom and were not fashionable. During this initial assessment Betty received praise regardless of her choices.

Then, Betty learned to combine various popular color assortments. A brown top went with brown or tan pants but not with purple pants.

When Betty coordinated the colors appropriately she always received enthusiastic praise, "Nice work, that’s a popular combination!" She loved the attention. After an incorrect color combination the trainer modeled the correct combination, placed the clothes back on the table and asked Betty to dress the doll again.

After fourteen 25-minute sessions Betty could coordinate any colored clothes. A few months later Betty could also coordinate her own clothes. She had caught up with fashion.

**ANALYSIS OF THE INTERVENTION**

We could argue that we are teaching good taste and that there is an underlying tastefulness principles. But we doubt it. This study is a kind of symbolic matching procedure (and transfer from doll to her⁸). Drs. Nutter and Reid defined an appropriate response class, the one they would differentially reinforce. Then, they define the stimulus class for the correct matching response. Defining the stimulus class was not easy. They determined what were the popular color combinations by observing what people wore. Typical color combination included wearing a black shirt and a white dress, or a light blue sweater with dark blue pants. Societal preference (usually called fashion) determined these stimulus classes. In other words, a green shirt went with a blue jean (same stimulus class), but a green shirt did not go with red pants (different stimulus classes). This is so because a majority of people approves or disapproves of such color combinations. A bit arbitrary you might say. You are right. Such is fashion; and fashion is always subject to changes. So, the arbitrary stimulus classes are also subject to changes.

Drs. Nutter and Reid gave feedback and a reinforcer each time Betty composed a fashionable combination. That is, each time Betty matched a particular top with an appropriate colored bottom for that top she received a praise. As a result of this training, Betty’s fashionable clothes combination increased while the unpopular clothes choices decreased.

Keep in mind that fashion is always subject to change or may seem vain to some. However, some seemingly minor appearance changes may lead to important changes in people’s life, by changing other people’s perception. Cosmetic changes, such as wearing coordinated clothes may be a modest step toward societal integration of people with developmental disabilities because it removes visible stigma. Of course, cosmetic change should not occur at the expense of needed basic changes. That is, more basic self-help skills (e.g., washing, eating, cooking...) should be taught first.

⁸ We will address transfer of training in chapter 12.
Differential Reinforcement

QUESTIONs
1. Should you implement this intervention with all individuals who have problems with coordinating clothes?

Example of Complex Stimulus Control:
Mutual Exclusivity

Comparing Two Complex Discrimination Procedures

Typical children learn new words quickly and with no special training. Sometimes, they directly ask for the name of the object. For example, at a museum exhibit, children say "what is this?" and adults reply "that's a crossbow." However, oftentimes, children learn the name of the object without asking what the object is, and without hearing someone say "this is a ballista." Rather, they hear someone talk about the ballista (the unknown word) in the presence of the ballista (the unknown object) and other well-known objects, like a catapult, a battering ram, and a siege tower. For this type of learning to take place the child must be already familiar with many common objects. Thus, when the child encounters a less common object for which he has no name (the ballista in our example), the object is likely to be the only object-with-no-name among a group of objects for which the child already has a name (in our case, the other siege engines). So, as the adult talks about the unknown object, the child learns the name of that object because that is the only object-with-no-name in sight. This phenomenon is referred to by cognitive psychologists as "mutual exclusivity" and by behavior analysts as "exclusion." You can already see how teaching this learning strategy could be benefiting children with autism and with other language deficits. The strategy would allow autistic children to learn object names in the natural environment, without trained teachers. The following story illustrates how this learning strategy is taught. There are two strategies and one is more effective than the other. Let’s see what they consist of.

For one school semester, Sang Woo and Max worked with Jimmy, the child with autism. Sang Woo and Max registered for practicum credit. They received each three credit hours, which amounted to 12 hours of work per week. During the morning session, Sang Woo ran a number of procedures. One of these procedures was quite different from the other procedures. First, the name of the procedure was mysterious. The procedure was called "fast mapping". At the beginning of the semester Sang Woo

---


10 The technical lingo for the name of an object is tact. As in, "the child directly asks for the tact." We will elaborate the concept of tact in chapter 13.

11 A siege engine that resembles a giant crossbow.


joked about the odd procedure name. He said to Max "why teach fast mapping? Jimmy doesn't drive" or "Why teach fast mapping? Jimmy isn't going anywhere?" and "shouldn't we teach slow mapping first?" These childish comments betrayed Sang Woo's lack of understanding for the procedure. As a result, Sang Woo implemented the procedure poorly for a number of days. One day, Jamon, the teaching assistant, observed a session and saved the day. This is what Jamon saw.

For each trial, Sang Woo placed three items on the table; two familiar items (e.g., dog, car, tree, frog) and one item Jimmy had never seen before (the syringe or the obelisk).

Then Sang Woo asked Jimmy to point to one of the new items (either the syringe or the obelisk). The following diagram illustrates two consecutive trials of the receptive task. For the first trial, Sang Woo placed the three pictures in front of Jimmy and asked him to point to the syringe. For the second trial, he asked Jimmy to point to the obelisk.

**RECEPTIVE TASK**

**SAMPLE TRIALS**

Trial 1: "Point to syringe"

Trial 2: "Point to obelisk"

During the receptive task, Sang Woo always presented the two new items separately. So, the obelisk and the syringe never appeared together within the same trial.

When Jimmy learned to point to both new objects upon hearing their name, Sang Woo tested the outcome of the procedure (also called mapping outcome). For the mapping outcome test, he placed three items on the table. This time, only one item was a known item and the remaining items were the two new items (the syringe and the obelisk). On a given trial Sang Woo asked Jimmy to point to one of the new object.

**MAPPING OUTCOME**

**SAMPLE TRIAL**

Trial 1: "Point to syringe"

Trial 2: "Point to obelisk"

The mapping outcome test helps assessing whether Jimmy has learned to point to the syringe when Sang Woo says "syringe" and when the obelisk is also present and vice versa.

After observing the fast mapping session, Jamon carefully read the instructions for the procedure. He was almost sure Sang Woo did not run the procedure according to the instructions. Jamon's quick reading of the instruction confirmed his initial doubts. So, Jamon sat in front of Jimmy and showed Sang Woo how it was done.

**Jamon:** First, you only run trials with the syringe until Jimmy gets 2 sessions in a row with 90 percent of correct responses. Typical trials look like this:

Trial 1: "Point to Syringe":

Trial 2: "Point to Syringe":

**Jamon:** Of course, sometime, you ask for the know items, like the frog or the dog. Got it?

**Sang Woo:** Got it.

**Jamon:** Now, when Jimmy points reliably to the syringe, you gradually introduce the new stimulus. This time, you run half of your trials, 10 out of 20 for example, showing the syringe only, and the other half showing the syringe
and the obelisk within the same trial. Your trials will look like this:

Trial 1
"Point to syringe":

Trial 2
"Point to obelisk":

Jamon: Do you get it?

Sang Woo: Now I got it.

Jamon: Good. Then you can do the mapping outcome probes at the end of the sessions. You did these right when I observed you. Now, let go over the whole thing again. First, you ask for the syringe until Jimmy responds correctly on 90 percent of the trials. Then, you mix the obelisk and the syringe on half of the trials and you train the response to obelisk until Jimmy responds correctly 90 percent of the time. When Jimmy finally gets both syringe and obelisk right you move on to the fast mapping probe. Which typically looks like this:

Trial 1:
"Point to syringe"

Trial 2:
"Point to obelisk"

ANALYSIS OF THE PROCEDURE

Let's first look at the rational behind the fast mapping intervention. Why should we teach fast mapping?

We know that young children acquire language at an astounding rate. And we know that the increase in vocabulary size and sentence length is most dramatic between the ages of two and five. Researchers also found that, for many children, the rate of word acquisition increases drastically after they have acquired approximately 50 words. This fast growth has been identified as the word spurt, or the naming explosion. Before the naming explosion, children go through a sequence of pre-language "stages" of development that include, crying, cooing and various types of babbling. We think that these preliminary steps lead to the first verbal utterances. By 52 weeks most children say their first word usually a request. At this time, the various language sounds echoed are brought under stimulus control and are also controlled by more complex (i.e., learned and/or private) motivational variable.

Definition: Concept
Mutual Exclusivity
- Upon hearing a new word sound
- the child selects a stimulus which has no name
- rather than a known stimulus.

One of the processes proposed to explain the naming explosion is called fast mapping. This process refers to the "children's ability to form a quick, initial, partial understanding of a word's meaning." One of the mechanisms that may explain fast mapping is called mutual exclusivity. Mutual exclusivity is defined as children's tendency to give only one name to one object and to avoid having more than one name or receptive label for an object.

Drs. Ellen Markman and Gwyn Watchel pointed out that mutual exclusivity helps children learn in the absence of training.

That is, children may be able to learn name of a novel object by excluding the known objects.


One problem is that children may respond to the new object simply because of its novelty. To rule out this potential problem, Drs. Wilkinson and Green (1998) compared two fast mapping procedures: the concurrent introduction procedure and the successive introduction procedure. The concurrent introduction procedure (the procedure involuntarily run by Sang Woo) consisted of two exposure sessions and a test session. During the exposure session the children heard a novel label selected from an array containing two known stimuli and one novel stimulus (this is the traditional fast mapping procedure). During the second exposure session the experimenters repeated the same procedure with a second unknown stimulus (e.g., the obelisk). Later, the mapping outcome session featured three stimuli, including both previously unknown stimuli. During these sessions the children heard the novel stimulus (e.g., "Syringe") and selected from a well known stimulus, and the two previously unknown stimuli to which they were exposed.

**Differential Reinforcement of Exclusion**

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jimmy has no praise</td>
<td>Points to syringe</td>
<td>Has a name for the syringe</td>
</tr>
<tr>
<td>S^D</td>
<td>No name for the syringe</td>
<td>After</td>
</tr>
<tr>
<td>S^A</td>
<td>Has a name for the syringe</td>
<td>After</td>
</tr>
</tbody>
</table>

In contrast to concurrent introduction procedure, the successive introduction procedure (the procedure modeled by Jamon) consists of presenting one unknown stimulus along with two known stimuli during the initial exposure session. Once the novel stimulus is learned, the next exposure session consists of the presentation of a novel unknown stimulus along with the previously unknown stimulus presented during previous sessions and a known stimulus. Then, the mapping outcome test is similar to that of the concurrent procedures. Namely, the experimenter presents both unknown stimuli within the same array and asks the child to point to each stimulus. The result of the comparison of the two procedures shows that all participants selected the correct stimulus upon hearing the novel label, but they were more accurate after the successive procedure than after the concurrent procedure.

The following graphs illustrate Wilkinson and Green's results. "C" means concurrent and "S" means successive.

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QUESTIONS
1. *Stimulus Exclusion*—define and describe the training procedure.

2. What were Wilkinson and Green (1998) results?
Behavior Analysis and Autism

Example of Chaining to teach hygiene related behaviors

**Betty Learns to Care for Herself**

Joan: Walk in the bathroom and close the door.
Betty: Yep.
Joan: Good. Now pull down your underwear.
Betty: Yep.
Joan: That’s right! Betty, put your underwear in the bag.
Betty: OK.
Joan: Good Job! Now wipe and put the paper in the toilet.
Betty: Done.
Joan: Alright, great! Please, put on the clean pair of underwear.
Betty: Alright.
Joan: Pull the tabs off the clean sanitary napkin.
Betty: Yep.

Joan: Super! Now throw the strip in the trashcan.

Betty: (silence)

Joan, who was pretending to wash her hands in the sink facing the opened swinging door of the toilet, glanced toward the toilet stall and Betty.

Joan: Good, we are almost done. Pull up your underwear and your pants.

Betty: OK, yep.

Joan: That’s right! Flush the toilet.

Betty pushed on the chrome lever on the side of the water tank. The boisterous “siphonic” noise echoed through the bathroom.

**ANALYSIS OF THE INTERVENTION**

First, Joan conducted a task analysis for changing underwear. She broke down this complex behavior into twenty steps! For many people a given step is a reinforcer for the preceding step (e.g., fastening the sanitary napkin is reinforced by being able to pull up the underwear) and, at the same time, a discriminative stimulus for the following step. At the beginning of the intervention, Joan provided no praise and gave tokens regardless of the correctness the behavior.

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As a result, the performance remained low (see Baseline [BL] in Figure 1). After making reinforcers contingent upon correct responses, the desirable behaviors increased rapidly. By the end of the intervention, Betty and all the other participants could complete the task without verbal prompts.

**CHANGING UNDERWEAR**

**TASK ANALYSIS**

Figure 1. Number of independent steps performed by four mentally handicapped adults on the skill sequence for changing their soiled underwear.

**BL TRAINING FOLLOW UP**

<table>
<thead>
<tr>
<th>Session</th>
<th>Baseline and follow up (no praise)</th>
<th>Intervention (praise and tokens)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Betty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bertha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Booney</td>
<td></td>
</tr>
</tbody>
</table>

**QUESTION**

1. Please diagram the differential contingency for throwing the strip in the trashcan

```
Before   Behavior   After
```

2. Complete the contingency diagram for one of the task component described in the preceding story.

**Concept**

**TASK ANALYSIS**

Before the intervention Joan did a task analysis. This means that she broke down a complex response, of changing ones feminine protection, into small response components. Joan prompted and reinforced menstrual care behaviors according to each component. Often, tasks analysis are necessary when we are trying to teach complex behaviors such as, fencing, writing, using a computer... Although the behaviors taught to people with special needs are not usually as complex, a task analysis is necessary because the behavior was not acquired under natural circumstances. Then, the trainer reinforces each component from the sequence of response

**Definition: Concept**

**Task Analysis**

- An analysis of complex behavior
- and sequences of behavior
- into their component responses.

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When you do a task analysis you look at the process rather than the product. This means that you have to look at the sequence of responses in the "feminine care" response chain rather than just looking at the final product: leaving the bathroom with clean underwear.

Reinforcing each component response is more difficult than checking for the last response, but it is sometimes necessary. You have to look at the details of the process leading to the desired outcome when the outcome is not happening.

**Definition: General Rule**  
**Process versus product**  
- Sometimes you need to  
- make reinforcers and feedback contingent on  
- the component responses of the process,  
- not just the product (outcome).  
- Do this when you can't get quality products of sufficient quantity,  
- though you've made reinforcers and feedback contingent on  
- the ultimate production of those products.

**QUESTIONS**  
**Task analysis** — give an example for the child you work with  
**Process versus product** — Apply the general rule to your example of task analysis.

**Concept**  
**BEHAVIORAL CHAINS**

Consider Betty's behavioral chain. She pulls down her pants and her underwear, removes the cotton lining, discards the lining, pulls up her underwear and flushes the toilets. This is quite a complex behavioral chain. Other behavioral chains may seem simple because they are so natural for us. However, apparently simple behaviors, such as walking are also complex behavior chains. Walking involves moving one foot forward, leaning forward, bringing a foot down, straightening up, moving the other foot forward...and the whole chain starts anew. Relatively simple behaviors such as entering and exiting a room may be broken down into a behavioral chain. Like with other behavioral chains, the first response is an S<sub>D</sub> for the second response. So, Knocking at the door is a S<sub>D</sub> for saying, "can I come in?" In turn, saying "can I come in" (along with a positive response from the person inside the office) is an S<sub>D</sub> for opening the door.... Each response produces a stimulus and is followed by another response.

**Definition: Concept**  
**Behavioral chain**  
- A sequence of stimuli and responses.  
- Each response produces a change in the Environment that  
- acts as a discriminative stimulus  
- for the next response.

**QUESTION**  
1 Diagram a behavioral chain consisting of a coat removal example (give a detailed task analysis).

**Principle**  
**DUAL-FUNCTIONING CHAINED STIMULI**

In a behavioral chain the response produces a stimulus that serves two functions: it acts as an

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SD and as S'. It is an SD for the next response and as a conditioned reinforcer for the response that preceded it. The reinforcer following the terminal link in the chain is often a primary reinforcer or maybe an activity selected during a stimulus preference assessment.

Let's consider a hand-washing example emphasizing the dual function of the stimuli:

- the sight of the sink is a stimulus in the presence of which we turn on the water.
- the sight and feel of water on hand reinforced turning on the faucet (if you turned on the faucet and no water came out, turning on the faucet would not be reinforced).
- at the time, the sight and feel of the water acts as an SD for moving the hand toward the soap dispenser and working it to a lather.
- the feel of soap on hands is an S' for the preceding response (if no soaps comes from the dispenser, the reaching will not be reinforced).
- the feel of the soap on hand is an SD for rinsing ones hands.
- the sight and feel of the water washing off the soap is an S' for rinsing ones hands (if the water was so soft that it did not remove soap, rinsing would not be reinforced).
- at the same time, the sight and feel of rinsing off soap is an SD for turning off the faucet.
- The sight of the absence of water is a S' for turning off the faucet.
- the sight of the water off is also an SD for reaching for a paper towel and drying hands.
- dried-hands is a S' for using the paper towel.
- finally, dried hands is an SD for throwing the paper towel in the trashcan.

Hand washing is an example that the stimuli in the behavioral chain can function as SD and S' at the same time. That is it functions as a reinforcer for the response that produced it and as an SD for the next response.

<table>
<thead>
<tr>
<th>Definition: Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual-functioning chained stimuli</td>
</tr>
<tr>
<td>- A stimulus in a behavioral chain</td>
</tr>
<tr>
<td>- reinforces the response that precedes it.</td>
</tr>
<tr>
<td>- That stimulus also acts as an SD for the response that follows it.</td>
</tr>
</tbody>
</table>

So far, we have seen one type of behavioral chain—the total-task presentation. In the next examples we will present other ways to establish chains of responses with forward and backward chaining procedures.

**Increasing Drinking**

Josh was a 12-year-old boy diagnosed with autism and moderate mental retardation. Josh also suffered from numerous serious gastrointestinal conditions such as hiatal hernia, esophagitis secondary to frequent emesis, and chronic constipation. After an aggravation of his gastrointestinal problems, Josh refused to eat and drink. As a result, he was fed through a tube. However, Josh's refusal of food and drinks were not linked to his medical condition.

Dawn collected data on Josh's drinking. Each time she brought a cup of water up to Josh's lips she recorded whether he swallowed the water, spat it out or pushed the glass away.

---

Dawn established that the target response was really a chain of responses. First, Josh should bring the cup to his mouth, then he should take the water into his mouth and finally Josh should swallow that water.

Initially Dawn wanted to increase Josh's swallowing. The last link in the response chain. Dawn gradually increased the amount of water. At first, Dawn reinforced swallowing (she could tell by the movement of the larynx and the Adam's apple). Later, she added more water to the syringe. After swallowing, Josh received paper and scissors. He enjoyed cutting various shapes. A typical session consisted of five water presentations. After 30 sessions, Josh reliably swallowed the content of a syringe containing 3 teaspoons of water.

**TERMINAL LINK**

Next, Dawn replaced the syringe with a cup. Initially Dawn prompted Josh to drink the few drops of water in the cup. Josh brought the cup to his mouth and lowered the cup. A stream of water came from his rounded lips. The water splashed Dawn's face. She did not clench. She grabbed the paper and scissors and waived it in front of Josh as she prompted him to drink the content of the cup. Josh picked up the cup and brought it to his lips. Dawn could see his larynx move up and down. She knew he was drinking.

**INITIAL LINK**

Later, Dawn gradually added apple juice to the water and reinforced drinking with access to paper and scissors. Within a few sessions Josh accepted the tasty water.

**ANALYSIS OF THE INTERVENTION**

Dawn started the intervention by reinforcing the last link in the behavioral chain. She reinforced the swallowing response. This is called backward chaining. Instead of establishing the first link in the chain, then the second, backward chaining starts with the end. You establish the terminal (or last) link first and then you move on to the second to the end. Finally, the initial link is established after all the other links are acquired. In general, it is a good idea to use backward chaining when the target response (e.g., swallowing) does not occur frequently or is absent altogether.

**INITIAL LINK (established last)**

**INTERMEDIATE LINK**

**TERMINAL LINK (established first)**

**Definition: Concept**

**Backward Chaining**

- The establishment if the final behavioral chain,
- with the addition of preceding links
- until the first link is required.
Dawn also used a fading procedure. She increased the amount of fluid\(^3\) when Josh accepted the specified amount during the previous two sessions. This combination of fading and backward chaining was an effective treatment for liquid refusal.

QUESTIONS

1. What was the first behavior established in the behavior chain and why?
2. Give an example of a behavior chain that could be established via backward chaining.

\(^3\) You may be used to fading out procedures that gradually decreases or withdraws a prompt. However, there are also fade in procedures that gradually increase the amount of stimulation like light, noise, food or water.
Adam Learns to Play with his Toys’

Christmas brought many presents to Adam. His parents, Erin and Bob, had read a report by Dr. Don Horner2 on "environmental enrichment" and decided that Adam needed more toys and more games to play with. Adam was showered with toy airplanes, spaceships, boats, tanks, animals, and people. Santa also brought numerous music boxes, a mini keyboard, a flute and even a full size piano. But Adam seldom played with his new toys. Instead he played with his mother set of keys. He simply held them and shook them. When Adam used his new toys he spun them on the floor or twirled them between his thumb and index fingers.

Erin shared her concerns about Adam’s lack of appropriate play with Dawn, who had been supervising Adam’s in-home program since his diagnosis, two years ago. During her bi-monthly visits to Adam’s home, Dawn saw the huge number of toys littering Adam’s playroom. She grouped the toys that had similar functions. For example, she grouped all the rolling toys, like cars, tanks, and motorcycles for which appropriate play consisted of holding them by the top and moving them on the floor. She grouped bugs and frogs in the "hopping things" category. Correct play responses for this group consisted of hopping or jumping. Lastly, she grouped musical instruments. For example, keyboard play was appropriate when Adam produced a sequence of notes.

Erin and Dawn trained Adam to play with one toy from each category. For example, Erin handed Adam a small plastic tree-frog and said "Play with this." Adam picked up the frog, smelled it, giggled and dropped it nonchalantly. Erin said "No do it like this" and she made the frog hop. Adam picked up the frog and made it hop. "Good. Play with this," said Erin, as she handed Adam a toy soldier. Adam smelled it and made it oscillate between his thumb and index finger. Erin said, "No do it like this" and she made the toy-soldier move side to side to simulate walking. Adam imitated the motion. Erin praised him and gave him another toy to play with.

---

3 This type of environment is rich in stimulation from toys and people.
Soon, Adam was skillfully playing with one toy from each set, but he could not play with other similar toys. For example, he could play with the toy soldier but kept sniffing and spinning the Power Ranger doll. It was time to start the generalization training. Erin started training with toys within the same set. After Adam responded correctly three times in a row with a given toy, Erin moved on to another toy within the same set. For example, Erin trained three exemplars of rolling toys and Adam started playing appropriately with the remaining rolling toys. Then, they started training with the animal toy set. The first time Adam played with a toy cow he made it move like a car. But, further training corrected that problem. They continued training with other animal toys until Adam could play with all of them. In this manner, they trained Adam with all the toys in all the sets.

But, in the end Adam played appropriately with new toys that were not even part of the training. New bugs, unknown and exotic bugs hopped, and new fashionable cars (and trucks) rolled and tires screeched.

As a result of training multiple examples of toys within a set, Adam learned to play appropriately with all the toys within that set. Including those he had not been trained with. (the following graph shows that no direct training was necessary for Bug 1 and Bug 2). However, Erin had to train all the toy sets because they required very different toy-related behaviors. This means that when Adam learned to play with the cars he was not more likely to play appropriately with the animal set or the plane set. WITHIN SET SHOWS GENERALIZATION AND NO GENERALIZATION ACROSS SETS.

Interestingly, stimulus generalization to untrained toys occurred faster once Adam was trained with one set of toys. In other words, the initial training facilitated the acquisition of play behaviors for the other sets. However, each of the musical toys had to be trained separately and no generalization occurred within this category. It is possible that generalization was more difficult with these toys because they looked different and Adam had less experience with these toys in general.

The previous story illustrates that stimulus generalization can be facilitated by the successive training of multiple examples of the same thing. For example, people toy play was trained with a "Star War" android figure, a "Troll" doll, a "Gumby", a male doll and a cut out wood figure.

Definition: Concept
Stimulus Generalization
- The behavioral contingencies
- in the presence of one stimulus
- affect the frequency of the response
- in the presence of another stimulus.
Principle

STRATEGIES FOR GENERALIZATION

Adam learned to play with his new set of toys thanks to the training of sufficient exemplar strategy. Trevor Stokes and Don Baer summarized most of the strategies that you may use to promote stimulus generalization. These strategies affect the frequency of the response in the presence of another stimulus. The following strategies are proposed by Stokes and Baer in their seminal paper.

1. Train and hope—After training it is hoped that generalization would occur across responses, settings, and trainers. This approach is not really a strategy, but rather a lack of strategy. The train and hope approach may or may not produce generalization but no steps are taken to facilitate generalization. At large, train and hope is a bad approach to training children with autism and other developmental disabilities because we know that their behavior tends to come under the exclusive control of the training situation or some component of the training stimulus. This is called stimulus overselectivity (more details on stimulus overselectivity later in this chapter).

<table>
<thead>
<tr>
<th>Training: Frog 1 → hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing: no systematic test for generalization</td>
</tr>
</tbody>
</table>

2. Sequential modification—After the initial training sessions, generalization is systematically assessed across non-training conditions. This means that generalization is assessed in different settings, across therapists, responses and subjects. If generalization does not occur, the target response is trained directly for each of the conditions.

<table>
<thead>
<tr>
<th>Training: Frog 1 → hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing: test Frog 1 across setting, trainers... and test Frog 2</td>
</tr>
</tbody>
</table>

3. Introduce to Natural Maintaining Contingencies—This strategy is achieved by choosing a behavior that will be maintained by reinforcement contingencies that exist in the natural environment, outside of the training sessions. In Adam's case, the stimulation coming from playing with the toy themselves may be a natural maintaining contingency—in this case toy play is automatically reinforced. In addition, Adam may find some peer partners to play with. The attention for the peer play partner could also reinforce appropriate play behaviors—in the case toy play is socially reinforced. The introduction of natural maintaining contingencies also known as the behavior trap. With the behavior trap the behavior is acquired with extraneous reinforcers but, once learned, the behavior is maintained by reinforcers that are directly related to performing the behavior, rather than by the powerful reinforcers that were added during the training. Thus, when the behavior contacts its natural reinforcing contingencies it is trapped. At this point, the additional reinforcers that were once necessary to increase the operant level of the target behavior may be dropped.

| Training: Frog 1 → hop → added reinforcers & natural reinforcers |
| Testing: Frog 1 → hop → natural reinforcers only |

4. Train sufficient exemplars—This is the approach that Dawn selected to train Adam in appropriate toy play. The training of multiple examples of the same concept (e.g., frog and bugs hop around but cars and bikes roll on the ground) is one of the most popular ways to train for generalization. The training goes on until the child starts responding correctly to stimuli that are not trained. The number of examples necessary to achieve generalization will vary across child and across task difficulty.

<table>
<thead>
<tr>
<th>Training: Frog 1 → hop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing: Frog 1 across setting, trainers... and test Frog 2</td>
</tr>
</tbody>
</table>

---


The frequency of the response before the intervention.
But, training multiple examples that vary along irrelevant dimensions is a good way to get stimulus generalization.

5. **Train loosely**—This approach emphasizes the loose control over the $S^D$, the context and the response. For example, in training some conversational skills such as greetings it may be best to use different questions and accept different answers than to only train a single answer to a single question. That is, the teacher may alternate between the following questions: *How are you? What's going on? What's happening? How is it hanging?* And accept responses such as, *well, ok, not bad, so-so, hi, or high.*

6. **Use indiscriminable contingencies**—The behavior analyst arranges the learning environment so that the schedule of reinforcement and/or the layout of the setting are not discriminable. When the learning environment is very different from the natural environment the new response may come under the narrow control of some features of the learning environment. This may be a concern in discrete-trial environments that are usually very discriminable from the rest of the world. So, parents and educators should also conduct training trials in other settings in playroom or during lunch. One way to make contingencies less discriminable is to have a 24 hours a day therapy mixing DTT and incidental training.

7. **Program common stimuli**—The behavior analysis insures that stimuli in the training environment are also present in the generalization environment. Common stimuli maybe tangibles, like Adam's toy bugs and all his other toys, or they may be people that are part of the natural environment but that participated in the training. For example, if Adam's sister or classmates had taught him to play with the toys, sibling or peers would be common to the training environment and to the natural environment. Numerous studies use peer tutors because they tend to facilitate stimulus generalization and response maintenance.

8. **Mediate generalization**—The newly trained response occurs in other situations because it helps appropriate responding. Language is the most common mediator. For example, self-instruction training teaches people to recite rules for solving problems.

9. **Train to "generalize"**—this approach targets generalization as a response in itself. You can reinforce appropriate variations of the correct response.

---

Learning a new skill means that the learner can perform that skill during training and after the training is over. *During training*, the learner must first acquire that skill. We say that a skill is acquired when the learner has reached a predetermined response criterion (for example, three consecutive sessions with 90 percent response accuracy). *After training*, skill maintenance means that the skill maintained across time and unreinforced trials. Often, maintenance is an on-going staff or parent struggle because the initial training does not usually program a maintenance strategy that does not involve external help.

---

**Example transfer of training**

**Correspondence training**

Where have all the cowboys gone?\(^7\)

Bridget sat comfortably in a soft leather chair behind her desk. Her coffee in one hand, an incident report in the other, she read a detailed report written by the staff of the Good Neighbor Group Home. One report caught Bridget's attention. A few days ago, she recalled reading a similar incident report. From reading the account of the incident it was obvious that the staff members were annoyed.

To understand the root of the problem you have to know that, for safety reasons, the room and office doors have no inside lock at the Good Neighbor Group Home. Safety had a price... The staff members complained that residents barged in rooms without knocking. This was especially disturbing when a staff member used the bathroom and a resident slammed open the door.

The staff referred to these invasive residents as cowboys because their door slamming reminded them of the theatrical entrance of a cowboy into the frontier saloon of a spaghetti Western.

As Bridget brought the coffee cup up to her lips, her office door swung open. Here came Leroy, a friendly African-American resident diagnosed with mild mental retardation.

Leroy: What are you doing baby?

Bridget: I'm reading about people walking in without being invited first.

Leroy: You mean like birthday party invited.

Bridget: Yes, you go to birthday parties after being invited.

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Leroy: Man, I like those birthday parties. Delicious sweets. Mmm, delicious. I want a birthday party baby. Mmm. I... (Bridget interrupted)

Bridget: Leroy! We started talking about people walking in without knocking not about birthday parties!

Leroy: Yep, I got to go now. (Leroy turned and briskly walked out of Bridget's office before she had time to say anything.)

During the weekly staff meeting, Bridget mentioned the incident. Everyone agreed that something had to be done. Someone suggested social skill training...

After two weeks of social skill training, doors still swung open, residents still barged in offices and toilets, or engaged in inappropriate talks which they unilaterally ended, and staffs were still called "baby" or "dude." It was time for another intervention.

Bridget performed a task analysis of all the steps needed to enter a room appropriately. She concluded that the chain of behavior should consist of knocking on the door, saying the staff member's name before asking for the permission to enter and asking to speak to the staff member. Bridget also broke down the skills necessary to leave a room after a visit.

Bridget met with the cowboys everyday. She made each cowboy promise that he would enter the room or leave the offices appropriately. On the next day Bridget met with each cowboy and asked for a verbal report. If a cowboy said that he walked in an office appropriately, and the owner of the office reported the same thing, the cowboy could go out to the corner bar and have a non-alcoholic beverage. If the cowboy's report did not match the report of the owner of the office, the cowboy did not receive the reinforce.

**REINFORCEMENT CONTINGENCY**

**INITIAL LINK:**

<table>
<thead>
<tr>
<th>Before</th>
<th>Initial Link</th>
<th>Delay</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leroy does not go to corner bar</td>
<td>Leroy knocks at the door</td>
<td>next day</td>
<td>Leroy goes to the corner bar</td>
</tr>
</tbody>
</table>

**INTERMEDIATE LINK:**

<table>
<thead>
<tr>
<th>Before</th>
<th>Initial Link</th>
<th>Delay</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leroy does not go to corner bar</td>
<td>Leroy says the staff's name</td>
<td>next day</td>
<td>Leroy goes to the corner bar</td>
</tr>
</tbody>
</table>

The final link of the response chain is a bit unusual because the chain of response is only reinforced if Leroy's verbal report matches his non-verbal responses. This matching of verbal and non-verbal responses is sometime called correspondence.

**FINAL LINK:**

- **Before:** Won't go to the corner bar
- **Behavior:** Leroy says that he completed the whole behavior chain
- **Sd:** Leroy did not do the whole behavior chain the day before
- **After:** Won't go to the corner bar
- **After:** Will go to the corner bar

---

*This contingency is called an analogue contingency because the consequence for the behavior is delayed. In Leroy's case, Bridget announces the consequences on the next meeting day. Note that the terminal link is a direct acting contingency because the consequence is immediate.*
A few weeks later, Bridget sat behind her desk drinking her coffee and reading staff incident reports. A line from the reports reminded her of a previous report. One staff member who was unaware of the on-going intervention wrote: "I haven't seen a door swing open for days! Where have all the cowboys gone?"

**ANALYSIS OF THE INTERVENTION**

This intervention illustrates an example of mediated generalization training. The mediational response is Leroy's report of the previous social interactions. The reports became mediators of appropriate social interactions when they matched these social interactions. This match between what someone says and someone does is called correspondence. This intervention specifically trained and reinforced correspondence.

The appropriate social interactions also maintained long after the intervention was discontinued. That is, the appropriate social interactions maintained when the additional contingency were removed. The maintenance of the behavior in the absence of getting a drink at the corner bar, may indicate that Leroy has stepped into a behavioral trap. Some natural reinforcers, like attention and approval, may maintain appropriate social interactions.

**Definition: Concept**

**Performance maintenance**
- The continuing of performance
- after it was first established.

**Definition: Concept**

**Behavior trap**
- Add a reinforcement contingency
- to increase the rate of behavior.
- Then the behavior will frequently contact
- built-in reinforcement contingencies,
- and those built-in contingencies
- will maintain the behavior.

**QUESTION**

1. Describe how you would establish a behavioral chain that would be likely to maintain in the absence of programmed reinforcement (behavioral trap).

**Example of Generalization and Maintenance of DTT skills**

**From School to Home**

Remember Frank and Sang Woo? We saw them in chapter 2 where Sang Woo inadvertently reinforced Frank's tantrum by giving him cookies. When we terminated the reinforcement contingency, Frank's tantrums all but disappeared.

Frank is currently attending a discrete-trial classroom 2-hours a day in addition to working in his home. In the classroom and at home, Frank works on language and motor skills. He is learning to behave as a listener by pointing to objects named by the teacher. And he is also learning to *tact* objects by saying their name when asked "what is this?"

The classroom training took place at a small desk were Sang Woo sat across Frank. All around, partitions separated each child's work area from the rest of the classroom. The home training took place everyday, after school. Sang Woo and Florence—Frank's mom—conducted the home sessions. The home training resembled the school training in that Frank sat in a chair at a worktable across from his teacher. The procedures were also identical at home and at school.

In spite of the similarities between the school and the home, Florence could see a difference in Frank's performance at school and at home.

---


10 The tact is a type of verbal behavior whose form is controlled by non-verbal stimuli. More details on the tact and other verbal behaviors in chapter 13.
In watching a classroom videotape, Florence saw Frank call objects by their name and point to items she had no idea he could identify. In comparing the percentage of correct response for the same procedure, Frank seemed to be cruising at school and stagnating at home. What he learned at school stayed there. What could account for the discrepancy between the school and in-home performance? What was responsible for the lack of generalization?

Marianne Allman, Frank's schoolteacher, thought that the discrepancy between the in-home and school performance might be due to the different ways reinforcement occurred in the two environments. Marianne wrote a note home to insure that Sang Woo reinforced correct responses as often as his teacher did at school. It was agreed that the schoolteacher and Sang Woo would reinforce every third correct response in average for the response that Frank had mastered. When working on a new response, the teacher and Sang Woo delivered a reinforcer after every correct response.

As a result of making the school sessions and the home sessions consistent, Frank started to label items at home while he worked with Sang Woo and Florence. More remarkably, Frank answered correctly during sessions were no reinforcer was provided; at least for sometime.

ANALYSIS OF THE INTERVENTION

This intervention used common schedules of reinforcement in the home and in the school. The similarities of the schedules of reinforcement contributed to make contingencies less discriminable across settings. In addition, many common stimuli were programmed across the school and the home environment. Frank sat at a table in front of his tutor. Common items were used for the tact training. The programming of common stimuli across settings affected increased stimulus generalization. Then, maintenance was assessed during non-reinforced sessions. For these non-reinforced sessions it was clear that no response would maintain in the absence of reinforcement and that we should not expect maintenance in the absence of reinforcers.

CONCEPT

TRANSFER OF TRAINING

Before ending this chapter we would like to mention the concept of transfer of training because it is often mistaken with stimulus or response generalization.

We have told Betty's story in chapter 10. Briefly, Betty learned to dress according to fashion by matching certain colored tops with colored bottoms. Betty's training started modestly with dressing dolls. Only after successes at dressing the dolls did she started dressing herself. This new behavior of dressing herself cannot be explained with stimulus generalization. Stimulus generalization or response generalization means confusion or failure to discriminate. Even though Betty was moderately mentally retarded she could tell the difference between the dolls clothes and the clothes she put on herself. And she surely could tell the difference between the dolls on the table and her own body. The similarities between the training stimuli and the real things are so small that we can't really talk about stimulus generalization. We can't even talk about response generalization because the behavior of dressing the doll has little topographical and functional similarities with dressing herself. So if it's not generalization it's transfer.

Definition: Concept

Transfer of training

- Performance established
- At one time
- In one place
- Now occurs in a different time and place
Example of Verbal Behavior Intervention
Functional Communication Training
and SIB in an Inpatient Unit

Denise's Leather Jacket

Denise is a tall and adipose^2 twenty-nine year old woman. As a child, she was diagnosed with severe mental retardation and had vocal behavior. Throughout her career in a classroom for severely mentally handicapped students, she picked up a dozen signs^3. Of course, that doesn't tell you much about Denise.

Denise is a fighter. She pushes, kicks and bites to get what she likes most: Her leather jacket. She has a mean punch too. Go ask Rocco, the new intern, who just returned from the hospital with a broken nose. At the time of the incident, Rocco was attempting to replace the jacket with a shirt, which was more appropriate for indoor wear. Denise did not like the shirt. She punched him fast and hard.... When no one is within arms reach, Denise also pinches herself.

After she gives herself a pinch, the intern on duty gives Denise her jacket, presumably to "appease" her. For the attentive interns, this self-injurious behavior came to mean, "Give me my jacket."

THE INAPPROPRIATE CONTINGENCY

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denise has no jacket</td>
<td>Denise hits or pinches herself</td>
<td>Denise has a jacket</td>
</tr>
</tbody>
</table>

Establishing Operation

Cold Temperature

Recently, Rocco successfully replaced the jacket with a more appropriate indoor garment, a cardigan sweater. But, this substitution alone was not enough to satisfy Rocco. He thought Denise should learn to request her sweater appropriately. Rocco started functional communication training (FCT). FCT consists in teaching appropriate requests to a person with language deficits.

In the process of teaching the request, Rocco would say "sweater, please" and wait for Denise to repeat an approximation of the request. Each time Denise asked appropriately, he would give her the sweater. She immediately wrapped herself in it and clutched the cuffs tightly. Rocco gradually faded the prompt

---

2 Fatty.
3 Not road signs but American Sign Language.
"sweater, please." Within a few sessions, Denise would ask independently and calmly for her sweater.

Soon Denise stopped pinching herself and hitting others. Rocco is happy about that too.

Although this study claims that FCT decreases inappropriate behaviors, it is not clear whether the decrease occurs because of the newly established verbal response (i.e., the FCT response) or because of the extinction of inappropriate behaviors. A recent study by Hagopian and colleagues showed that FCT without extinction did not contribute to a reduction of inappropriate behaviors. To the contrary, Dr. Hagopian observed an average of 17.4% increase in inappropriate behavior when extinction was not a part of the intervention. Later, when they added extinction to the FCT procedure, all cases showed a 90% or more decrease in inappropriate behavior. Put another way, the extinction component of DRA is crucial to the success of functional communication training interventions.

Denise learned to say, "sweater, please" to get her sweater. However, this is more complex than it sounds. The response "sweater, please" occurs because Denise wants the sweater. But what makes her want the sweater? For example, the cold temperature (an establishing operation) may have evoked the request for the sweater. Bringing the request response under control of the room temperature (an establishing operation) takes some expertise. At first, Rocco provided numerous SDs (e.g., the sight of the sweater and his asking "What do you want?") and prompts (e.g., his saying "sweater, please"). Later, as Denise learned to request, Rocco faded each prompt and SD until the establishing operation (feeling cold) exclusively controlled the response "sweater, please".

---


5 This prompt is also called an intraverbal prompt (more details later in this chapter).

6 This prompt is called a vocal imitation or echoic prompt.
Functional communication training strengthens (or teaches) a verbal response known as a mand. The mand (from demand and command) is a type of verbal behavior that specifies its reinforcer. Think about mands as requests.

**Definition: Concept**

**Mand**
- A verbal response that is controlled by
- an establishing operation and that
- specifies its own reinforcer.

The following diagram illustrates Denise’s manding behavior. We are not so sure about the nature of the establishing operation. Was it temperature or was it sensory deprivation, or both? Earlier we speculated that a decrease in temperature may be the establishing operation for the mand but, for the purpose of this example let’s now assume that the establishing operation was sensory deprivation (the withholding of the sweater). This means that the reinforcers for the mand “sweater, please” were the sensations associated with the stimulation from the sweater (softness, weight, etc.).

EO: TACTILE DEPRIVATION

Below you can see a diagram for the generic contingency reinforcing the mand.

**MAND REINFORCEMENT CONTINGENCY**

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific reinforcers</td>
<td>MAND</td>
<td>Specific reinforcers</td>
</tr>
</tbody>
</table>

EO
- Specific to the behavior or outcome

Now give you own example of mand training

**EO: TACTILE DEPRIVATION**

Before
- Denise has sweater

Establishing Operation
- No tactile stimuli for a while

MAND
- Denise says “sweater please”

After
- Denise has her sweater

What makes us human?

It was Jamon’s first day teaching the seminar in Behavior Analysis and Special Populations. His twelve students sat quietly around the rectangular table in the meeting room.

Jamon had spent hours pondering on the best way to start the seminar. He wanted to make an impact on the new recruits. He needed something powerful enough to capture their

7 The occurrence of the mand is controlled to a lesser extent by non-verbal discriminative stimuli. However, the major controlling variable is the establishing operation.
attention. He thought, "I could impress them by asking if they can hear the voices in my head. Or, I could ask them if they think my butt is too big."

In a moment of inspiration, Jamon thought, "What better way to start a course on Special Populations than by asking 'what makes us unique'."

Most people would say that we have a mind or that we can think about the future and remember the past. Some people may say that we have a culture and a cultural evolution unlike any other species. Some may also say that our use of language is unique to Homo sapiens.

As Jamon thought about the things that made us so special he covertly zoomed in on one feature of our behavior—language or verbal behavior. Verbal behavior was the common denominator to all the other human attributes. Thinking, planning ahead, and recalling the past, are (dependent on) verbal behavior. In addition, the elaboration and transmission of a culture across generations and advances in technology leading to the domestication of untamed resources are intimately dependent on verbal behavior.

"Why are we blessed with the gift of verbal behavior?" Jamon said to the class.

"Because we have a mind." Said Blake with an air of unshaken confidence.

"Well, how do we know we have a mind?" Jamon said.

"We can speak and express our thoughts." Said Christy, a bit annoyed by this naive question.

"Good", said Jamon, "let's see, if verbal behavior is an expression of our mind, and our mind is only explained by the presence of language, what error are we making?"

"Isn't it like circular reasoning?" Said Sang Woo.

"You are right. This is totally circular", Jamon replied. "We have the ability to speak the way we do because of a long evolutionary process that left us with a specially shaped larynx, and a tongue and lips that we could control relatively easily. I guess a small difference in morphology gave us the coolest gift of all—verbal behavior."

"So what?! What's so cool about verbal behavior? Can't we get things done without it?" That was Kevin's sarcastic voice.

What's cool about verbal behavior?

This is the comment that Jamon had hoped for. Kevin had raised the fundamental issue. Kevin had unknowingly defined verbal behavior.

"Great comment, Kevin! What is the difference between verbal and non-verbal behavior?" Jamon asked.

"None," said Kevin. "It's all behavior. I guess verbal behavior is a bit easier because it doesn't involve many muscles, so you can speak for a long time."

"You are close. It is true that talking is behavior, like pushing or pulling. However, it is a little bit different. The consequences for the verbal behavior always depend on the reaction of your listeners." Said Jamon.

Jamon scribbled the familiar contingency diagram on the board:

<table>
<thead>
<tr>
<th>Before</th>
<th>Behavior</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison has no milk</td>
<td>Allison babbles &amp; grabs the milk bottle</td>
<td>Allison has milk</td>
</tr>
</tbody>
</table>

8 Of course, other animals do have a language. Maybe even a complex form of language. But that's for another seminar or another day.
Jamon said that grabbing the bottle was clearly non-verbal behavior. Why?

"It's not verbal behavior because Allison didn't speak. She hasn't used her vocal cords." Said Julie.

Jamon replied, "You are almost right. But, verbal behavior is not only vocal. You could ask verbally by signing, pointing toward the bottle or handing an icon with the picture of the milk bottle. That's still called verbal behavior; it's just non-vocal verbal behavior. We know that Allison did not use verbal behavior by looking at the consequence for her behavior. In this case, reaching and grabbing the bottle got the milk bottle. Allison didn't need anyone to deliver the milk. She got it herself. Technically, we say that because no caregiver (acting as a listener) provided the milk, the behavior (reaching and grabbing) is classified as non-verbal behavior.

Now, let's imagine mom was around. As Allison reaches toward the bottle and babbles 'bababbbaaa,' mom picks it up and gives it to her. Later, each time Allison says 'bababbbaaa' mom diligently hands her a milk bottle. Would this qualify as verbal behavior? And why?"

Stan, the grad student, answered rapidly, "The mother provides the consequence; so it must be verbal behavior, I mean language."

"Exactly," said Jamon, "and this is what the interaction looks like when we use a diagram."

**MAND REINFORCEMENT CONTINGENCY**

![Diagram]

Jamon added, "notice that the 'mom-stimulus' serves two functions. First, mom is a discriminative stimulus for babbling for milk (remember that the major controlling variable is the establishing operation). This means that mom reinforces a particular babbling sound. In other words, mom has been correlated with the availability of the reinforcer. So, when mom is around, the baby tends to babble more than when she goes shopping."

Jamon continued, "Second, mom provides the reinforcer. Unlike the S^- you find in the Skinner box - the light or the sound - mom is actually responsible for the presentation of the reinforcer. That's why Allison loves her mom."

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**Definition: Concept (broad definition)**

**Verbal Behavior**
- Behavior that is reinforced by the mediation of another person.

**Vocal Behavior**
- Any behavior of the vocal cords.

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9 Verbal behavior is the term used by B. F. Skinner. It is often confused with vocal behavior (sounds and noises). For Skinner speech meant verbal-vocal behavior and other methods of non-vocal language, including gestures, were also verbal behaviors.
**Question:** On a separate piece of paper, give an example of:

- non-verbal
- non-vocal behavior
- non-vocal verbal behavior,
- and non-verbal vocal behavior.

**Definition: Concept Review**

**Discriminative Stimulus (S°)**
- A stimulus in the presence of which a particular response will be reinforced or punished.

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**How do we Talk about Verbal Behavior? The Terminology Maze**

Behavior analysts treat language as behavior and that's why most behavior analysts use the expression *verbal behavior* when talking about language. Language is also operant behavior. As such, it is controlled by contingencies of reinforcement and punishment. And once we adopt that view, we are in a better position to teach verbal behavior to people that have deficits. Behavior analysts are also interested in the function of the words we say rather than in the words themselves," said Jamon and he waited for some reaction from the students.

"Are you saying that we should stop studying grammar and semantics?" said Stan to facilitate the discussion. Before seminar, Stan and Jamon had agreed that Stan would play the "Devil's advocate" to help illustrate the problem.

"I guess, what I'm saying is that verbal behavior means behaving with words and this type of behavior is as functional as behaving without words. So, if we are serious about teaching verbal behavior to children with autism, we should teach functional verbal behavior rather than grammar or the meaning of words."

Researchers working in the field of linguistics are concerned with the meaning of words. They say that the speaker translates an idea into words (encoding) and speaks to the listener. Upon receiving the words, the listener decodes the words by transforming them into ideas. All this is speculative thinking! The computer processing system metaphor is an easy answer to a complex problem.

You should think of language as an interaction between the speaker and the listener, said Jamon. Linguists tend to emphasize the role of the listener who perceives and encodes words and sentences. Behavior analysts are targeting the speaker's behaviors because they are interested in the variables controlling language production, in addition to how people understand language. The role of the listener (also called audience, like at a theater) is important in *shaping,* and *maintaining* the speaker's behavior. However, studying the speaker's behavior has a great advantage: It allows us to teach language to people with language deficits.

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**Why do we say the things we say?**

As we have seen throughout the previous chapters, people with developmental disabilities often have a poor verbal repertoire (See a great article by Philip Drash & Roger Tudor for an elegant analysis of possible aggravating factors...
for language delays\textsuperscript{11}). The verbal repertoire consists of various operants (behaviors). And the elementary verbal operants include mands, tacts, echoics and intraverbals.

"What are some controlling variables for language? Or, why do we say the things we say," asked Jamon.

As mentioned earlier in this chapter, the mand is a verbal operant whose major controlling variable is an establishing operation. The mand specifies its reinforcers (Michael, 1998\textsuperscript{12}, p. 154; Skinner, 1957, Chapter 3\textsuperscript{13}). This means that the mand is controlled by what you want.

The tact is a verbal operant whose form is under the control of a nonverbal $S^D$. The tact specifies what the individual sees, hears, touches, smells and feels (Michael, 1998, p. 149-150; Skinner, 1957, p. 81). In general, tacts are reinforced by generalized reinforcers, like praise and approval. The tact is sometimes referred to as a label or name.

The intraverbal is a verbal operant whose major controlling variable is a verbal stimulus with which it does not have point-to-point correspondence (i.e., subdivisions or parts of the response are not identical to other subdivisions or parts of the verbal $S^D$). The intraverbal specifies a different verbal response to a verbal stimulus. Holding a conversation and answering questions on an exam are common examples of intraverbal behavior.

Finally, the echoic is a vocal-verbal operant whose principal controlling variable is a model's vocal-verbal stimulus which it matches (point-to-point correspondence). The echoic specifies the speech sounds the individual heard. Most early intervention programs place a heavy emphasis on mand and echoic training. Because mand training helps the learner meet immediate needs and decreases inappropriate ways to ask for things, and echoic training facilitates the learning of other verbal repertoires (and also vocal articulation). It stands to reason, that when a child can echo words, these words can be trained as mands, tacts or intraverbals. We should think of the echoic as the corner stone of verbal behavior.

"So, if you see something and call it by its name, do you have a tact?" Stan said.

"That's right, this is called tacting. When you 'tact,' your response is controlled by the visual, auditory, gustatory (taste), and olfactory or tactile (touch) properties of a non-verbal stimulus. This means that if you say 'chicken' when you see, feel, smell, taste or hear a chicken you are tacting. Usually, tacting is followed by social reinforcement. The implication is that if you say 'chicken' because you want to eat, then you are not tacting but you are manding, because your behavior is reinforced by getting some chicken rather than by getting attention or approval. When we start tact training, (teaching a child to tact or name something) we may use tangible reinforcers such as dime-sized snacks, rather than social reinforcers, especially if social approval has not yet become very reinforcing for the child" said Jamon.

Jamon rushed to the board and frantically drew the generic diagram for the tact contingency.

\textsuperscript{11} Drash, P. W., and Tudor, R. M. (1993). A functional analysis of verbal delays in preschool children: Implications for prevention and total recovery. The Analysis of Verbal Behavior, 11, 19-29. Unfortunately this journal is very hard to find even in major research libraries. You can obtain copies of the journal (a.k.a., AVB) by contacting the ABA national office in Kalamazoo, MI.


**Tact Training and Discrete Trial**

"How should we teach this behavior to children with language deficits?" Dawn asked. "We can show them an object and ask, 'what is this?'" said Stan, who was familiar with the Lovaas-style discrete-trial procedure.

"That's it!" said Dawn with enthusiasm. "You show an object and give a prompt, like 'What is this?' or 'What do you see?' and you reinforce the correct tact with a reinforcer that is not related to the response. This means that if the child says 'Cup' (when he sees a cup), he gets a bite of food, a sip of drink, or nice, warm praise. In the context of tact training the child labels the objects but does not want the object."

"How would you categorize the verbal response 'cup' if the child actually wanted the cup?" said Jamon.

**Intraverbal Behavior and Discrete Trial**

After a year of discrete-trial training Willy, age 10, had a solid tact repertoire. He could name almost any toy or food. Willy could also tact various animals, furniture, clothing articles, colors, shapes and textures. Unfortunately, Willy could not carry on a conversation or

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answer to the simplest question that drew on concepts. When his mom asked, "Name a food" or "Tell me about lions", Willy kept quiet, as if he didn't hear the question.

Meanwhile, at Big-Time Discrete-Trial classroom, Mae, the teaching assistant, thought the time had come to teach some basic intraverbal skills.

In the cubicle Stan asked, "Willy, name a toy." Willy rolled his eyes.

Stan said, "Car."
Willy repeated, "Car."

Stan asked again, "Willy, name a toy." Willy frowned and looked toward his favorite food, baby-carrots, stored in a cup.

Stan said, "Car."
Again, Willy repeated "Car."
Immediately, Stan said, "Name a toy."
Willy replied "Car." Stan praised him copiously and gave him a piece of carrot.

Eventually, Willy learned many intraverbal relationships. An intraverbal response is controlled by previous verbal stimuli (e.g., spoken words). This means that an intraverbal response may be an answer to a question or a memorized poem where each line and word is spoken in a sequence determined by the previous word. For example, when Willy's mom asked, "What are some toys you play with?" he replied "car, ball and doll." After learning some adjectives, Willy started to combine adjectives and nouns. When asked "Tell me about an animal," he would say, "big dog, furry cat...."

When Willy joined the public classroom, he had learned long chains of intraverbals.... One day, while the children wrote quietly, Willy stood up and faced the Star-Spangled Banner. He said "I pledge allegiance to the flag of the United States of America and to the Republic for which it stand, one nation under God, indivisible, with liberty and justice for all," and his voice conveyed the triumph of a new imperator.

### Concept: Definition

**Intraverbal**
- Verbal behavior that is controlled by
  - an immediately preceding language stimulus
  - and that is reinforced with
  - a non-specific reinforcers.

### ANALYSIS OF THE INTERVENTION

Willy's intraverbal training started with one-word answers such as "red" or "dog". Once Willy acquired a number of answers, like "pants, shoes, and shirt," to the question "What do you wear?" Mae probed and trained multiple word answers. This means that Willy started saying "blue pants" or "fuzzy socks" when asked, "What do you wear?" Although this is clearly not "making conversation" it is a humble start.

The important thing to remember is that language is made of large classes of behaviors that serve very different functions. Some verbal behaviors allow you to get things while others allow you to describe things etc. As an adult, when you learn new words, you can immediately use the new word in many situations. But very young children and children with language delays do not automatically tact an object because they have learned to ask for it. So, you should training all language functions relevant to the same word.

Also forget about expressive language. They are so many subcategories of expressive language that expressive has no value for describing (assessing) a child's repertoire and designing an INDIVIDUALIZED program. Start using the functional taxonomy offered by B.F. Skinner: TACTS, MANDS, INTRAVERBALS, etc.
Date: 7 March 2000

To: Richard Malott, Principal Investigator
    Sebastian Bosch, Student Investigator for dissertation

From: Sylvia Culp, Chair

Re: HSIRB Project Number 99-12-05

This letter will serve as confirmation that your research project entitled "Elementary Principles of Behavior Applied to Autism and Other Mental Disabilities: A Workbook Evaluation" has been approved under the expedited 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.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

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

Approval Termination: 7 March 2001
BIBLIOGRAPHY


