

*Behavior Analysis and Strategy  
Application after Brain Injury:  
Addressing the long-term behavioral  
outcomes of brain injury*

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# *The Analysis of Behavior: Key Points*

- Definition of behavior includes thinking, saying and doing.
- Behavior occurs, interacts with the environment and produces consequences.
- Darwinian-like model wherein behaviors are selected by the environment.
- The goal of behavior analysis is to enable prediction and change of behavior.



# *Two Types of Learning*

## *Respondent*

- Concerned with environmental events that precede target responses.
- $S \rightarrow R$

## *Operant*

- Concerned with environmental events that follow the responses (its consequence)
- $R \rightarrow S$

# *Respondent or “Classical Conditioning”*

- Must involve a reflexive response (blink, salivation, etc.)
- Stimulus elicits a response (organism is passive)
- Think Pavlov’s dog....



# *Respondent or “Classical Conditioning”*

- Classical Conditioning is a process by which a neutral stimulus comes to *elicit* a reflexive response through pairing with a stimulus that already elicits a reflexive response.
- *In short...Classical Conditioning is the formation of new reflexes!*



# *Operant Conditioning*

- But as you probably already noticed, we do not simply react to stimuli in the environment.
- Based on our history, we also act in ways that affect or change the environment.
- This is where the  $R \rightarrow S$  arrangement, mentioned previously, requires examination.



# *The Three and Four Term Contingency*

The familiar... 3 Term

$$A \rightarrow B \rightarrow C$$

The more precise... 4 Term

$$E.O. \rightarrow S^D \rightarrow R \rightarrow S^{+/-}$$



# *The Four Term Contingency*

**Establishing Operation:** Any change in the environment that alters the effectiveness of some stimulus or event as a reinforcer.

**Discriminative Stimulus:** An event or stimulus that precedes a response and sets the occasion for the behavior to occur.

**Response/Behavior:** "If a dead man can do it, it ain't behavior. And if a dead man can't do it, then it is behavior"

**Stimulus:** Any event that changes the probability of a response when presented after it:  $S^+$  refers to a stimulus that increases the probability of a behavior occurring, and  $S^-$  refers to a stimulus that decreases the probability of a behavior occurring...but more on that later.



# *Keys to Operant Conditioning...*

- Concerned with environmental events that follow the response (its consequence)
- The organism is active
- The organism emits responses
- Involves reinforcement and punishment
- Think Skinner...



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# *Operant Conditioning*

- Operant conditioning is a training or learning process by which the consequence of a response affects the likelihood that the individual will produce that response again.



# *Reinforcement*

Reinforcement refers to any process that *increases* the likelihood that a particular response will occur again in the future.

*Positive Reinforcement* occurs when the arrival/delivery of some stimulus following a response makes that response more likely to occur in the future.

*Negative Reinforcement* occurs when the removal of a stimulus following a response make that response more likely to occur.



# *Punishment*

Punishment refers to any process that *decreases* the likelihood that a particular response will occur again in the future.

*Positive Punishment* occurs when the arrival/delivery of some stimulus decreases the likelihood that the response will occur again.

*Negative Punishment* occurs when the removal of some stimulus decreases the likelihood that the response will occur again.



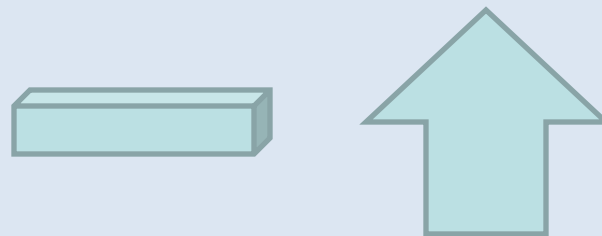
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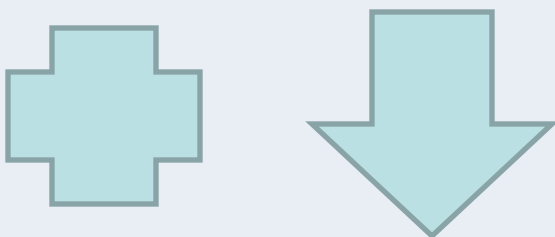


**A stimulus is added such that the likelihood of the behavior increases.**

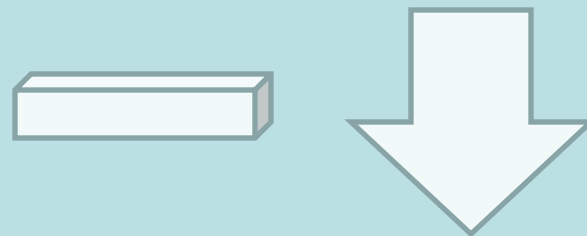


**A stimulus is removed such that the likelihood of the behavior increases.**

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**A stimulus is added such that the likelihood of the behavior decreases.**

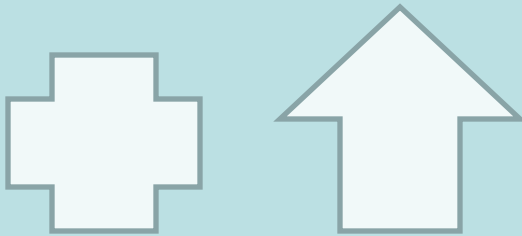


**A stimulus is removed such that the likelihood of the behavior decreases.**

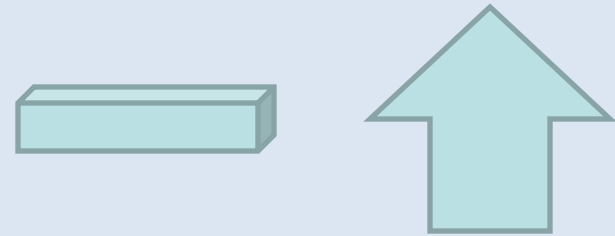
Positive

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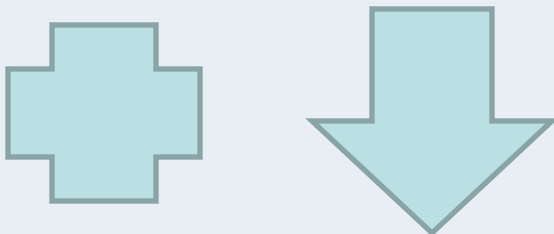


**A day laborer is paid after 8 hours of work, as a result they return the next day.**

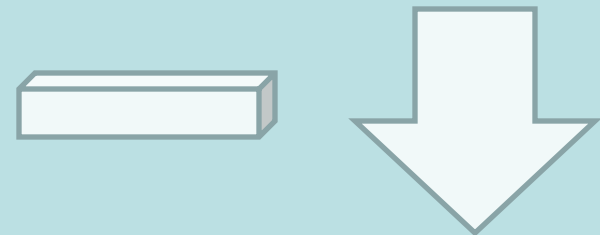


**After hitting the snooze button the alarm goes off, as a result the snooze button is used more in the future.**

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**A pink slip is issued to the late employee, as a result the employee begins to come to work late less often.**



**A fine is issued to a driver for speeding, as a result the driver speeds less frequently.**

# *Function*

- Function is the behavior analytic term that refers to “why” an individual exhibits a certain behavior; specifically, it refers to those consequences that maintain the behavior.
- Often, an individual will display a number of behaviors that may differ in topography but share a similar function; these are referred to as Functional Classes of Behavior.
- All operant behavior occurs within some context, and understanding this context is key to modifying any behavior.



# *Generalization*

When an organism responds similarly to different/un-trained stimuli or situations.



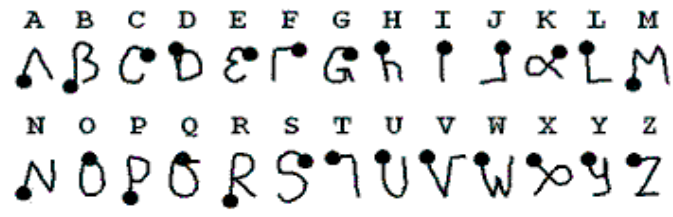
# *Discrimination*

When an organism responds differently to similar stimuli.



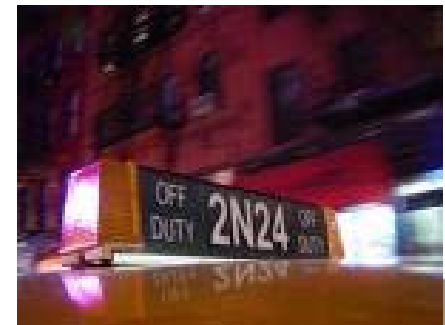
# *Shaping*

A technique in which successively closer approximations to the target response are reinforced until the target response finally occurs.



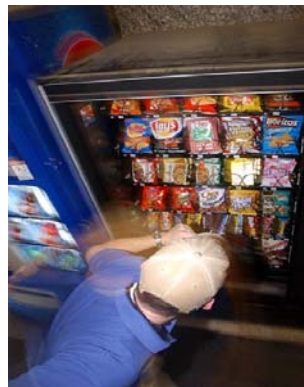
# *Extinction*

A planned or unplanned process by which an operantly conditioned response declines in rate and eventually disappears if it no longer results in a reinforcer.



# *Characteristics of Extinction*

- **Extinction Burst:** a phenomena associated with extinction, characterized by a rapid and/or escalated burst in responding following the termination of contingent reinforcement.
  - Extinction bursts can also include shifts in the topography of the behavior.

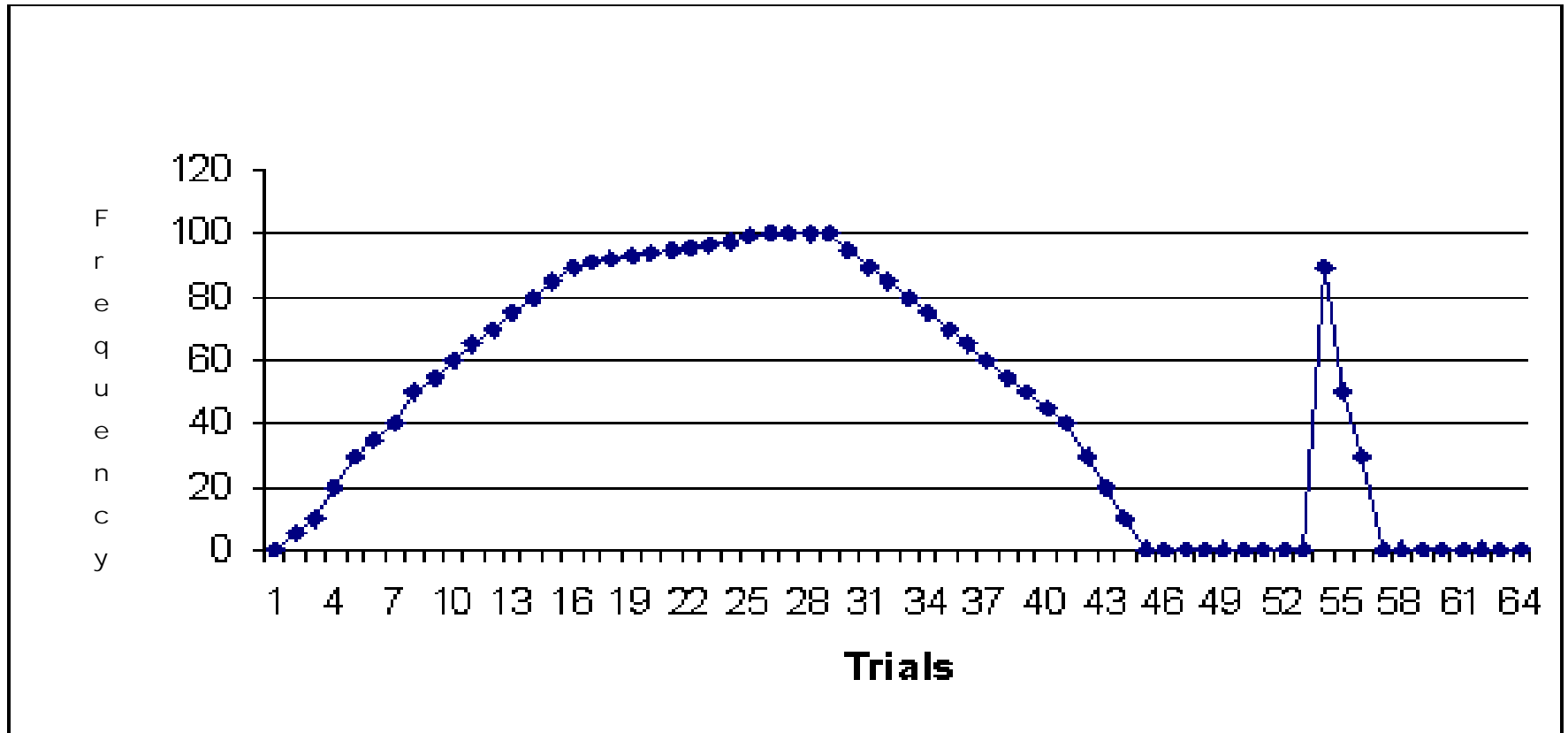


# *Characteristics of Extinction*

- Passage of time following extinction can include *spontaneous recovery* of responding, i.e. “one more try.”
- A single reinforced response following extinction can result in the individual responding again, even at a rapid rate.



# *Extinction Curve*



# *Schedules of Reinforcement*

- *Extinction*: A particular response never produces a reinforcer.
- *Continuous Reinforcement*: A particular response always produces a reinforcer (1:1).
- *Intermittent Reinforcement*: A particular response sometimes produces a reinforcer.



# *Continuous Reinforcement*

- Produces less variability in topography of behavior.
- Utilized to promote acquisition of behavior
- Behavior is highly sensitive to extinction
- Think piece work and soda machines



# *Intermittent Reinforcement*

- Produces greater variability in topography of behavior.
- Utilized to promote generalization and maintenance of behavior
- Behavior is highly resistant to extinction
- Think hourly pay and slot machines



# *Why Do We Need to Know About Schedules of Reinforcement?*

- In order to understand what is maintaining a particular behavior we not only need to look at the function of that behavior, but also the schedule on which it is being reinforced or maintained.
- Behaviors within the same functional class can be sensitive to concurrent schedules of reinforcement, making analysis more critical.
- Attempting to intervene without this knowledge could result in danger to client or others.

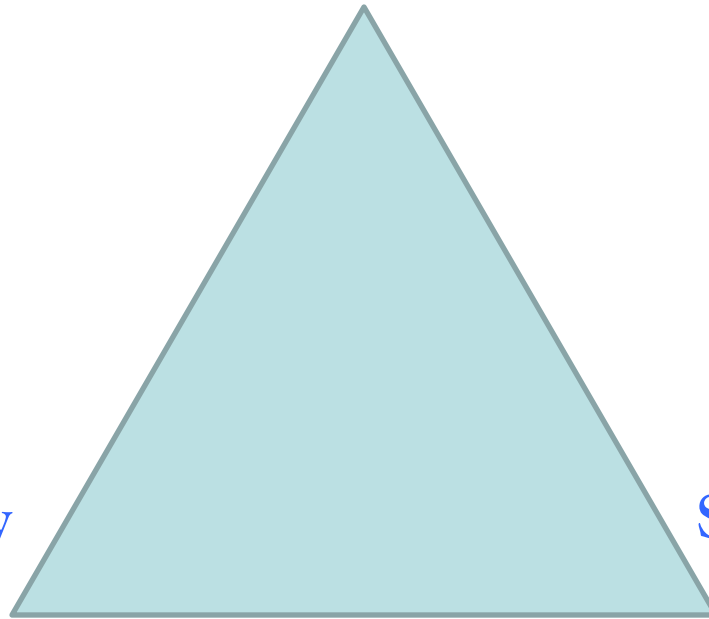


# *Applied Behavior Analysis in Neurobehavioral Programming:*

Establish  
Medical Stability

Promote  
Behavior Stability

Develop  
Stable Activity Plan



Establish  
Medical Stability

Promote  
Behavior Stability

Develop  
Stable Activity Plan



# *Sources of Medical Instability*

- Drug and alcohol use
- Poor sleep
- Pain
- Vestibular
- Medication regiment and compliance
- Acute, unresolved or pre-existing medical issues/conditions



# *Principles and Concepts To Be Considered*

- Establishing operations
- Antecedents
- Establish criteria for stability; should include operational definitions and quantitative measures
- Efficacy of consequence-based programming limited by variability in responding

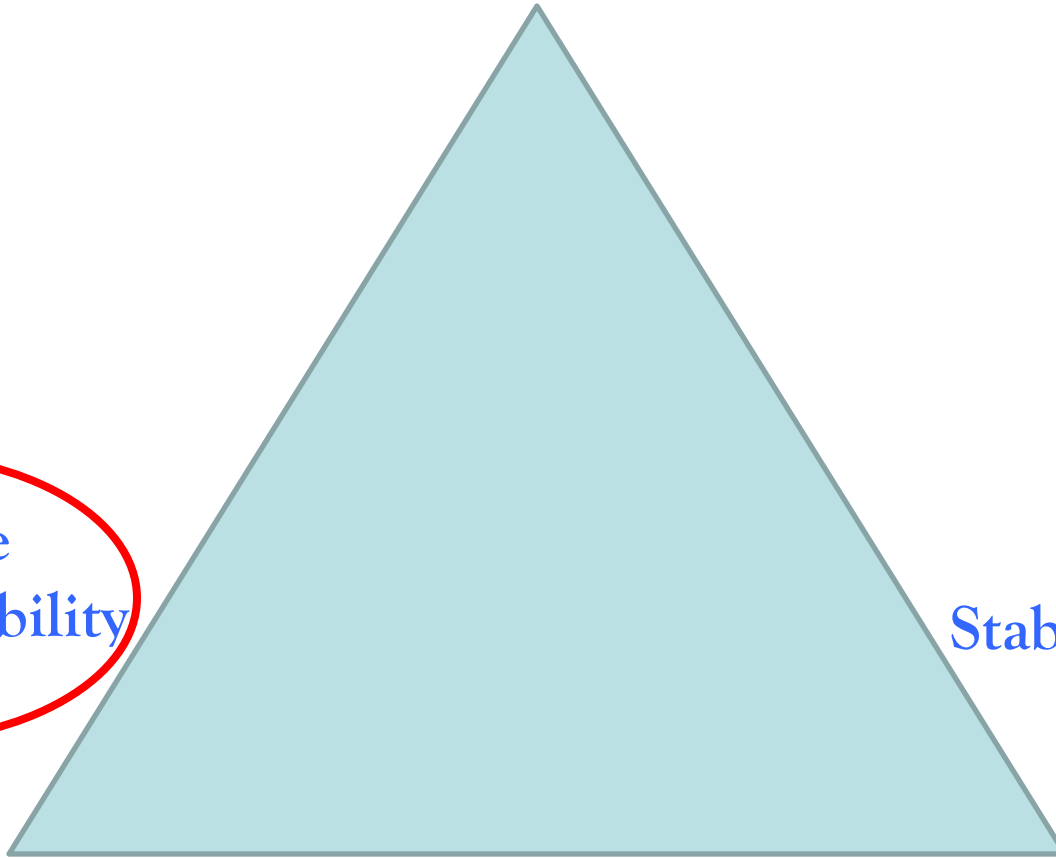


# *Behavior Programming Elements*

- Create and disseminate Crisis Plan
- Implement structured routine to promote stability and enable data analysis
- Determine method and type of data collection
- Identify and define target behaviors
- Prioritize behaviors and maintain appropriate expectations



Establish  
Medical Stability



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# *Characteristics of Behavior Instability*

- Refusal/Resistance
- Threatening/Demanding
- Verbal Aggression
- Physical Aggression
- Property Destruction
- Elopement
- Substance Use
- SIB (e.g. cutting, burning)



# *Principles and Concepts To Be Considered*

- Function
- Reinforcement
- Stimulus salience
- Schedules of Reinforcement
- DRL/DRO/DRA/DRH
- Shaping
- Extinction & NCR
- Generalization & Maintenance
- Punishment

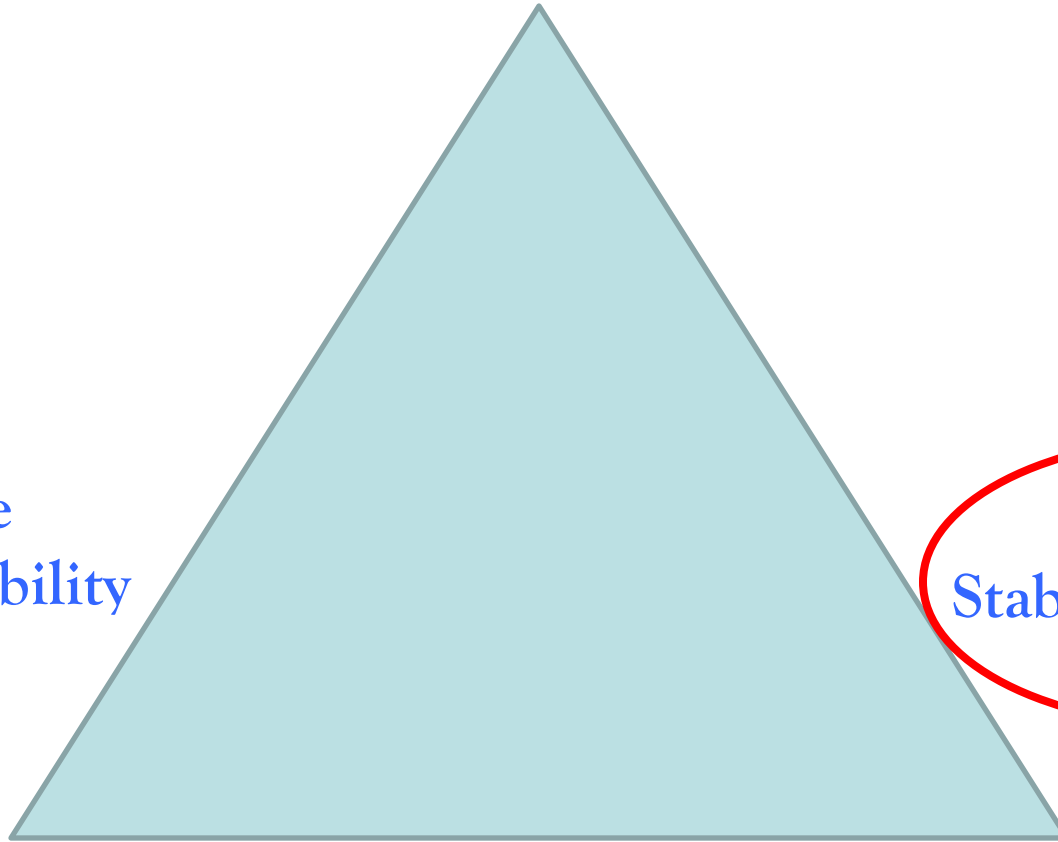


# *Behavior Programming Elements*

- Conduct Preference Assessment
- Consider Functional Analysis/Assessment to refine hypotheses
- Identify Functional Classes of behaviors
- Identify precursors for target behaviors (especially if high risk )
- Refine data collection and employ data-based decision making for programming elements
- Employ procedure for one or more target behaviors (e.g. differential reinforcement, shaping, positive/negative reinforcement)
- Combine Extinction and NCR techniques to promote safety



Establish  
Medical Stability



Promote  
Behavior Stability

Develop  
Stable Activity Plan

# *Features of An Unstable Activity Plan*

- Limited choice
- Limited a-vocational/vocational opportunities
- Imbalance of reinforcement availability/potency with regard to preferred activities
- Inattention to risks associated with competing reinforcers or inaccessibility of support
- Poor follow through



# *Principles and Concepts To Be Considered*

- Generalization
- Maintenance
- Schedules of reinforcement
- Differential reinforcement
- Advanced concepts to be discussed



# *Behavior Programming Elements*

- Involve client, if possible, and continue data-based decision making
- Continue to refine and work towards criteria for stability and safety
- Ensure generalization and maintenance of skills through specific programming and support
- Advanced application to be discussed



# *Advanced Applications*

- Functional Trials
- Self Management
- Criteria Checklists
- Continuum-based Programming
- Discharge Planning



# *Advanced Concepts*

- Skills vs. Motivation
- Smaller Sooner/Larger Later
- Awareness (source of behavior change)

