Behavior Analytic Interventions for Individuals with Autism Spectrum Disorders

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RESUMEN

Los trastornos del espectro autista (TEA) son trastornos generalizados del desarrollo caracterizado por deficiencias en la conducta social y comunicativa y excesivos comportamientos repetitivos y estereotipados. La efectividad de las intervenciones de análisis del comportamiento para mejorar las deficiencias de comportamiento y los excesos en las personas con TEA ha sido bien documentada. Este artículo describe varios tipos de intervenciones del campo del análisis del comportamiento que son utilizadas para tratar las limitaciones de las habilidades a las que a menudo se enfrenta esta población, incluidos los procedimientos de enseñanza altamente estructurados, tales como la enseñanza por ensayo discreto y los procedimientos de enseñanza naturalísticos. Se enfatiza la utilidad de las intervenciones basadas en el análisis del comportamiento para el establecimiento de repertorios verbales.

Palabras clave: Trastornos del espectro autista (TEA); Análisis del comportamiento; Conducta verbal.

ABSTRACT

Autism spectrum disorders (ASD) are pervasive developmental disorders characterized by deficits in social and communicative behavior and excesses in repetitive and stereotyped behaviors. The effectiveness of Behavior analytic interventions to improve the behavior deficits and excesses in individuals with ASD has been well documented. This paper describes several types of behavior analytic interventions used to address skills deficits often faced by this population; including highly structured teaching procedures such as discrete trial teaching (DTT) and naturalistic teaching procedures. The utility of behavior analytic interventions for establishing verbal repertoires is highlighted.

Keywords: Autism spectrum disorders; Behavior analysis, Verbal behavior.

Behavior Analytic Intervention for Learners with Autism

Autism spectrum disorders (ASDs) are pervasive developmental disorders characterized by marked impairments in social interaction and communication, in addition to restricted, repetitive, and stereotyped behaviors and interests (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, APA, 2000). An estimated 1 in 110 children in the United States are diagnosed with an ASD (Rice, 2009). Currently, there is no known cause for autism. Interventions based upon applied behavior analysis (ABA) have been identified as empirically validated treatments for individuals with ASDs (Schreibman, 2000). It is recommended that early intensive behavioral intervention (EIBI) incorporate discrete trial teaching (DTT), naturalistic teaching procedures, and verbal behavior approaches. This review will discuss the role of ABA in the treatment and education of individuals with ASDs.

Early Intensive Behavioral Intervention (EIBI) and Discrete Trial Teaching

It is widely acknowledged that EIBI can produce marked gains in children with ASDs. There are a number of behavioral approaches indicated as effective interventions for these children documented in peer-reviewed journals. It is difficult to ascertain which are the best approaches for learners with specific characteristics, as well as the number of hours necessary for treatment to be effective (Kasari, 2002). It is also difficult to draw inferences from the published literatures because so many different outcomes due to the variety of outcome measures employed (IQ, scores on standardized language assessments, educational placements, etc.).

Lovaas, Koegel, Simmons, and Long (1973) suggested that intervention incorporated into a variety of naturalistic settings will be effective when begun early in a child's life. Dawson and Osterling (1997) reviewed eight intervention programs providing EIBI (Douglas Developmental Disabilities Center at Rutger's University, Health Sciences Center at the University of Colorado, Learning Experience, An Alternative Program for Preschoolers and

Parents, May Institute, Treatment and Education of Autistic and Communication-Handicapped Children, and Young Autism Program at University of California) for young children with ASDs to identify common elements and treatment outcomes for these programs. The mean age of children with ASDs who attended these programs was 3 ½ to 4 years, and the children received 15 to 40 hours per week of intervention. Outcome data varied indicating gains in IQ scores, language abilities, and inclusion in typical settings for some of the children attending these programs. Common elements of these programs focused on attending to the environment, imitation, appropriate play, and use of language targeted in a combination of one-on-one discrete trial instruction and instruction in typical settings including naturalistic teaching and small group instruction.

The National Research Council (2001) identified six components that are essential to developing appropriate intervention to young children with autism. These components include entry into an intervention program as soon as the diagnosis is considered, full year instructional programing with a minimum of 25 hours of intensive intervention per week, multiple teaching opportunities in 1:1 and small group settings as dictated by the individual's needs, necessary parent and caregiver training, low student to teacher ratios, and continued evaluation of the child's program and progress. Many of these features are encompassed using a discrete trial teaching (DTT) instructional method; this has been highlighted in the legislation and litigation surrounding education and individuals with ASDs with parents seeking DTT as an instructional format for their children (Nelson & Huefner, 2003).

Discrete Trial Teaching

Discrete trial teaching (DTT) is a teaching method often used in EIBI. DTT is a teaching method that is comprised of units of instruction allowing for multiple learning opportunities within a short period of time. Each teaching unit is relatively short; lasting 10-20 s, thus

allowing the instructor to rapidly present many teaching opportunities in a short period of time (Smith, 2001). Historically, discrete trial teaching focused upon instruction in such skill areas as expressive and receptive language, gross and fine motor imitation, and direction following. Each discrete trial has five identifiable components, including the instruction, prompts, the response, a consequence, and an intertrial interval. The instruction consists of short statement or question given by the instructor that serves as the discriminative stimulus for the learner's response (Smith). When necessary, the instructor provides prompts to increase the likelihood of correct responding until the learner is able to independently respond to the instruction (Smith). After the learner responds, his or her behavior is either reinforced (correct responses) or error correction is provided (incorrect responses), the specific consequence is determined by the child's preferences and the specific skill being taught (Smith). Between each teaching unit is an intertrial interval, this is a short period of time (1-5s) where no instruction is occurring before another unit of instruction is presented (Smith). DTT has been demonstrated to be an effective instructional method for individual with ASDs with maximal gains occurring when intervention is implemented for 30-40 hours per week (Nelson & Huefner, 2003).

Despite the reported effectiveness of DTT for individuals with ASD, there are several limitations to the instructional method. First, DTT is highly structured, meaning that children often are learning only to respond to specific instructions under specific contexts that are often contrived and may not be representative of the "real world" in which the response will need to occur (Smith, 2001). It has also been shown that responses learned in DTT formats may not be durable over time, and across settings, stimuli, and instructors (Schriebman, 2000). That is, a skill taught using DTT may only be learned in that specific distraction-free context. A child who learns to say "cup" when shown a picture of a cup in an instructional room with a teacher during DTT sessions may be unable to say "cup"

when shown an actual cup at home by his mother unless additional programming for generalization is included. These limitations have led to the implementation of naturalistic teaching procedures within programs for individuals with ASDs.

Naturalistic Teaching Approaches

Naturalistic teaching approaches have been utilized to teach a variety of skills including verbal behavior to children with autism spectrum disorders in a less structured manner than other approaches such as DTT. Unlike DTT, naturalistic teaching methods are less contrived and are child led rather than being primarily led by the teacher. These teaching methods utilize stimuli and situations within the child's natural environment. Naturalistic teaching procedures aim to provide learning opportunities based upon the child's current interests, capitalizing on the establishing operation (EO) of deprivation; EOs are conditions which temporarily increase the reinforcing value of an item and temporarily increase in the frequency of responses that have been reinforced by that object (Cooper, Heron, & Heward, 2007). For example, a child who is water deprived, or thirsty, has an EO for a drink and is more likely to request a drink than if he or she was not water deprived. Because teaching trials are conducted in the natural environment with common, everyday stimuli, teaching to expand the stimulus class to variables in the natural environment is not needed (Stokes & Baer, 1977). Responses are reinforced by giving the child access to items in the natural environment. A child approaching an area, reaching for a desired item, or looking at a desired item may be indicators of a child's interest. A teacher or parent could assume this to be the initiation of a teaching trial, prompt a response, and give access to the item or area contingent upon the targeted response. For example, a child may indicate motivation to go outside by standing by the door. A parent could prompt the child to mand (request) "outside" and give the child access contingent on the vocal response. If going outside is reinforcing, the child will mand to go outside without prompts

in the future after repeated exposure to these contingencies. Parents can use naturally occurring routines, such as meal time, to provide learning opportunities. The number of learning opportunities throughout the day can be increased by contriving establishing operations. For example, a parent could remove an item present in a typical routine or move items out of the child's reach to contrive opportunities for mands. There is a vast applied behavior analytic literature on different naturalistic teaching approaches all with a common theme of using a child's motivation to create learning opportunities. These models include Incidental Teaching, Milieu Teaching, Enhanced Milieu Teaching, the Mand-Model Approach, Pivotal Response Treatment, Embedded Teaching, and the Natural Language Paradigm. For the purpose of this chapter, only a few of these approaches will be reviewed.

Incidental Teaching

Incidental teaching is a child-initiated naturalistic teaching procedure first introduced in a series of articles published by Hart & Risley beginning in 1968. The teaching technique targets verbal behavior within a child's natural environment during typical routines such as free play. The environment should be enriched with preferred stimuli, and language elaboration is relevant to the reinforcer identified by the learner. Once a child initiates (e.g., hand raise or reaching for an object), the teacher may model a particular response or require language elaboration, after which the child is given access to the desired item, and the teacher provides behavior specific praise affirming that the child's response was correct (Hart & Risley, 1978). For example, a child might approach a teacher and mand for a car, thus initiating a teaching opportunity. The teacher can then require a language elaboration by pointing to the wheel on the car and asking ¿"What is this?. If the child doesn't respond, the teacher may model an appropriate response. Once the child repeats

the response or gives an approximation, the teacher confirms "Your right. That's a wheel!" and then provides access to the car.

Incidental teaching has been demonstrated as an effective teaching method in teaching three boys with autism to use prepositions to describe the position of items (McGee, Krantz, & McClannahan,1985). Employing a multiple baseline design across participants and sets of prepositions, acquisition of tacts (labels) using prepositions and generalization of the use of tacts in a novel environment was compared in instruction via Incidental Teaching and a DTT approach. Stimuli were placed on shelves out of the children's reach. The child initiated a trial by tacting or manding for an item, and the teacher required language elaboration (i.e., responding "The car is on top of the box." when asked "Where is it?" by the teacher). Responses were followed with behavior specific praise and access to the desired item. Results indicated Incidental Teaching was as effective as a DTT approach in teaching the children to tact the position of items using prepositions; however, the Incidental Teaching procedure produced better generalization of use of the taught prepositions in a free-play setting in comparison to prepositions taught using DTT. McGee, Almeida, Sulzer-Azaroff, and Feldman (1992) taught peer tutors to use incidental teaching to increase initiations in 3 boys with autism using a multiple baseline design. Using behavioral skills training, peer tutors were taught the following steps to criteria: Wait for the target child to initiate a request via reaching for the toy, model a response (e.g., "say duck"), give the child the toy, and provide behavior specific praise (e.g., "Great! You said duck"). Results showed increased initiations from the children with autism that maintained when adult interaction was systematically faded. A recent publication focused on teaching caregivers to implement incidental teaching to increase mands in 3 children with autism via behavioral skills training. Using a multiple baseline design, parents were taught to arrange the environment to facilitate motivation, gain the child's attention, provide a potentially

reinforcing stimulus, wait for an initiation, prompt a verbal response, and reinforce the child's response. Results indicated that parents with limited knowledge of behavior analysis can be taught to implement the procedure correctly (Hsieh, Wilder, & Abellon, 2011).

Natural Language Paradigm

The Natural Language Paradigm (NLP) describes a more structured naturalistic teaching procedure. A teacher or parent contrives motivation and initiates teaching trials by presenting a small array of preferred items in front of the child. Once the child indicates motivation by looking at, reaching for, or pointing to the item, the teacher models a response (vocalization or motor action). The teacher repeats the response until the child imitates or approximates, and correct responding or approximations are reinforced with access to the desired toy or item and behavior specific praise. For example, a teacher and child are seated on the floor, and the teacher presents three toys in front of the child and instructs to "pick one." The child reaches for a train, and the teacher picks up the train and instructs "say train." The child repeats the response, the teacher gives the train to the child, and says "you're right, it is a train!"

Research has been conducted demonstrating the efficacy of NLP with therapists and parents as teachers. Koegel, O'Dell, and Koegel (1987) employed a multiple baseline design to assess the effectiveness of this procedure to increase vocalizations in two 4 and 5-year old nonverbal children with autism. Data presented showed an increase in the children's imitative responses in comparison to baseline and a slight increase in utterances produced without an adult model for both children. Laski, Charlop, and Schreibman (1988) demonstrated that parents can learn to implement this procedure and showed marked increases in vocalizations in eight children with autism via their parents' implementation of this procedure. Data were collected on the parents' use of reinforcement for

communication attempts, providing multiple learning opportunities by allowing the child access to a toy for a limited amount of time, targeting stimulus and response class expansion (using different materials and requiring varied responses), and shared control (accepting variations of the modeled response and following the child's lead to change activities). Gillett & LeBlanc (2007) taught three parents to use NLP to increase both appropriate play behavior and vocalizations in three children with autism. Parents modeled a play response in addition to a vocalization and provided access to a desired toy contingent on the child's vocalization. Employing a multiple baseline across participants, marked increases in the children's play and vocalizations were demonstrated.

Pivotal Response Treatment

Pivotal response treatment (PRT) is a comprehensive approach that incorporates naturalistic teaching to target the deficits of autism. Key to the approach is the use of parents or peers as teachers to increase the child's ability to learn from the natural environment just as typically developing children acquire language and play skills. Teaching should be conducted in an enriched environment (e.g., home or school). Using the procedures described previously, parents or peers model play or language responses and provide access to a toy or item of interest contingent on the child's attempt to imitate a modeled response (Koegel & Koegel, 2006). Providing frequent choices, shared control, responsivity to multiple cues is emphasized as well. Pivotal areas of intervention include increasing a child's motivation to engage in communication and social interaction via continued exposure to response-reinforcement contingencies, increasing joint attention and social interaction initiations, and self-management of behavior.

Research in PRT has indicated the effectiveness of a naturalistic teaching approach to increase skills in these pivotal areas. In Pierce and Schreibman (1995), typically-developing peers were taught to use PRT to increase conversation, play initiations, and

joint attention with two 10-year-old peers with autism. A multiple baseline design across participants was employed to demonstrate improved social initiations, joint attention, and increased word use in comparison to baseline. Stahmer (1995) targeted symbolic play and language skills using PRT in seven boys with autism, ages 4 to 6 years. Data were collected on symbolic play and play complexity in play situations with a caregiver prior to and following language and play intervention with an experimenter. Results showed an increase in symbolic play following play intervention for all participants.

Verbal Behavior

Skinner's 1957 *Verbal Behavior* provided a conceptual analysis of verbal behavior as operant behavior that is reinforced through the mediation of the listener. Skinner's taxonomy of verbal behavior differed from more traditional accounts of verbal behavior in that he focused on the function, not form, of behavior. That is, each episode of verbal behavior, according to Skinner, is defined not by what it sounds or looks like, but by the change in the listener's behavior that occurs contingent on the response. Skinner's primary verbal operants; the mand, tact, intraverbal, and echoic (see Table 1), all have distinct controlling variables and consequences that distinguish one operant from the others (Skinner, 1957). Skinner's conceptual analysis led to a body of research (see Sautter & LeBlanc, 2006) now conceptualized as the verbal behavior approach. The verbal behavior approach is not an instructional procedure; rather, it is the application of Skinner's analysis, which can be presented using a variety of instructional procedures including DTT and naturalistic teaching (Barbera & Rasmussen, 2007). Emphasis on establishing a communicative repertoire rather than focusing on compliance and receptive tasks is what distinguishes verbal behavior curricula from more traditional, Lovaas-type programs (Barbera & Rasmussen).

Table 1.

Controlling variables and reinforcers that maintain four of the verbal operants described by Skinner (1957).

Operant	Controlling variable	Consequence	Example
Mand	Establishing Operation	Specific reinforcement	Joe has not eaten in three hours (EO: food deprivation). Joe says "cracker" and Joe's mother gives him crackers.
Tact	Non-verbal stimulus	Nonspecific reinforcement	Carla is walking with her mom and sees a dog across the street. Carla says "Doggy!". Carla's Mom looks at the dog.
Intraverbal	Verbal stimulus	Nonspecific reinforcement	The teacher asks William what his name is. William replies "Will".
Echoic	Verbal stimulus (with formal similarity and point-to-point correspondence)	Nonspecific reinforcement	The teacher says "bubbles" and Sophia immediately says "bubbles".

Specific components that define the verbal behavior approach from more traditional programs include the focus on what is typically referred to as expressive language. The focus is to teach the learner the skills necessary to communicate with others, but this learning should be done in a way that is enjoyable for the learner (Barbera & Rasmussen, 2007). It is critical that the instructional environment, instructor(s), and instructional tasks be paired with reinforcement to ensure that the learner is approaching the work environment willingly (Barbera & Rasmussen). Identifying, and using, reinforcers to increase desired behaviors and correct responses is another important step to language instruction (Barbera & Rasmussen; Sundberg & Michael, 2001). As with any instructional

program, language instruction should begin with assessment of the child's current skill level; this may include developing interventions to target challenging behaviors that pose as barriers to learning (Barbera & Rasmussen; Sundberg, 2008). Following the initial assessment specific goals and objectives are developed and instructional methods are identified; as previously mentioned, the verbal behavior approach can be implemented using both naturalistic teaching and DTT instructional methods and is often implemented using a combination of the two.

 Assessment and Curricula for Individuals with Autism

The verbal behavior approach is not a specific curriculum; however, tools have been developed that can be used to assess a learner's baseline performance and develop goals and objectives to be targeted for intervention. The Verbal Behavior Milestones Assessment and Placement Program (VBMAPP) is a five component program designed to measure verbal behavior, guide individualized intervention and instruction needed to address skills deficits, and evaluate progress over the course of a treatment program (Sundberg, 2008). The VBMAPP is comprised of five component parts; milestones assessment, barriers assessment, transition assessment, task analysis and skills tracking chart, and placement and individualized education plan (IEP) goals. The milestones assessment is broken down into three levels based on developmental level (0-18 months, 18-30 months, and 30-48 months). Level 1 of the assessment includes the evaluation of mand, tact, listener, social, visual perceptual and match-to-sample, independent play, motor imitation, and echoic skills. Level 2 of the assessment includes continued evaluation of level 1 skills, as well as an evaluation of listener responding by function, feature, and class (FFC), intraverbals, classroom/group routines, and linguistic skills. The last level of the assessment, level 3, evaluates the skills previously addressed in levels one and two as well as writing, reading, and math skills. The barriers assessment provides a measure of learning barriers

frequently faced by children with autism and other developmental disabilities. Specifically, the barriers assessment allows for the development of behavior change procedures to change behaviors that may have otherwise interfered with the learner's ability to participate in instructional sessions (Sundberg, 2008). The transition assessment is used to evaluate the learner's progress and skill readiness to participate in a less restrictive learning environment. The task analysis and skills tracking component of the VBMAPP provides a more detailed assessment of the learner's skills including those skills that may not be considered milestones, but are important to generalization and maintenance (Sundberg, 2008). The final component of the VBMAPP, the placement and IEP goals, provides sample IEP goals for each of the milestones found in the milestones assessment to assist an instructor in developing an instructional program based on a learner's assessment results.

As previously mentioned, applying Skinner's analysis of verbal behavior to an instructional program does not require that the program be taught using a specific type of instructional framework. That is, once the learner's skills have been assessed and goals and objectives have been identified a program may utilize DTT and naturalistic teaching procedures depending on the learners skills level, skills to be targeted, and instructional setting. The key consideration when using the verbal behavior approach is to ensure that the learner finds the instructional environment, including the instructor and tasks, enjoyable by incorporating reinforcers and preferred items.

Initial Communication Training: The Mand

The mand should be the verbal operant taught first when developing programming to establish a verbal repertoire. Skinner defined the mand as a verbal operant controlled by establishing operations (EO) (see Michael, 1988) and reinforced by the stimulus specified in the mand. Mands are often targeted first to give a child control over his or her

environment and gain access to preferred items which is thought to make language training more enjoyable for the learner (Sundberg & Michael, 2001). Research also suggests that problem behavior may decrease after teaching a learner to mand for preferred items and that mands are most likely operant to be emitted spontaneously (Barbera & Rasmussen, 2007; Sundberg & Michael). Mand teaching procedures fall under two general categories; those that capitalize on existing establishing operations (EOs) and those that require the instructor to contrive EOs. Capitalizing on existing EOs requires that the instructor use a stimulus that the learner has shown interest in but to which they don't have access. For example, the learner's caregiver may inform the instructor that the learner has not eaten for several hours, indicating that he or she is food deprived, which may serve as an EO for a preferred food. If the instructor does not have this information, or if the EO for food is not strong enough to evoke a mand, the instructor may assess which stimuli in the environment the learner shows interest in (e.g., a light up toy) and restrict access to that item.

Contriving establishing operations requires that the instructor create a context that increases the reinforcing effect of a specific stimulus. This can be done using the interrupted chains procedure (Hall & Sundberg, 1987). The interrupted chains procedure involves the instructor selecting a behavior chain that the learner already has in his or her repertoire, or that the instructor teaches the learner prior to mand teaching. A necessary item needed to complete an activity is removed from the chain requiring the learner to request the item before he or she can finish the behavior chain. For example, in a study by Rosales and Rehfeldt (2007), participants were taught to play a CD using a portable CD player. The behavior chain required nine steps, including picking up the head phones and plugging them into the CD player). An establishing operation for the headphones was contrived by instructing the participants to complete the chain without the headphones

present (Rosales & Rehfeldt). The participant was required to mand for the headphones in order to complete the behavioral chain and have access to music from the CD player. Once the learner has acquired several mands the instructor may begin introducing transfer trials to begin teaching other verbal operants.

Transfer Trials to Teach Verbal Operants

Typically developing children generally acquire large verbal repertoires without specialized intervention. However, for children with autism to acquire the appropriate echoic, mand, tact, and intraverbal repertoires that allow them to communicate information about their environment, direct teaching of each verbal operant is often required. Research suggests that for children with autism additional intervention is often needed for the same response topography to be learned across verbal operants (Shillingsburg, Kelley, Roane, Kisamore, Brown, 2009). Transfer trials may often be used to facilitate teaching the same response across multiple operants. Using transfer trials the teacher is able to use the skills already in the learner's repertoire to help teach new responses. Examples of transfer trials are presented in Table 2.

Table 2.

Examples of transfer trials across operants.

Verbal Operants	Example
Echoic □ Tact	Show the learner a picture of a cat "What is it? Cat." Learner echoes "Cat" Show the learner a picture of a cat "What is it?" Learner tacts "Cat"
Tact □ Intraverbal	Show the learner a picture of a car Learner tacts "Car" Ask the learner "What do you ride in?" with no picture Learner intraverbally responds "Car"
Listener Responding □ Intraverbal	Show the learner a picture scene "show me the ball" Learner points to ball Ask the learner "What do you play with?" Learner responds intraverbally "Ball"
Listener Responding □ Tact	Show the learner an array of pictures "show me the shirt" Learner points to the shirt Show the learner a picture of a shirt "What is it?" Learner tacts "shirt"

Transfer of stimulus control between verbal operants has been documented in behavior analytic literature (see Barbera & Kubina, 2005; Drash, High, & Tudor, 1999; Sundberg, Endicott, & Eigenheer, 2000). The type of transfer trial used is determined by the learner's current repertoire. That is, if a learner has a large tact repertoire many of the transfer trials may involve transferring the stimulus control for the response from pictures or objects to other controlling variables such as questions (intraverbal). Likewise, if a learner has an extensive echoic repertoire many of the transfer trials will involve transferring stimulus

control from the echoic prompt to other stimuli. Transfer trials may also include transferring stimulus control from listener responding or match-to-sample repertoires. These techniques may be especially useful for learners who begin a program with little or no communicative behavior, but are able to correctly select items from an array or match pictures. Barbera and Kubina demonstrated the efficacy of instruction comprised of two types of transfer trials, listener responding to echoic to tact and echoic to tact transfer, to teach a learner with autism and mild intellectual disability to tact 30 stimuli. The receptive to echoic to tact transfers began with the instructor showing the learner an array of pictures an give the instruction "touch (target)", the learner would then touch the target and echo the name of the item, upon the learner's correct response the instructor showed the learner the picture and asked "what is it" (Barbera & Kubina). The echoic to tact transfer trials consisted of the instructor holding a picture of the item and saying the name of the item. The learner then echoes the name of the item, after the learner's response the instructor shows the learner the picture and asks "what is it?" (Barbera & Kubina). This combination of transfer trials lead to the acquisition of 30 previously unknown tacts (Barbera & Kubina).

Skinner's (1957) analysis of verbal behavior has led to many effective interventions and teaching strategies for learners for autism. However, these teaching procedures and interventions are not without criticism. Namely, because the verbal operants are functionally independent many learners with autism require multiple teaching trials across operants. That is, using traditional behavior analytic intervention based on Skinners analysis a child would need to be directly taught to request an apple, label an apple, and respond "apple" when asked to name a fruit that is red. This type of teaching is costly and often unrealistic in managed care settings. Relational Frame Theory (RFT), an alternative

account of verbal behavior, addresses these concerns by identifying protocols that do not require direct teaching of each verbal operant for all targets.

Interventions Based on Relational Frame Theory

RFT offers an alternative account of verbal behavior based on derived relational responding, which involves responding to relations between stimuli in the *absence* of a history of direct reinforcement for responding to those specific relations (Hayes, Barnes-Homes, & Roche, 2001). The emergent response of relating one stimulus in terms of another is considered a generalized operant or a functional class of behaviors (Hayes et al., 2001; Healy, Barnes-Homes, & Smeets, 2000). As an illustration of the concept of derived relational responding, an individual can be taught that orange is sweeter than lemon and orange is less sweet than strawberry. Following instruction on these two stimulus relations, the emergence of relations that lemon is less sweet than orange, strawberry is sweeter than orange, lemon is less sweet than strawberry, and strawberry is sweeter than lemon would be observed without direct instruction on those relations (Figure 1).
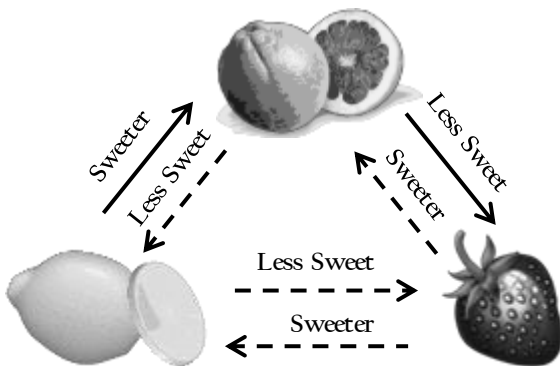

*Figure 1.*Example of derived relational responding with instructed relations (solid lines) and emergent relations (dashed lines) for three stimuli.

The potential benefits of instruction based on derived relational responding can be seen in the preceding example. If direct instruction for two relations between stimuli is provided, four additional relations will emerge. This is important when considering the limited amount of time available for instruction for individuals with autism. An effective and efficient intervention that results in generative responding is needed, and treatment based on RFT has the potential to offer this. Another advantage of RFT is that derived relational responding can occur according to many different types of relations, which provides the ability to teach rich verbal repertoires. The preceding example of the orange is a relation of comparison that involves a qualitative relationship between the stimuli being related. Examples of other types of relations include relations of coordination or sameness (e.g., relations between a picture of bicycle, the written word "bicycle", and the spoken word "bicycle") and relations of hierarchy in which one stimulus is a member of another stimulus (e.g., broccoli is a type of vegetable which is a type of food).

According to RFT, derived relational responding according to all types of relations is learned through a history of direct reinforcement for engaging in relational responding. This history is provided through multiple exemplar instruction (MEI) in which relational responses are directly taught, and following MEI relational responding will occur in the absence of direct instruction (Berens & Hayes, 2007). While the RFT account of verbal behavior is very different from Skinner's (1957) analysis of verbal behavior, Barnes-Holmes, Barnes-Holmes, and Cullinan (2000) proposed that a synthesis of these two accounts could provide the foundation for a successful program of instruction in verbal behavior. The suggested synthesis describes a "verbal" operant as an operant that emerges through participation in a derived relation and in the absence of direct instruction. Research based on this synthesis that examines language interventions for individuals with autism and intellectual disabilities has begun to emerge.

Derived verbal operants

According to the synthesis proposed by Barnes-Holmes et al. (2000), a derived mand is a mand that emerges in the absence of direct instruction. The previously mentioned study by Rosales & Rehfeldt (2007) provides an example of derived mands and how individuals can be taught this skill. Following the aforementioned mand instruction using the interrupted chain procedure, conditional discrimination instruction was used to teach participants to select corresponding pictures and printed words following the dictated names of the items. After instruction, participants demonstrated the emergence of coordination relations by matching the pictures to the corresponding text, and they were also observed to orally name (i.e., tact) the pictures as well as read the text aloud. Furthermore, participants successfully used the text in order to request items needed to complete the chained task demonstrating derived manding (Rosales & Rehfeldt, 2007). This study highlights the utility of an RFT approach for teaching functional communication skills because the use of text as opposed to pictures to mand is more appropriate for an adult learner. This study further demonstrates the utility of RFT instruction to create a generative repertoire. Following instruction on only two skills (i.e., matching dictated names to pictures and matching dictated names to text), five additional skills emerged (i.e., matching pictures to text, matching text to pictures, tacting pictures, reading text, and manding using text).

While the previous study showed the emergence of derived mands using relations of coordination, derived manding has also been demonstrated using relations of comparison. Murphy & Barnes-Holmes (2009) examined the emergence of derived more-than and less-than mands in three children with autism. In order to contrive motivating operations for more or less, the authors created a board game that required the participant to earn smiley faces in order to win, and a greater or lesser number of smiley faces was requested by exchanging cards depicting different symbols. Conditional discrimination instruction for

more- and less-than relations was conducted using two of symbols, A1 (more) and A2 (less). Participants were then exposed to a second phase of conditional discrimination instruction in order to teach coordination relations between the A1 and A2 symbols and four other symbols. Specifically, relations were trained between the A1-B1 and B1-C1 symbols as well as the A2-B2 and B2-C2 symbols. Probes for derived manding followed using the C1 (more) and C2 (less) symbols to play the board game. Another phase of conditional discrimination instruction was conducted in order to reverse the previously trained coordination relations (i.e., matching B1-C2 and B2-C1 symbols). A second probe for derived manding using the board game was administered to determine if mands for more (C2) and less (C1) would emerge following the reversal. All participants demonstrated the emergence of derived more- and less-than mands following conditional discrimination instruction as well as derived mands following the reversal of instruction (Murphy & Barnes-Holmes, 2009). The importance of these findings is to highlight the utility of an RFT approach to teach a flexible mand repertoire in children with autism. The ability to reverse previously instructed mands is an important skill in order to ensure that an individual's mand repertoire is flexible enough to be functional in the natural environment.

Similar to the concept of a derived mand, a derived tact is a tact response that emerges in the absence of direct instruction (Barnes-Holmes et al., 2000). A study conducted by Halvey & Rehfeldt (2005) with adults with intellectual disabilities illustrates how a derived tact repertoire can be taught. Three categories of preferred items (e.g., the category "music" included a CD, Walkman, and portable radio) were identified for each participant. Initial pretest probes indicated that participants were unable to mand or tact the items using the corresponding category name. Instruction using a graduated time-delay was introduced to teach requesting of one preferred item from each category using the appropriate category name (e.g., request the Walkman using category name "music").

Conditional discrimination instruction using all three items from each category was then conducted (e.g., teach Walkman-to-CD and Walkman-to-portable radio) followed by posttest probes evaluating the emergence of manding and tacting using category names. Results for posttest probes indicated the emergence of derived mands through the use of the category name to request items from category that were not directly taught (e.g., request CD and portable radio using "music") as well as derived tacts evidenced by the labeling of items using the category names without explicit instruction in this skill (Halvey & Rehfeldt, 2005). These results are important in considering the organization of instructional programs because the emergence of a tact repertoire in the absence of direct instruction can save valuable instructional time. Additionally, a functional tact repertoire allows an individual to communicate effective with others about his or her environment and relay information about various contexts without direct training.

Derived intraverbals, which are intraverbals that emerge in the absence of direct instruction, are also important for teaching verbal behavior (Barnes-Holmes et al., 2000). Perez-Gonzales, Garcia-Asenjo, Williams, and Carnerero (2007) used MEI to teach children with pervasive developmental disorders to derive intraverbal antonyms. Participants were directly taught to respond intraverbally to statements in which the correct response was an antonym (e.g., "Tell me the opposite of up" and the correct response is "down"). Test probes for the emergence of reversed intraverbal responses were then conducted (e.g., "Tell me opposite of down" and the correct response is "up"). If the participant responded incorrectly to the reversed intraverbal statement, this response was directly instructed. Following instruction, a new set of statements was introduced, and the instruction-probe sequence was repeated. After MEI, participants correctly responded to reversed intraverbal statements in the absence of direct instruction (Perez-Gonzales, Garcia-Asenjo, Williams, & Carnerero, 2007). This skill is extremely important, as many

language interactions are comprised of intraverbal responses, and without a repertoire of derived intraverbals, functional communication limited in individuals with autism.

Advanced social skills

RFT also provides a foundation for creating programs of instruction for more complex verbal interactions based on a type of derived relational responding called deictic relations (Hayes et al., 2001). Deictic relations make up a repertoire that is generally referred to as "perspective-taking skills." In these relations stimuli are related according to the perspective of the speaker based on three points of reference: person, place and time, which provide the basis for the three basic types of deictic relations I-You, Here-There, and Now-Then, respectively (Hayes et al., 2001). In order to investigate and teach perspective-taking behavior, deictic relations are separated into three levels of complexity: simple, reversed, and double reversed relations (McHugh, Barnes-Holmes, & Barnes-Holmes, 2004). Simple relations involve responding to stimuli according to one deictic relation. For example, "I have a cat and you have a dog. What animal do I have?" Reversed relations involve the reversal of a simple deictic relation. For instance, "I am here at the park and you are there at the mall. If here were there, where would I be?" Double reversed relations include the reversal of two simple deictic relations. For example, "Yesterday, I played basketball there at the gym, and now, I am reading a book here at home. If now were then and if here were there, where would I be now?" The importance of these relations is evident in the course of everyday conversation that requires an individual to respond to deictic relations in order to understand and appropriately interact with another person.

A study by Davlin, Rehfeldt, and Lovett (2011) investigated the assessment and instruction of deictic relations in typically developing children while engaged in a daily activity. A protocol of deictic relations was created using children's storybooks, which required participants to change perspective according to character, place, and time within each

story, and these deictic relations were presented while participants read the stories with the experimenter. All participants showed deficits in responding to simple, reversed, and double reversed relations at the start of the study. Following training using multiple exemplars, the emergence of simple, reversed, and double reversed relations was observed for all participants (Davlin et al., 2011). Although conducted with typically developing children, this study provides the foundation for creating a successful instructional program for children with autism. Instruction of deictic relations can also benefit advanced social skills beyond simple perspective-taking including asking for advice (e.g., "What would you do in my situation?" or empathizing with another individual (e.g., "Luz lost her phone. If I were Luz, how would I feel?).

Future Directions

Behavioral interventions have been demonstrated to be effective to teach learners with ASDs a variety of skills using several teaching methods (e.g., DTT, naturalistic approaches) (Schriebman, 2000). Future research should focus on cost effective ways to teach individuals with ASDs a variety of skills in multiple settings. Specifically, research should focus on interventions that can be implemented outside of laboratory settings to facilitate derived relational responding with learners with ASD (see Rehfeldt & Barnes-Holmes, 2009). These interventions should focus on basic language skills (e.g., manding) as well as more complex skills (deictic relations). Focus should be granted to the instruction of skills that will result in the emergence of untaught skills, can be easily carried out by teachers and parents, and will result in the generalization of skills to a variety of everyday situations.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Washington, DC: Author.

Barbera, M. L. & Kubina, R. M. (2005). Using transfer procedures to teach tacts to a child with autism. *The Analysis of Verbal Behavior, 21*,155-161.

Barnes-Holmes, D., Barnes-Holmes, Y., & Cullinan, V. (2000). Relational frame theory and Skinner's Verbal Behavior: A possible synthesis. *The Behavior Analyst, 23,* 69-84.

Berens, N. M., & Hayes, S. C. (2007). Arbitrarily applicable comparative relations: Evidence for a relational operant. *Journal of Applied Behavior Analysis, 40,* 45-71.

Barbera, M. L., & Rasmussen, T. (2007). *The Verbal Behavior Approach: How to teach children with autism and related disorders*. Philadelphia, PA: Jessica Kingsley Publishers.

Cooper, J.O., Heron, T.E., & Heward, W.L. (2007). *Applied behavior analysis* (2nd edition). Upper Saddle River, NJ: Pearson Education.

Davlin, N.L., Rehfeldt, R.A., & Lovett, S. (2011). A Relational Frame Theory approach to understanding perspective-taking using children's stories in typically developing children. *European Journal of Behavior Analysis, 12,* 403-430.

Dawson, G., & Osterling, J. (1997). Early intervention in autism. In M.J. Guralnick (Ed.), *The effectiveness of early intervention* (p. 307-326). Baltimore: Paul H. Brookes Publishing.

Gillett, J.N. & LeBlanc, L.A. (2007). Parent-implemented natural language paradigm to increase language and play in children with autism. *Research in Autism Spectrum Disorders, 1,* 247-255.

Hall, G. & Sundberg, M. L. (1987). Teaching mands by manipulating conditioned establishing operations. *The Analysis of Verbal Behavior, 5*, 41-53.

Halvey, C.,& Rehfeldt, R. A. (2005). Expanding vocal requesting repertoires via relational responding in adults with severe developmental disabilities. *The Analysis of Verbal Behavior, 21*, 13-25.

Hart & Risley (1978). Promoting productive language through incidental teaching. *Education and Urban Society, 10*, 407-429.

Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post-Skinnerian account of human language and cognition.* New York, NY: Plenum.

Healy, O., Barnes-Holmes, D., &Smeets, P. M. (2000). Derived relational responding as generalized operant behavior. *Journal of the Experimental Analysis of Behavior, 74*, 207- 227.

Hsing, H., Wilder, D.A., & Abellon, O.E. (2011). The effects of training on caregiver implementation of incidental teaching. *Journal of Applied Behavior Analysis, 44*, 199-203.

Kasari, C. Assessing change in early intervention programs for children with autism. *Journal of Autism and Developmental Disorders, 32*, 447-461.

Koegel, L.K. & Koegel, R.L. (2006). *Pivotal response treatments for autism: Communication, social, & academic development.* Baltimore, MD: Brookes Publishing.

Koegel, R.L., O'Dell, M.C., & Koegel, L.K. (1987). A natural language teaching paradigm for nonverbal autistic children. *Journal of Autism and Developmental Disorders, 17*, 187-199.

Laski, K.E., Charlop, M.H., & Schreibman, L. (1988). Training parents to use the natural language paradigm to increase their autistic children's speech. *Journal of Applied Behavior Analysis, 21*, 391-400.

Lovaas, O.I., Koegel, R., Simmons, J.Q., & Long, J.S. (1973). Some generalization and follow- up measures on autistic children in behavior therapy. *Journal of Applied Behavior Analysis, 6*, 131-166.

McGee, G.G., Krantz, P.J., & McLannahan, L.E. (1985). The facilitative effects of incidental teaching on preposition use by autistic children. *Journal of Applied Behavior Analysis, 18*, 17-31.

McGee, G.G., Almeida, M.C., Sulzer-Azaroff, B., & Feldman, R.S. (1992). Promoting reciprocal interactions via peer incidental teaching. *Journal of Applied Behavior Analysis, 25*, 117-126.

McHugh, L., Barnes-Holmes, Y., & Barnes-Holmes, D. (2004). Perspective-taking as relational responding: A development profile. *The Psychological Record, 54*, 115-144.

Michael, J. (1988). Establishing operations and the mand. *The Analysis of Verbal Behavior, 6*, 3-9.

Murphy, C., & Barnes-Holmes, D. (2009). Derived more-less relational mands in children diagnosed with autism. *Journal of Applied Behavior Analysis, 42,* 253-268.

National Research Council (2001). *Educating children with autism.* Washington DC: National Academy Press.

Nelson, C. & Huefner, D. S. (2003). Young children with autism: Judicial Responses to the Lovaas and Discrete Trial Training Debates. *Journal of Early Intervention, 26*, 1-19.

Perez-Gonzalez, L. A., Garcia-Asenjo, L., Williams, G., & Carnerero, J. J. (2007). Emergence of intraverbal antonyms in children with pervasive developmental disorder. *Journal of Applied Behavior Analysis, 40*, 697-701.

Pierce, K. & Schreibman, L. (1995). Increasing complex social behaviors in children with autism: Effects of peer-implemented pivotal response training. *Journal of Applied Behavior Analysis, 28*, 285-295.

Rosales, R., & Rehfeldt, R.A. (2007). Contriving Establishing operations to establish derived manding skills in adults with severe developmental disabilities. *Journal of Applied Behavior Analysis, 40*, p. 112.

Sautter, R. A., & LeBlanc, L. A. (2006). Empirical applicaions of Skinner's analysis of verbal behavior with humans. *Analysis of Verbal Behavior, 22*, 35-48.

Schreibman, L. (2000). Intensive behavioral/psychoeducational treatments for autism: Research needs and future directions. *Journal of Autism and Developmental Disorders, 30*, 373-378.

Shillingsburg, M. A., Kelley, M. E., Roane, H. S., Kisamore, A., & Brown, M. R. (2009). Evaluation and training of yes-no responding across verbal operants. *Journal of Applied Behavior Analysis, 42*, 209-223.

Skinner, B. F. (1957). *Verbal Behavior*. Cambridge, MA: Prentice Hall, Inc.

Smith, T. (2001). Discrete trial training in the treatment of autism. *Focus on Autism and Other Developmental Disabilities, 16*, 86-92.

Stahmer, A.C. (1995). Teaching symbolic play skills to children with autism using pivotal response training. *Journal of Autism and Developmental Disorders, 25*, 123-141.

Stokes & Baer (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*, 349-367.

Sundberg, M. L. (2008) *Verbal behavior milestones assessment and placement program: The VB-MAPP*. Concord, CA: AVB Press.

Sundberg M. L., Endicott K., Eigenheer P. (2000). Using intraverbal prompts to establish tacts for children with autism. *The Analysis of Verbal Behavior*, *17*, 89–104.

Sundberg, M. L., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification, 25*, 698-724.

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