Differential Reinforcement & Antecedent Control
(Using Prompting and Shaping to Teach Behaviors)

SPCD 519
February 22, 2010

Stimulus Control

Learning to pay attention to and respond differentially to things in the environment (stimuli) that
- give us info about what behavior is probably going to work in this situation,
- the context under which it will be effective, and
- what we will likely get for it (reinforcement).

Discriminative Stimulus ($S^D$)

- An antecedent stimulus that signals that reinforcement is available if a response is displayed
- Comes before a response
- Signals that a response will probably be reinforced—occasions the behavior
Stimulus control

S₀ R Sᵣ⁺

Antecedent Behavior Consequence
Phone rings Pick up phone and answer it. Talk to person who called.

S-delta (S▲)

• Any antecedent stimulus present when the behavior is NOT reinforced

S⁻ R S⁻⁺

Antecedent Behavior Consequence
Knock on door. Pick up phone and answer it. No one talks to you.

An S-delta signals that reinforcement is NOT available.

Using Differential Reinforcement

1. Reinforce the target behavior when it occurs in the presence of the discriminative stimulus, AND
2. Don’t reinforce the target behavior when it occurs in the absence of the discriminative stimulus or in the presence of the S-delta.
• **Stimulus Discrimination** - Ability to tell the difference between two events or stimuli and change your response accordingly
  - E.g., See red light, I stop the car.
  - See green light, I accelerate.

• **Simple discrimination training** - teaching a student to differentiate one thing from another
  - \( A \neq B \)

---

**Discrimination training using differential reinforcement**

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Behavior</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog (( \text{S}^D ))</td>
<td>Student says, “dog.”</td>
<td>Praise</td>
</tr>
<tr>
<td>Cat (( \text{S}^+ ))</td>
<td>Student says, “dog.”</td>
<td>Teacher says, “Wrong!”</td>
</tr>
</tbody>
</table>

---

**Stimulus Overselectivity**

• **Stimulus overselectivity**
  - Focusing on one aspect of an object or environment while ignoring other aspects
  - Doesn’t know which characteristics to focus on
  - Learns to pay attention to irrelevant stimuli (e.g., background color of word card)

• **Examples**
  - Vending machines
  - Beginning readers

• How can you make the \( \text{S}^+ \) more salient so that student will be more likely to make correct response?
Factors that affect the $S^D$'s Control Over a Behavior:

- The **potency** of the $S^D$ and/or $S^R^+$
- The **reliability** of the $S^D$ in predicting $S^R^+$
- The **immediacy** of the $S^R^+$ that the $S^D$ predicts
- The **cost** of attaining the $S^R^+$ that the $S^D$ predicts

Prompts: How we initially get an individual to exhibit the desired behavior in the presence of the $S^D$

**Prompts** — behavior of another person **or** a type of stimulus that “increases the likelihood that a person will engage in a correct behavior at the correct time”
- delivered **with or after** presentation of the $S^D$
- are used to reduce errors when individuals are acquiring new skills, but are then faded as the new skill becomes more fluent

Prompting Process

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Behavior</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target stimulus present ($S_d$)</td>
<td>Behavior does not occur</td>
<td>Do not reinforce</td>
</tr>
</tbody>
</table>

If behavior does not occur, then
- there is no behavior to reinforce
- no stimulus control can be established
- no learning of the target behavior can occur
The prompt is used to get the behavior to occur. Behavior is reinforced when the target stimulus is present. This allows target stimulus to get control of behavior.

E. Carter, 2006

Prompting & reinforcing the behavior only when the target stimulus is present gives the stimulus the control that the prompt has.

Prompting once usually is not enough!!

E. Carter, 2006

If the behavior consistently occurs only when the target stimulus is present,
- the prompt is not needed;
- transfer of stimulus control has occurred
- learning has occurred—Celebrate!!!

E. Carter, 2006
Types of prompts:

- Response prompts – assistance by another person to increase likelihood that correct behavior will occur in the presence of the $S^D$

Transferring Stimulus Control

- **Transfer of stimulus control** is eliminating the prompt (fading) to get the behavior under the stimulus control of the natural (relevant) $S^D$
  - Used to get the behavior to occur in the presence of the $S^D$ without prompts
  - Avoids prompt dependency

- How do you eventually remove prompts?
  - By using prompting hierarchies or some form of time delay

Verbal Prompt
Gesture
Model
Partial Physical
Full Physical

Least-to-most prompting Hierarchy
Graduated Guidance

Reduce prompt (gradually) from full physical guidance to “shadowing”

Time Delay is a procedure to fade prompts

- Constant (fixed) Time Delay
- Gradual/Progressive/Increasing Time Delay
Another Type of Prompt

- **Stimulus prompts** – a change in some aspect of the \( S^0 \) that makes a correct discrimination more likely
  - Also must fade these prompts

<table>
<thead>
<tr>
<th>cat</th>
<th>rat</th>
<th>bat</th>
<th>sat</th>
</tr>
</thead>
</table>

**Stimulus Shaping:** distractor stimuli initially very different from the natural stimulus on one or more dimensions; over time, are changed to be more like the natural stimulus, requiring the student to make increasingly fine discriminations between the two

<table>
<thead>
<tr>
<th>cat</th>
<th>rat</th>
<th>bat</th>
<th>sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>cat</td>
<td>rat</td>
<td>bat</td>
<td>sat</td>
</tr>
<tr>
<td>cat</td>
<td>rat</td>
<td>bat</td>
<td>sat</td>
</tr>
<tr>
<td>cat</td>
<td>rat</td>
<td>bat</td>
<td>sat</td>
</tr>
</tbody>
</table>

**Stimulus fading:** changing one or more dimensions of the stimulus prompt

```
| star | star | star | star |
```

```
| milk | milk |
```

```
| star | star |
```
Teaching Complex Behaviors: Chaining

**Chain** - A complex behavior consisting of two or more component behaviors that occur together in a sequence; sometimes called stimulus-response chains

**Link** – each component behavior or subskill within a behavioral or instructional sequence

---

**TASK ANALYSIS**

- **Stimulus-Response Chain**
  - **Backward Chain**
  - **Forward Chain**
  - **Total Task Chain**

---

- **Backward Chaining** - *Last* component of chain is taught/reinforced first, then next-to-last, and so on, until entire chain is learned (e.g., learning to use computer to access the internet, JABA, 40(1) pp. 185-189)

- **Forward Chaining** – *First* component of chain is taught first; then next step and so on until entire chain is learned
Total Task (Concurrent) Presentation

- Trainer **prompts** the learner through **all** steps in the chain, then gradually fades prompts, until individual completes entire chain independently.

---

Teaching with Prompts

1. Choose the prompt most appropriate for the student and the task.
2. Get the student’s attention.
3. Always start the learning situation by presenting the S₀ (natural cue).
4. Prompt the correct response.
5. Reinforce the correct behavior.
6. Fade prompts as soon as possible (transfer stimulus control)
7. Continue to reinforce unprompted responses.

---

Shaping

**Shaping**: Differential reinforcement of successive approximations of a target behavior, until the target behavior is exhibited.

Reinforce slight changes in some dimension of the behavior until the behavior gradually approaches the target.
How to Use Shaping

• Define target behavior precisely
• Identify an appropriate starting point/behavior
• Choose proper size and duration of time on steps (pace)
• Choose reinforcer
• Combine use of discriminative stimuli with shaping
• Differentially reinforce successive approximations

Coming up next week

• We’ll learn ways to use consequences to INCREASE behaviors and learn how to write a behavior support plan based on the purpose/function of a problem behavior.
• Read Chapter 7 in your text and the Pengra chapter on E-Reserves.
• We’ll begin work on a case study that will help you practice writing BSPs (Sm Grp #5).