Stimulus Control

What is stimulus control?
- Occurs when the rate, latency, duration, or amplitude of a response is altered in the presence of an antecedent stimulus
- Is acquired when responses are reinforced only in the presence of a discriminative stimulus ($S^D$)
- And not in the presence of other stimuli
  - Known as stimulus deltas ($S^\Delta$)

The Development of Stimulus Control

$S^D$  $\rightarrow$  Response  $\rightarrow$  $S^{R+}$
Telephone rings  Pick up phone and say “hello”  Friendly conversation

$S^A$  $\rightarrow$  Response  $\rightarrow$  $S^O$
Doorbell rings  Pick up phone and say “hello”  Friendly conversation withheld

Comparison of Stimulus Control and Motivating Operations

- Similarities
  - Both events occur before the behavior of interest
  - Both events have evocative functions
- Motivating operation is something that changes the value of a stimulus as a reinforcer
  - Establishing operation (EO) makes the reinforcer more valuable
  - Abolishing operation (AO) makes the reinforcer less valuable

MOs and Stimulus Control

EO  $S^D$  $\rightarrow$  Response  $\rightarrow$  $S^{R-}$
Difficult Worksheet  Teacher 1  Student displays aggression  Task break provided

EO  $S^A$  $\rightarrow$  Response  $\rightarrow$  $S^O$
Difficult Worksheet  Teacher 2  Student displays aggression  Task break withheld

Stimulus Generalization and Discrimination

- Stimulus Generalization
  - Occurs when stimuli that share similar physical characteristics with the controlling stimulus evoke the same behavior as the controlling stimulus
- Stimulus Discrimination
  - Occurs when new stimuli that are similar to the controlling stimulus but do not evoke the same response as the controlling stimulus
Stimulus Control and Stimulus Generalization are a Continuum

Stimulus Control and Stimulus Generalization are a Continuum

Stimulus Control: SD Responses that occur in the presence of SD are reinforced. Behavior increases.

Stimulus Generalization: SΔ Responses that occur in the presence of the SΔ are not reinforced. Behavior decreases.

Note: Reduced reinforcement quality or quantity will also decrease behavior.

The Development of Stimulus Control

SD: Telephone rings
   Response: Pick up phone and say "hello"
   SR+: Friendly conversation

SΔ: Doorbell rings
   Response: Pick up phone and say "hello"
   SΔ: Friendly conversation withheld

Concept Formation

In ABA, is not a hypothetical construct or mental process.

Complex example of stimulus control that requires:
1. Stimulus generalization within a class of stimuli
2. Stimulus discrimination between classes of stimuli

Example: Concept of Red

Stimulus generalization across all red objects
- Light red to dark red
- Different objects (car, ball, pencil)

Stimulus discrimination between red and other colors
- Red ball vs. yellow ball
- Red dress vs. blue dress

Teaching Concepts

Requires discrimination training

Antecedent stimuli representative of a group of stimuli that share a common relationship are presented with stimuli from other stimulus classes.

Ultimately, the common stimuli form a stimulus class.
Types of Stimulus Classes

• Feature stimulus class
  • Stimuli share common physical forms (i.e., topographical structures)
  • Stimuli share common relative relationship (i.e., spatial arrangements)
  • Developed through stimulus generalization
• Arbitrary stimulus class
  • Do not share a common stimulus feature
  • Limited number of stimuli
  • Developed using stimulus equivalence

Stimulus Equivalence

• The emergence of accurate responding to untrained and nonreinforced stimulus-stimulus relations following the reinforcement of responses to some other trained stimulus-stimulus relations.
• Useful for teaching complex verbal relations
  • Reading
  • Language arts
  • Mathematics

Factors Affecting Stimulus Control

• Consistent use of reinforcers contingent upon correct responding in the presence of the $S^0$ is critical.
• Also important are:
  • Pre-attending skills
  • Stimulus salience
  • Masking and overshadowing

Pre-attending

• Is a prerequisite skill for stimulus control
  • Looking at instructional materials
  • Looking at teacher when responses are modeled
  • Listening to oral instructions
  • Sitting quietly for short periods of time
  • These may need to be taught before stimulus control procedures are implemented

Stimulus Salience

• Is the prominence of the stimulus within the environment
• Increased saliency facilitates efficiency of instruction

Masking and Overshadowing

• Increase or decrease salience of stimuli
• Competing stimuli may block the evocative function of an $S^0$
• To limit the negative effects:
  • Rearrange the environment
  • Make instructional stimuli more intense
  • Consistently reinforce behavior in the presence of instructionally-relevant stimuli
Using Prompts

- Can be very important
- Are supplementary antecedent stimuli used to cause a correct response in the presence of an S<sup>0</sup>
- Two types:
  - Response prompts operate directly on the response
  - Stimulus prompts operate directly on the antecedent task stimuli

Response Prompts

- Verbal instructions
  - Vocal
  - Non-vocal (e.g., written)
- Modeling
  - A demonstration of the desired behavior
  - Physical Guidance
    - Partially physically guide the student’s movements

Stimulus Prompts

- Movement cues
  - Pointing, tapping, touching, looking at
- Position cues
  - Place one stimulus closer to the student
- Redundance
  - Stimulus or response dimensions are paired with correct choice

Transfer of Stimulus Control

- Prompts should be used only during acquisition
- Transfer stimulus control from prompt to naturally-existing stimuli by using fading
- Want the transfer to be fast

Transferring from Response Prompts

- Most-to-least prompts
  - Physically guide participant through entire performance
  - Gradually reduce amount of physical assistance
    - Modeling
    - Verbal instruction
    - Natural stimulus

Graduated Guidance

- Immediately fade physical prompts
- Follow participant closely with hands
- Gradually increase distance between hands and participant
Least-to-Most Prompts

• Provide participant with an opportunity to perform the response with the least amount of assistance on each trial

• Participant receives greater degrees of assistance with each successive trial without a correct response

Time Delay

• Varying the time interval between presentation of a natural stimulus and the presentation of a response prompt

  - Constant time delay
    • Begin with a 0-sec delay
    • Then use a fixed delay (e.g., 3 sec)

  - Progressive time delay
    • Begin with a 0-sec delay
    • Gradually and systematically increase delay

Stimulus Fading

• Highlight a physical dimension of a stimulus, then gradually fade the exaggerated dimension

• Superimposing one stimulus on top of another and gradually fade it

Stimulus Shape Transformations

• Use an initial stimulus shape that will prompt a correct response

• This shape is gradually changed to form the natural stimulus, while maintaining correct responding

Summary

• Stimulus control is very important in changing behavior.

• Need to be systematic about how you will do it

• Monitoring of behavior is critical for success

• Provide good reinforcers