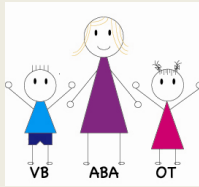


Applied Behavior Analysis & Occupational Therapy



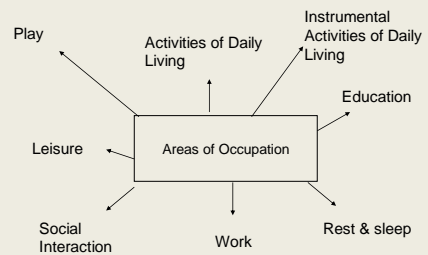
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What is occupational therapy?

- Occupational therapy is skilled treatment that helps individuals achieve independence in all facets of their lives. Occupational therapy assists people in developing the "skills for the job of living" necessary for independent and satisfying lives (Hussey, Sabonis-Chafee, & O'Brien, 2007).

What OT is Not:

- A specific strategy, approach or program (sensory integration, pencil grips, etc.)
 - An intervention for a specific population (i.e. children with autism)
 - A "fad." Occupational therapy is almost 100 years old.
- (Hussey, Sabonis-Chafee, & O'Brien, 2007).

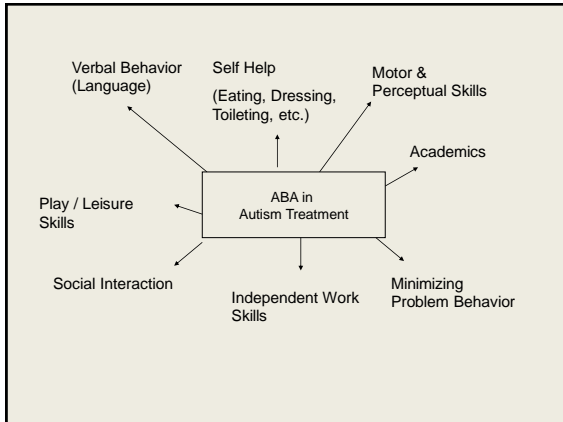


What is ABA?

- Applied
 - Behavioral
 - Analytic
 - Technological
 - Conceptually systematic
 - Effective
 - Possesses generality
- (Baer, Wolfe & Risley, 1963)

What ABA is Not

- A specific strategy, approach, or program (i.e. discrete trial training, token economies, etc.)
 - An intervention for a specific population (i.e. children with autism)
- (Cooper, Heron, & Heward, 2007)



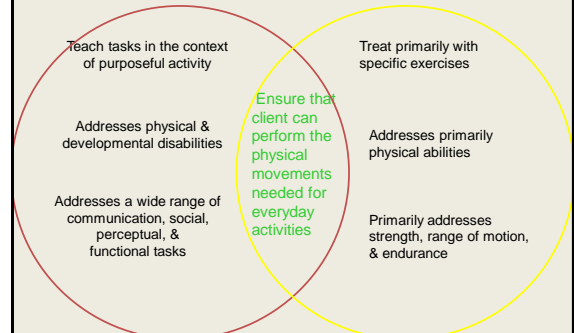
History of the field

- 1917 – Birth of the profession, origins in mental health hospitals
- World War II – field recognized by armed forces, utilized to rehabilitate soldiers
- Post WWII – heavy emphasis on physical disabilities, rehabilitation, adaptive equipment
- 1970's – involvement in de-institutionalization & "related service" provision in schools
 - A. Jean Ayres gains popularity
- Current paradigm = challenge of evidence based practice (Hussey, et al., 2007)

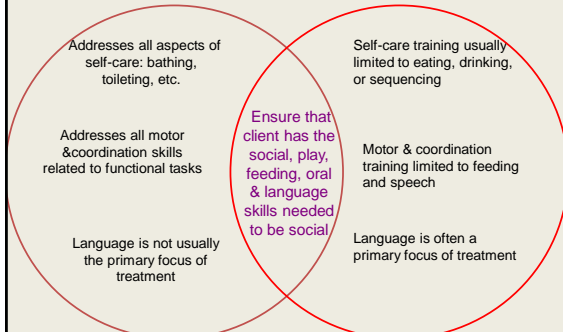
Training

- OTR versus COTA
- OTD
- Recent changes in field require a master's degree in OT for OTR certification
 - Coursework in anatomy & physiology, kinesiology, neuroscience, psychology, and the study of occupation across the lifespan
- Supervised field work

Roles of OT & PT



Roles of OT & SLP



OT Areas of Expertise

- Task analysis
 - Demands of task, pre-requisite skills, motor function, etc.
- Developmental sequence of task acquisition across the lifespan
- Methods of modifying tasks to make them simpler or safer
- Methods of modifying the environment to reduce response effort or increase safety (Hussey et al., 2007; American Occupational Therapy Association, 2005; American Occupational Therapy Association, 2008)

ABA Areas of Expertise

- Determining why a behavior is occurring (functional assessment)
- Reducing problem behavior
- Teaching new, purposeful behaviors to replace problem behavior and increase quality of life

(Cooper, Heron, & Heward, 2007)

What Makes Us the Same

- A desire to create meaningful, socially significant changes in the lives of the people we serve
- High levels of professional education
- A commitment to scientific, evidence-based practice

The Assumptions of Science That We Share

1. Empiricism
2. Determinism
3. Systematic manipulation
4. Skepticism
5. Law of parsimony

(Cooper, Heron, & Heward, 2007)

The Benefits of a Behavioral Approach to OT

- Strong evidence base
- Procedures for teaching a variety of occupations & performance skills
- Yields measurable results
- Prevent and reduce the frequency of problem behavior

Evidence Base

- Evidence is highly valued within the field of behavior analysis, and it has been an evidence-based profession since its inception
- There are numerous free accessible journals on the internet on a wide range of topics, many of which could apply to OT practice (JABA, TAVB, etc.)

Effective Procedures to Address Entire OT Practice Framework

- The current OT Practice Framework (AOTA, 2008) addresses a wide range of performance skills and occupations

OT Practice Framework

OCCUPATIONS

- ADL's
- IADL's
- Rest & sleep
- Education
- Play
- Leisure
- Social Participation

PERFORMANCE SKILLS

- Motor & Praxis Skills
- Sensory Perceptual Skills
- Emotional Regulation Skills
- Cognitive Skills
- Communication & Social Skills

Addressing the Entire Framework

- Behavioral procedures can be applied by OT's to address some of the skills that sometimes "fall through the cracks" in OT sessions
- Example: Skinner's analysis of verbal behavior is of direct significance when addressing communication skills

Yields Measurable Results

- ABA provides a framework for collecting and analyzing data to make sure that clients are meeting their goals
- Because procedures are directly derived from research across many types of learners, they are likely to produce optimal outcomes

Prevent & Respond to Problem Behavior

- In many settings where a behavior analyst is not on-staff, the OT may take ownership of this area
- Consistency is crucial in reducing problem behavior

A Model for Behavioral OT Sessions

Adjunctive Activity: Intensive Teaching Trials

- Responding to earn an unrelated reinforcer
- Can occur in any setting
- Additional reinforcement is necessary

Purposeful Activity: Natural Environment Teaching

- Responding in the context of a related reinforcing activity
- Occurs in the context of fun activities
- The behavior itself is reinforcing

How ITT & NET Pertain to OT

- Intensive teaching can be viewed as an adjunctive activity, that prepares the individual for purposeful activity
- Natural environment teaching involves purposeful activities that are inherently motivating to the client
- Once the skill is performed in purposeful activities, we can probe to see if generalization occurs to daily occupations

Performance Skills

- According to Fisher (2006), performance skills are observable, concrete, goal-directed actions clients use to engage in daily life occupations.
- Motor & Praxis Skills
- Sensory Perceptual Skills
- Emotional Regulation Skills
- Cognitive Skills
- Communication & Social Skills

Basics of Teaching Performance Skills

- Task analysis
 - Prompting
 - Shaping
 - Chaining
- (Cooper, Heron, & Heward, 2007)

Performance Skills

- Motor & praxis skills
- Cognitive skills
- Emotional regulation skills
- Communication & social skills
- Sensory perceptual skills

Teaching Motor Imitation

- Motor skills are often acquired through imitation
- Research suggests that early motor imitation skills are an indicator of optimal outcomes in children with ASD (Sutera et al, 2007) including language development (Stone et al, 1997)
- Motor imitation is also extremely important for non-vocal learners who rely on sign language as their primary form of communication
- Children with autism have more difficulty acquiring motor imitation than peers with other developmental disabilities with similar mental ages (Stone et al, 1997)

Problems with Motor Imitation

- Learner's motor skills are generally delayed
- Learner's motor skills and imitation skills do not match
- Learner lacks precision in imitation
- Inappropriate source of stimulus control
- Generalized imitation has not been established

Intervention Strategies

- Use of non-verbal stimuli as within-stimulus prompts / stimulus shaping (Stoddard & Gerovac, 1981; Summers, Rincover, & Feldman, 1993)
- Teach "meaningful" actions before non-meaningful actions (Stone et al., 1997)
- Use objects that provide visual or auditory feedback (Ingersol et al., 2003)

Intervention Strategies

- Teach movements that contact part of the body (Seal & Bonvillian, 1997)
- Continue teaching until generalization occurs (Stokes & Baer, 1977)

Challenges to Acquiring Visual Perception Skills

- Failure to scan & respond correctly
- Failure to discriminate between subtle properties of stimuli
- Lack of self-rehearsal preventing joint control
- Physiologic variables (e.g. vision deficit, needs glasses, color blind, etc.)

Stimulus Overselectivity

- Stimulus overselectivity refers to the phenomenon in which behavior is controlled by unusually restricted aspect(s) of the environment, at the expense of the salient variable(s) (Walpole et al., 2007).
- Stimulus overselectivity is common amongst many learners with developmental disabilities (Dickson et al., 2006), and may interfere with tasks such as matching-to-sample, reading, spelling, and other important skills.

Differential Observing Response

- When learners are taught to first touch or tact a critical aspect of a stimulus, stimulus control can be expanded (Constantine & Sidman, 1975, Geren et al., 1997). This is referred to as a differential observing response (DOR).
- Teaching a differential observing response may be useful to help learners whose behavior is not yet controlled by all critical aspects of a non-verbal stimulus.
- Potential applications: block design, matching, puzzles

Teaching Self-Rehearsal to Evoke Joint Control

- Teach self rehearsal to evoke joint control
 - Advanced visual perception skills require the development of a strong tact repertoire in order for their development to occur.
- Joint control is the effect of 2 Sds (rehearsal and tact) acting jointly to exert stimulus control over a response.

(Lowenkron, 1984)

Joint Control

- Joint control occurs when the learner's self rehearsal (covert echoic) is matched by another stimulus (seeing purple bead). The two jointly control the response (selecting the bead).
- Teaching the self-rehearsal must occur prior to joint control occurring (Gutierrez, 2006). Without the self-rehearsal there is no second source of stimulus control.

Self-Rehearsal

1. Tact
2. Self echoic
3. Select correct stimulus

Potential applications: finishing patterns, visual memory, sequential memory, following multi-step instructions,

Communication Skills

- The development of functional communication skills is not unique to speech language pathologists, but is also shared by occupational therapists and behavior analysts
- Communication/Interaction skills are included in the 2008 Occupational Therapy Framework
 - Essential to occupational domain of social participation
- Behavior analytic texts and journals have been dedicated to the study and teaching of verbal behavior

Communication Skills

- AOTA included 20 terms to describe communication skills in the first version of OT Practice Framework (contacts, gazes, gestures, articulates, asserts, asks, expresses, shares, sustains, etc.) These terms were not widely adopted by clinicians, and are less stressed in the 2008 Practice Framework.
- Skinner's analysis of verbal behavior is likely ideal for cross-disciplinary collaboration (fewer terms, more research, already used by BCBA's and some SLP's)

Incorporating Mands into Daily Routines

- Importance of mand training throughout the day
 - Repetition; generality/generalization
- Manding during ADL's
- Manding during play
- Manding during work / educational activities

Modifying Signs

- Occupational therapists can play an important role in modifying signs for learners who are not yet echoic
- Movements that contact the body
 - Location of sign is easiest for learners with ASD to imitate (Seal & Bonvillian, 1997)
- Signs that involve a single movement precede signs that involve a chain of movements
- Bi-directional movements precede unidirectional movements
(Bonvillian & Siedlecki, 1998)

Emotional Regulation Skills

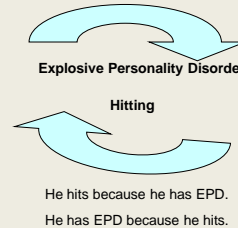
- Emotional regulation skills are included in the 2008 OT Practice Framework
- “**Responding** to the feelings of others by acknowledgment or showing support”
- “**Persisting** in a task despite frustrations”
- “**Controlling** anger toward others and reducing aggressive acts”
- “**Recovering** from a hurt or disappointment without lashing out at others”

Behavioral vs Non-Behavioral Explanations

- ABA uses antecedents / consequences to explain behavior
 - This is helpful, because we can manipulate cause & effect patterns
- Other fields may explain behavior in ways that are not helpful
 - Nominal fallacy
 - Reification
 - Affirming the consequence

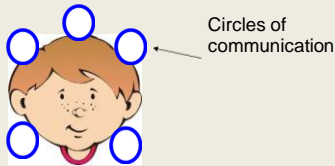
Nominal Fallacy

Explaining behavior by naming it



Reification

Explaining behavior by appealing to an entity whose existence cannot be proven



"Billy does not talk because his circles of communication are not wide enough."

Affirming the Consequence

- If A, then B. B exists, therefore: A.
- Example:
 - People who have brain tumors have headaches. (true)
 - I have a headache, therefore, I have a brain tumor. (NOT necessarily true!)

Management of Undesired Behaviors:

- Determine:
 - Why is this person engaging in a given behavior? (FUNCTION)
 - How can we manipulate the environment to decrease the future frequency of this behavior? (Should be based upon function)
 - What replacement behaviors can be taught to meet this person's needs?

Topography vs. Function

- Topography – the form a behavior takes
 - Hitting, laughing, jumping, drawing, etc.
- Function – the reason why a person is engaging in a behavior
- **A very, very important concept.**
 - Behavioral topography is NOT indicative of behavioral function (McGill, 1999).

Social vs. Automatic

- Social – someone else is required to provide reinforcement
 - Socially mediated positive
 - Socially mediated negative
- Automatic – reinforcer for behavior is the direct effect of the behavior itself
 - Automatic positive
 - Automatic negative

Extinction

- Extinction – failure to reinforce a behavior that has been reinforced in the past, ultimately leading to a decrease in the future frequency of that behavior
- Extinction is not the same as ignoring!
- Loosely speaking, it involves doing the opposite of what you have done in the past
- Extinction may not stop the behavior immediately. In fact, it is likely to get worse before it gets better (extinction burst) (Iwata et al., 1994)

“Sensory” Behaviors

- Behavior analysts and occupational therapists often strongly disagree regarding how to best treat “sensory behaviors” or stereotypy
 - Don’t ask, “Is it sensory or is it behavior?”
 - Instead ask, “What is s/he doing?” and then, “Why is s/he doing it?”

“Sensory” Behaviors: Socially Mediated Positive

- May have emerged under the control of automatic reinforcement, then “accidentally” shaped (Durrand & Carr, 1987)
 - Teach mands as a replacement behavior

“Sensory” Behavior: Automatic Positive

- Satiating MO (Rapp, 2004)
- General environmental enrichment (Vollmer et al., 1994; Ahearn, Clark, DeBar, & Florentino, 2005)
- Sensory extinction (Rincover, 1978; Rincover et al., 1979; Iwata, Pace, Cowdery, & Miltenberger, 1994; Rapp, Dozier, Carr, Patel, and Enloe, 2000)
- Matched stimulation (Piazza et al., 2000)

“Sensory” Behavior: Automatic Positive

- Response blocking (Tarbox et al., 2007)
- Earn opportunities to engage in the behavior (Haag and Anderson, 2004; Hanley et al., 2000)
- DRO (Harris & Wolchik, 1979)
- Response cost (Falcomata et al., 2004)

“Sensory” Behavior: Automatic Negative

- Address the MO
 - Teach replacement behaviors / mands
- (Rapp & Vollmer, 2005)

“Sensory” Behavior: Socially Mediated Negative

- o Stimulus fading / escape extinction (Freeman & Piazza, 1998)

Tolerating Non-Preferred Stimuli

- Challenge: Teach and reinforce compliance (sitting still quietly)
- Need to start with “baby steps” using an escape extinction hierarchy
- Start with the easiest step the learner can tolerate
- Count aloud to show passage of time
- Stop count (but not the non-preferred stimuli) if problem behavior occurs
- When count is complete, reinforce (escape + something fun)

Stimulus Fading / Escape Extinction

- Modify the hierarchy based upon each learner
- The smaller the steps, the less problem behavior you are likely to see.
- Practice many times per day
- This protocol can be used for “desensitization” of other things the learner does not like (certain clothes, getting hands messy, non-preferred foods, medical procedures, etc.)

Sensory / Perceptual Reinforcers

- Lovaas, Newsom, and Hickman (1987) described the properties of sensory and perceptual reinforcement
- They reported that some forms of auditory, kinesthetic, gustatory, olfactory, and tactile stimulation have been shown to serve as reinforcers for behaviors exhibited in animals as well as humans.
- They recognized that although all reinforcers provide some form of sensory stimulation, they proceed to describe a special class of reinforcers that they termed, “perceptual reinforcers”

Characteristics of Perceptual Reinforcers

1. Controlled directly by the behavior, rather than the social environment.
2. Considered primary reinforcers, because their reinforcing effects are attributed to the organic predisposition of the central nervous system.
3. Possess some degree of conditional generality across a particular population, meaning that members of a particular population tend to react similarly to specific forms of sensory stimulation (Lovaas, Newsom & Hickman, 1987)

Reinforcing Effects of Sensory Stimuli

- Ferrari and Harris (1981) used various sensory stimuli as reinforcers
 - Vibration reinforced behavior, to varying degrees, across participants
- Rincover, Cook, Peoples, and Packard (1979) identified sensory reinforcers that maintained behavior in children with autism
 - Used sensory extinction to reduce inappropriate behavior
 - Taught functionally equivalent play responses

Deep Pressure as a Reinforcer

- Reinforcing effects of deep pressure have not yet been studied
- Some studies suggest sensory stimuli, such as deep pressure, may have an effect upon the behavior of individuals with developmental disabilities

Research Aim

- This study sought to determine if deep pressure serves as a positive reinforcer for some children with autism and related developmental disorders.

Participants

- 3 children with autism & related developmental disorders
 - History of apparently favorable responses to deep pressure
 - No specific verbal or motor skills prerequisites, other than the ability to reach forward to touch a shape

Bennett

- 7 years old
- Diagnosis – autism, hypertonia
- Communication response form: Vocal + ASL
- Verbal repertoire:
 - At least 50 mands, over 100 tacts of items, 8 colors, & 5 shapes
- Weekly services:
 - 25 hours of ABA
 - 1 hour of speech therapy
 - 2 hours occupational therapy

Logan

- 5 years old
- Diagnosis – autism
- Communication response form: Vocal approximations of words
- Skill repertoire:
 - At least 10 mands, strong receptive repertoire
- Weekly services:
 - 3 hours of ABA
 - 4 hours of speech therapy
 - 1 – 2.5 hours occupational therapy

Carter

- 2 years old
- Diagnosis – PDD
- Communication response form: primarily ASL
- Skill repertoire:
 - At least 20 mands, imitation of signs, intraverbal signs
- Weekly services:
 - 15 hours of ABA
 - 1 hour of speech therapy

Variables

- Dependent variable – number of times the participant touches a circle and a triangle mounted on a plastic folder
- Independent variable - consequence of deep pressure

Materials

- Deep pressure
 - Pillows – used to push down on child
 - Blanket – used to swaddle child
 - Gloves - to be worn on the therapist's hands while manually delivering deep pressure
 - Gym mat – used to “sandwich” and squeeze a child

Materials

- Video camera
- Plastic yellow folder with purple circle and purple triangle

Preference Assessment

- Preference assessment to establish preferred means of deep pressure
 - Multiple array without replacement
 - Highest ranking item used throughout study
 - Logan & Carter = therapy mat “sandwich”
 - Bennett = rolled in thick blanket (“burrito”)

Baseline (A)

- 20 trials – “Pick one”
- Criteria = 4 sessions with a steady state or no clear trend
 - Circle touches
 - Triangle touches
 - No touches
- Bennett = consistently touched circle
- Logan = consistently did not touch either shape
- Carter = consistently touched triangle

Intervention B

- 10 Forced exposure trials (5 circle, 5 triangle) in semi-randomized order
- 20 trials (“Pick one”)
- Bennett & Logan
 - Circle touch = deep pressure
- Carter
 - Triangle touch = deep pressure
- Criteria = 4 stable data points, or positive trend in touches that resulted in deep pressure

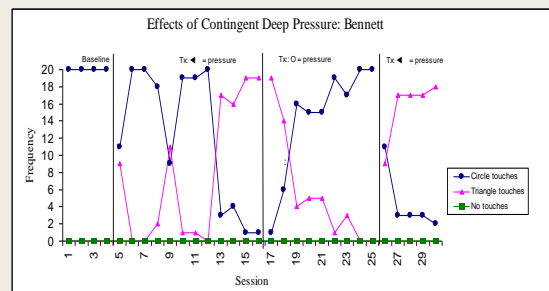
Reversal (C)

- 10 Forced exposure trials (5 circle, 5 triangle) in semi-randomized order
- 20 trials (“Pick one”)
- Bennett & Logan
 - Triangle touch = deep pressure
- Carter
 - Circle touch = deep pressure
- Criteria = 4 stable data points, or positive trend in touches that resulted in deep pressure

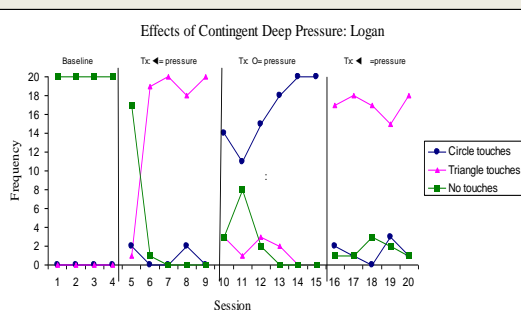
Return to Original Intervention (B)

- 10 Forced exposure trials (5 circle, 5 triangle) in semi-randomized order
- 20 trials (“Pick one”)
- Bennett & Logan
 - Circle touch = deep pressure
- Carter
 - Triangle touch = deep pressure
- Criteria = 4 stable data points, or increasing trend in touches that resulted in deep pressure

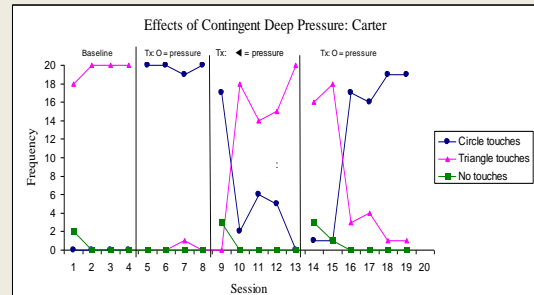
Bennett’s Results



Logan’s Results



Carter’s Results



Implications for Clinical Practice

- Data suggest that deep pressure reinforced the behavior of Bennett, Logan, and Carter
- Can be used as a positive reinforcer in acquisition programs
 - Cheap, easily accessible, healthy
- Can teach ways to access deep pressure, as a means of preventing stereotypy, SIB, or aggression

Implications for Clinical Practice

- Incorporating deep pressure touch into NET may create new opportunities to teach language
- Occupational therapists should consider the potential reinforcing effects of deep pressure when designing sensory diets
- Recognition that some occupational therapy treatments may produce relevant changes in behavior

Classifications of Sensory Stimuli

- Visual, auditory, olfactory, gustatory
 - Tactile: information provided primarily through skin about the texture, shape, and size of objects,
 - Vestibular: information provided through the inner ear related to gravity, space, and head/body position
 - Proprioceptive: information provided through muscles/joints regarding body position and movement
- (Ayers, 1979)

Potential Visual Reinforcers

- Behaviors that may be maintained by visual stimuli: spinning objects, lining up objects, squinting, scanning
- Spinning
 - Pinwheels
 - Tops
 - Gears
 - Spin art
 - Kaleidoscope

Potential Visual Reinforcers

- Lining up/stacking objects
 - Blocks
 - Dominoes
 - Lego
 - Objects with numbers/letters
- Scanning
 - iPod / iPad
 - Computer
 - Trains
 - Car or marble ramp
 - View master

Potential Auditory Reinforcers

- Music
- Instruments
- Computer / ipod games that produce sound
- Books with sound effect strips
- Pre-recorded tracks of idiosyncratic noises (with headphones)

Potential Tactile Reinforcers

- Messy play with paint, shaving cream, etc.
- Putty, clay, or play-doh
- Sand
- Water
- Vibration
- Textured rubbery toys
- Jewelry or keychains
- Various textures of material to touch with hands, feet, face
- Ball pit

Potential Vestibular Reinforcers

- Swinging
- Spinning in office chair
- Balance board
- Balance beam
- See-saw
- Rolling on ball, in tunnel, across mat
- Scooterboard

Potential Proprioceptive Reinforcers

- Run & crash
- Wheelbarrow walk
- Deep pressure: hugs, swaddling, weights
- Vibration
- Squeezing/popping bubble wrap
- Elastic bands
- Moon shoes; trampoline

Working Together

OTR

- Strong background in a wide range of disabilities
- Strong background in kinesiology, development, & physiology
- Extensive training (8 credits or more) in task analysis

BCBA

- Ability to determine function of a behavior
- Skill in data collection & analysis
- Knowledge of basic behavioral principles, including reinforcement schedules, extinction & punishment

Suggestions for Collaboration

- If referring one of your clients, find out in advance what approaches the other practitioner uses
- Everyone should contribute to the development & implementation of a behavior plan
- Consider the potential reinforcing and/or punishing effects of all sensory stimuli

Final Thoughts & Future Directions

We need more collaboration between BCBA's and OT's.

We need more dually certified professionals.

We need more behaviorally sound research on teaching occupations and performance skills.

We need an occupational therapy SIG.