National Applied Behavioral Analysis Models

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Superheroes social skills training, Rethink Autism internet interventions, parent training, EBP classroom training, functional behavior assessment: An autism spectrum disorder, evidence based (EBP) training track for school psychologists

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Introduction to Applied Behavior Analysis Therapy

Behavioral Theory

According to traditional theories which attempt to account for the presence of autism spectrum disorders (ASDs), all individuals diagnosed with autism possess a common trait that distinguishes individuals with ASDs from typically developing persons. Lovaas (2003) states that several problems exist with traditional theories. First, individuals with ASDs display a wide range of differences. While some develop no verbal language, others will develop language that is indistinguishable from peers. Likewise, intellectual functioning varies between individuals. Second, persons with autism differ in response to treatment. Some will achieve normal functioning, while others will derive little benefit from treatment. Third, behaviors commonly associated with autism are also displayed by other groups of individuals. All infants exhibit hand flapping, and tantrums are present in children with autism and typically developing children. These examples suggest that ASDs are characterized by more than one common trait, and the behavioral difficulties associated with ASDs are likely accounted for by multiple etiologies (Lovaas, 2003).

According to Lovaas (2003), autism is a hypothetical construct which has not been proven to exist. Because autism is a hypothetical construct behavior – not autism – should be treated. Thus, the current movement within the field of autism is to break down the disorder into separate units, or behaviors, and address these separate units rather than attempt to treat the construct as a whole. Lovaas' (2003) behavioral theory of autism includes four tenets –

1. The behaviors of autistic individuals can be accounted for by the laws of learning.
2. Autistic individuals have many separate behavioral deficits rather than one central deficit that, if corrected, would lead to broad-based change.
3. Persons with autism can learn once a special environment is constructed for them.
4. Autistic persons'. . .problems can be viewed as a mismatch between their nervous systems and the normal environment rather than approached as a disease. (p. 9-11)

Discrete Trial Training

According to Lovaas (2003), applied behavioral analysis (ABA) therapy is delivered within a discrete trial. A discrete trial consists of three steps – the presentation of an instruction by the therapist, a response emitted by the child, and a consequence delivered by the therapist and administered to the child. The instruction is short in length with unnecessary words omitted, and the same instructional phrase is used consistently across therapists. For example, an appropriate instruction is "drop block;" whereas, the instruction "Jacob, please drop the block into the bucket" is inappropriate due to the length and use of unnecessary words. The response is the correct behavior emitted by the child after the presentation of the instruction. No more than three seconds is allowed for the child to emit the response, and an appropriate response is consistently defined among therapists. The consequence, delivered immediately after the response, consists of anything that increases the probability that the child will emit the appropriate response again or anything that decreases the probability that the child will emit an inappropriate response. Of the two consequences, positive reinforcement or, increasing the probability of the child emitting the correct response, is used more frequently than punishment which is anything that decreases the probability of an incorrect response.

Other Important ABA Techniques

Prior to beginning ABA therapy, behaviors are broken down into units which are taught separately. The deconstruction of behaviors is known as task analysis. The beginning units of a behavior are simple enough that the child can easily earn positive reinforcement. As the beginning units are mastered, the child is not only learning the target behavior, but he is also learning that the appropriate response yields positive reinforcement. The relationship between the appropriate response and positive reinforcement is essential to ABA therapy (Lovaas, 2003).

As discussed by Lovaas (2003), positive reinforcement is anything that increases the probability of an appropriate response. A positive reinforcer can be anything that the child find pleasurable or reinforcing (i.e., food, toys, tickles, etc). When the child is learning the beginning units of a behavior, positive reinforcement is given on a continuous schedule; that is, the child is rewarded for every correct response. As the child masters the behavior, the reward schedule is thinned such that a reward is earned every n^{th} time the behavior occurs. There are two types of reinforcers: primary and secondary. Primary reinforcers are naturally reinforcing to a child and may include food and access to toys. Secondary reinforcers, such as tickles or praise, are not naturally reinforcing. A primary reinforcer is always accompanied with a secondary reinforcer, and the reward schedule for primary reinforcers is slowly thinned. Correct responses are always reinforced with secondary reinforcers.

Punishment, or anything that decreases the probability of an inappropriate response, is used less frequently than positive reinforcement. Punishment is used to stop or decrease a problematic behavior (i.e., tantruming, aggression, etc). The use of aversives, time-out, and overcorrection are examples of punishment. An aversive is physical punishment and may include spanking or slapping. Aversives should be used very rarely, if at all. Time-out involves removing the child from a rewarding environment. The effect of time-out has on a child's problematic behavior should be closely monitored. If the inappropriate behavior increases after the implementation of time-out, then the child likely finds time-out reinforcing. In such cases, the use of time-out procedures is inappropriate. When a student performs a behavior beyond what is needed, overcorrection has been applied. Overcorrection may consist of a child cleaning the entire house for making a mess in the kitchen or writing on paper continuously for writing on a wall. Although certain behaviors may warrant the use of punishment techniques, the preferred

method to reduce problematic behaviors is to reward appropriate behaviors that are incompatible with the problematic behaviors. For example, try rewarding the child for having a calm body instead of punishing him for having a tantrum. If punishment is used, the techniques should be employed with the close supervision of someone who has extensive experience in ABA therapy (Lovaas, 1981).

According to Lovaas (2003), when learning the beginning units of a behavior, the child may require the assistance of a prompt. A prompt is any action performed by the therapist that assists the child in performing a correct response so that the child can be reinforced and the behavior strengthened. A prompt is delivered after the presentation of the instruction. Types of prompts include – physical/manual, modeling, position, and recency. A therapist guides a child through the actions of a response with a physical/manual prompt. When the therapist performs a behavior for the child to imitate, a modeling prompt is used. Position prompts involve placing a target item closer to the child. When using a recency prompt, a therapist provides the answer prior to asking a question. For example, a therapist may instruct a child to "Touch sock" prior to asking "What is it?".

Once a child consistently emits a correct response with prompts, the prompts should be faded in a manner similar to thinning of reward schedules. Graduated guidance slowly reduces the amount of physical effort provided by the therapist. Most-to-least fading begins with a full physical prompt, fades to a gesture or model, and ends with a verbal instruction. Conversely, least-to-most fading begins with opportunity for the child to respond independently and progressively increases the amount of physical assistance required for the correct response (Lovaas, 2003).

Generalization and Maintenance

Generalization refers to the transfer of skills from one situation to another. Generalization can be promoted by teaching in different environments, having the child work with different adults, making the school and home environment similar, and using common reward schedules. Maintenance refers to the continued performance of a skill after teaching has ended. The maintenance of treatment gains can be protected by teaching in different environments, using an intermittent, or thin, reward schedule, using rewards that are natural to the learning situation, teaching functional behaviors, and reviewing previously acquired skills (Lovaas, 1981).

Teaching Developmentally Disabled Children: The ME Book

About the Author

Dr. O. Ivar Lovaas was the first researcher to suggest that autism can be successfully treated in some individuals. Dr. Lovaas diverged from psychotherapy, or the preferred method of treatment in the 1960s, and advocated for the treatment of ASDs according to a behaviorist model using ABA techniques. Dr. Lovaas' treatment method called for an intensive one-to-one program of behavioral modification to treat the social and psychological difficulties that are characteristic of ASDs. Dr. Lovaas published two treatment manuals, *The ME Book* and *Teaching Individuals with Developmental Delays*. In 1995, the Lovaas Institute was created to train therapists in the Lovaas Model of ABA (Fox, 2010).

Getting Ready to Learn

Getting Ready to Learn outlines steps for proper sitting, directing and maintaining the child's attention, and eliminating mildly disruptive behaviors. Proper sitting involves three commands: "Sit Down," "Sit Up Straight," and "Hands Quiet." When teaching the first command, "Sit Down," the therapist places a child-sized chair behind the child, then the

instruction “Sit Down” is given. A physical prompt is provided, if needed. The physical prompt employed is individualized to the child. Some children need to be physically placed on the chair while others comply to the command with slight pressure on the shoulders. Immediately after the child sits, reward using primary and secondary reinforcers. After reinforcement is delivered, the child stands and the behavior is repeated. As the child understands the relationship between compliance to the instruction and the obtained reinforcement, slowly fade the prompt so the child sits independently. For example, if the child requires pressure on the shoulders to sit, slowly fade the pressure given until the child sits without assistance.

Unlike the “Sit Down” command, “Sit up Straight,” and “Hands Quiet” are not explicitly taught; that is, the therapist waits for opportunities to teach these commands. The “Sit up Straight” command is given when the child has slumped in the seat or has slid down the seat. The command “Hands Quiet” is given for excessive fidgeting and/or self-stimulation. Several behaviors constitute compliance to the “Hands Quiet” command including – hands and arms hanging at the side, hands flat with palms flat on the legs, or hands folded in the lap. When the child is not sitting properly, the therapist states the command and provides a physical prompt, if necessary. Regardless of the prompt, the child is reinforced for compliance. The physical prompt is faded until the child can independently perform the request. Once the child understands what behavior is expected with each prompt, slowly thin all reinforcement.

Directing and maintaining the child’s attention involves teaching the child to visually attend to the therapist’s face and to objects in the environment. The “Look at Me” instruction is used to teach eye contact. This lesson is best taught after learning to sit properly. Once the child is properly sitting, give the instruction every five to ten seconds. In order to earn reinforcement, the child should look within two seconds of the delivery of the instruction and make eye contact

for one second. After the child looks, the therapist says “Good Looking” while providing reinforcement. If the child does not comply within two seconds, the therapist looks away for approximately five seconds before delivering the command again. Some children will need a prompt. Prompts may include holding a preferred object (e.g., food, toy, etc) in the line of vision while giving the command or the therapist pointing at his eyes while giving the command. Any required prompts are faded until the child can independently perform the request. Teaching the child to visually attend to other objects is taught using the same steps for “Look at Me.”

Eliminating mildly disruptive behaviors eliminates behaviors used to avoid working and/or used to interfere with teaching. Prior to eliminating disruptive behavior, determine what the child is trying to gain by engaging in the undesired behavior. The child is most likely trying to avoid working or trying to gain attention from the therapist. The most effective and least complicated procedure for eliminating disruptive behaviors is straight extinction. Straight extinction is the removal of the attention from the therapist; that is, the therapist pays the child absolutely no attention. The time-out from attention procedure is used when the therapist turns his body away from the child until the disruptive behavior stops. Time-out should not be used if the child frequently self-stimulates or if the child is trying to avoid a task. When straight extinction and time-out from attention are ineffective, the “No!” command is used. When the disruptive behavior occurs, the therapist immediately and forcibly says “No!” and specifies the behavior (e.g., “No talking!”). If the child discontinues the behavior, praise the child. The therapist should proceed with the task at hand if the child decreases the intensity of the behavior. If the disruptive behavior increases, the therapist should escalate the “No!” command.

Imitation, Matching, and Early Language Skills

The Imitation, Matching, and Early Play Skills unit outlines the teaching steps for beginning language skills. Imitation is crucial to the early acquisition of social, recreational, and language skills. Imitation of less complex and more discriminable behaviors are taught first. Gross motor imitation is the first skill in the unit. With the child properly sitting, the therapist gives the command "Do this. . ." while raising his arms. Reinforcement is given once the child raises his arms, regardless of the amount of assistance required. If a prompt was required, it is faded. The child can begin to learn additional gross motor imitations (e.g., touching nose, clapping hands, etc) once he can raise his arms without prompting with 90% accuracy across several trials. Once the child has acquired several imitations, the therapist randomly rotates the imitations across trials to ensure that the child is discriminating between actions.

Matching visual stimuli teaches the child to identify similarities and differences. Different forms of matching include – concrete matching (e.g., real objects), abstract matching (e.g., illustration of objects), and concrete-to-abstract matching. Concrete matching is taught first, and the child is taught to match one pair of concrete objects, hereafter referred to as A and A', with the instruction "Put Same With Same." The therapist places A on the table, gives A' to the child, and gives the instruction. A correct response occurs when the child puts A' near A. Reinforcement is given for correct responses. Use prompts and prompt fading as needed. Once a child can match A and A' without prompts, the therapist introduces B and B'. The second object should be very different from the first object (e.g., yellow cups and socks). The therapist places A and B on the table and gives B' to the child and says "Put same with same." If the child responds incorrectly, the therapist should say "No," retrieve B', and restart the trial using prompting as necessary. If the child responds correctly, reinforcement is provided and trials continue with A and B in the same positions until criterion is met. The same procedures are used

to teach a child to match alternating presentations of different objects, to match random positions of different objects on the table, and to match additional objects. Once concrete matching is mastered, abstract matching and concrete-to-abstract matching are taught. Eventually, matching skills can be expanded to matching classes (e.g., forms of transportation), matching colors, and matching shapes.

Following verbal instructions teaches the child to respond to simple requests and builds receptive language skills. Because the steps for teaching verbal instructions are similar to teaching imitation, this skill is best taught after the child masters imitation. Begin with the child responding to "Raise arms" and "Touch nose" using the teaching steps for imitation. Once the child masters five to ten instructions, the therapist has the child comply with one command every five seconds for at least one hour per day. After simple requests are mastered, the child is taught to comply with complex requests. Examples include complex actions (e.g., "Get [object]"), manipulating objects (e.g., "Turn on light"), and affectionate behavior (e.g., "Give Hug"). When complex requests are mastered, requests can be expanded by giving two instructions for two different objects at a time or by moving requested objects further away from the child.

Mastery of early language skills begins with the child learning to imitate sounds and words. Verbal imitation is the most difficult skill to teach; thus, approximately half of therapy time is devoted to language acquisition. If the child is less than six years old and independently uses complicated consonant-vowel combinations, then the child will probably learn language relatively quickly; however, if the child has not made much progress in the curriculum after two to three months of training, it may be appropriate to begin teaching a nonverbal communication system (e.g., picture exchange communication system, pages 13-14).

The verbal imitation curriculum is divided into five phases – Increasing Vocalizations; Bringing Vocalizations Under Temporal Control; Imitation of Sounds; Imitation of Syllables and Words; and Imitation of Volume, Pitch, and Speed of Vocalizations. In the first phase, Increasing Vocalizations, the therapist gives the command "Talk" and rewards any vocal response. The instruction is repeated every five to ten seconds until consistent responses are given. If the child does not vocalize, the therapist uses a physical prompt such as tickling or other activity that has a high probability of evoking a vocal response. Vocalizations are immediately reinforced, and prompts are faded. The goal of the second phase is to bring the vocalizations under temporal control; that is, the child is taught to vocalize within three seconds of the command. The same steps as described for first phase are used with slight modification. Once the child has mastered vocalizing within three seconds (e.g., correct performance on ten consecutive trials), the time interval is reduced to two seconds and a one second interval.

Whereas the first two phases reinforce any vocalizations, the remaining phases teach the child to make specific sounds and words. The third phase, Imitation of Sounds, teaches imitation of specific sounds which will later be used to form words. By the end of the third phase, the child imitates ten sounds including at least three consonant sounds. The therapist begins by saying one sound, such as "ah," and reinforcing close approximations of the sound. Slowly, the therapist only rewards sounds that are successively closer to the target sound (e.g., the therapist shapes the response). Once the child can reliably and correctly say the first sound, the therapist teaches a second sound, "mm," and then intermixes the first and second sounds once criterion for the second sound is obtained (e.g., accurate imitation over ten consecutive trials). Additional sounds are slowly added to the child's repertoire. The fourth phase, Imitation of Words, is similarly taught. The therapist chooses words that are composed of sounds learned in the

previous phase (e.g., “mama” [“mm” and “ah”]). As the teaching trials progress, successively closer approximations of the target word are rewarded. If the child cannot imitate the entire word, the therapist divides the word into separate sounds and uses chaining to form the sounds into a word. If the child’s speech is atypical, similar procedures are used to shape the volume, pitch, and speed of vocalizations.

Appropriate play skills are taught by using mastered nonverbal imitation skills. For example, the therapist presents the child with a block and says “Do this. . .” while constructing a tower. The child is rewarded for imitating the actions of the therapist. Once the child has mastered building a tower, the child can learn to build different structures. Similar procedures are used to teach the child how to play with cars, dolls, sports, dancing, and drawing.

Intermediate Language

The Intermediate Language unit summarizes the teaching steps for building receptive language and expressive language. Receptive object labeling begins with teaching the child to identify two objects. After the child masters the random rotation of two objects, additional objects are introduced. The first object (e.g., a cup) is taught by placing it on the table and instructing the child to “Touch cup.” If the child responds incorrectly, prompts are provided. A visual prompt involves the therapist touching the cup with the child expected to imitate the action, and a physical prompt occurs when the therapist physically guides the child to the cup. When two objects are presented, a proximity prompt may be used by placing the target object closer to the child. Any prompts should be faded. Receptive action labeling is taught by instructing the child to “Walk to [Mom].” Prompts are given by following the instruction with “Do this. . .” as the child imitates the therapist. Physical prompts are used, if necessary. The

second action label that the child learns is “Jump to [Door].” After the child masters each action, the instructions are given in random rotation followed by the introduction of new actions.

With expressive object labeling, the therapist places an object on the table and asks, “What is it?”. If the child replies with the correct label, reinforcement is given. If the child fails to name the object, the therapist prompts the child by naming the object which the child is expected to imitate. The therapist fades the prompt by providing the child with less of the word. Once the child masters a first object, a second object is introduced followed by random rotation and the introduction of additional objects. Expressive action labeling is taught by the therapist performing an action (e.g., standing up) and asking “What am I doing?”. If the child requires a prompt, the therapist stands up without asking the question and says “Standing.” The child imitates “Standing” to earn reinforcement. Random rotation and additional action labels follow.

Teaching Individuals with Developmental Delays: Basic Intervention Techniques

Overview of the Manual

Teaching Individuals with Developmental Delays: Basic Intervention Techniques was published by O. Ivar Lovaas in 2002 as a revised follow-up to the ABA techniques in *The ME Book.* Because much of the material presented in the current revision of the manual is comparable to the material in the original manual, the curriculum will be briefly summarized and will be followed by a review of the new information presented in the manual.

Curriculum Overview

In the introductory lessons, the therapist establishes cooperation with the child and reduces the child’s tantrums. These skills are comparable to the “Getting Ready to Learn Skills” in *The ME Book.* The first skill that the student learns is proper sitting, and tantruming is reduced using positive reinforcement when the tantrum subsides or using extinction. Once the

child masters proper sitting, the “Come Here” instruction is taught and “Hands Quiet” and “Sit Nice” are taught as needed. If no progress is made with the previous skills in the first hours of therapy, Lovaas suggests establishing cooperation with a preferred task, such as completing a puzzle or dropping a block into a bucket (e.g., commands “Put In” and “Drop Block,” respectively). The primary purpose of teaching preferred activities is to bring the child’s behavior under instructional control; that is, the child learns that compliance to a command yields a reward.

After the child learns proper sitting without tantrums, the following skills are taught – matching/sorting, imitation, receptive language, and expressive language. Within the nonverbal imitation curriculum, gross motor imitation using objects is taught first instead of gross motor imitation without objects as described in *The ME Book*. Because behaviors involving toys are more discriminable than behaviors involving the body, this revision to the curriculum sequence was necessary. After gross motor imitation with and without the use of objects is mastered, imitation tasks to improve finger-hand dexterity (e.g., stringing beads, tracing, etc) and fine motor imitation tasks are taught (e.g., point fingers, folding hands, etc).

Types of Language Learners

Lovaas categorizes children into two types of language learners – auditory learners and visual learners. Auditory learners acquire language with the use of the procedures described earlier. Approximately 45% of children diagnosed with autism will acquire verbal language skills comparable to typically developing persons. Conversely, visual learners are characterized by expressive language deficits and will not make much progress with the aforementioned language programs. Visual language learners require a visual form of communication examples of which include sign language and/or the picture exchange communication system, or PECS.

In its simplest form, the PECS teaches the child to approach an adult with a picture to be exchanged for something in the environment. For example, if the child wants a snack, the child may choose a picture and give it to a therapist to communicate his desire for a snack. PECS training involves two adults, the enticer and the helper, and the child. The enticer sits facing the child and holds out his hand, palm-side facing up, and the helper sits behind the child facing the enticer. A preferred object is placed between the enticer and the child along with a picture representing the object. The picture of the item is placed closer to the child. As the child reaches for the preferred object, the helper guides the child's hand to the picture, helps the child pick up the picture, and places the picture in the enticer's hand. Once the picture is handed to the enticer, the enticer says, "Chips! You want chips!" and immediately gives chips to the child. It is crucial that no direct verbal cues are used to initiate the exchange. Also, the use of the hand waiting palm-up and any physical prompts by the helper are faded as quickly as possible. Once the child can perform the exchange without assistance, environmental variables may be manipulated, such as increasing rewards represented by the pictures, increasing the distance to the enticer, increasing the distance to the picture, and generalizing the use of PECS across adults. The goal is for the child to use PECS without prompts or assistance in his daily routine.

A Work in Progress: Behavior Management Strategies and a Curriculum for Intensive Behavioral Treatment of Autism

About the Editors

A Work in Progress, edited by Ron Leaf and John McEachin, was published in 1999. Ron Leaf received his undergraduate and graduate degrees while working at UCLA's Young Autism Project under the direction of O. Ivar Lovaas (Autism Partnership, *Dr. Ronald Leaf*). Similarly, John McEachin completed his graduate training at UCLA on the Young Autism

Project. Together, the editors formed the Autism Project in 1994 where they serve as co-directors (Autism Partnership, *Dr. John McEachin*).

Disruptive Behavior

For many children with autism, the primary barrier to typical classrooms is disruptive behavior. Disruptive behaviors are difficult to change and may increase dramatically as attempts are made to alter these behaviors (e.g., extinction bursts). The features of the environment that trigger disruption (e.g., the antecedent of the behavior) are the most important aspect of the behavior. Positive learning situations, or situations where the child is likely to remain calm and cooperative, are designed to eliminate the triggers of disruptive behaviors. For example, if a child has difficulty transitioning from home to therapy, the child may be allowed to play for the first few minutes of therapy while complying with preferred commands (e.g., "Drive Truck"). As the child becomes calm, the therapist begins teaching. Positive learning situations increase the reinforcement given to the child, creates a positive relationship between the therapist and the child, and makes the learning environment enjoyable for the child.

When changing antecedents in the environment by creating positive learning situations is ineffective, the resulting behaviors tend to follow the escalation cycle. During the beginning stage of escalation, the child displays slight disruption. Once the disruptive behavior is noticed, continue with the activity while increasing the strength of the reinforcement. If the disruption increases, ignore the behavior and provide reinforcement, as appropriate. Moderate disruption is displayed during the second stage. At this time, stimulus change procedures are employed; that is, the therapist identifies the antecedent to the disruption. For example, if the task is too demanding, slowly redirect the child to a less demanding task. Reinforcement is given, as appropriate, and soothing reinforcers are given as time passes. The third stage represents

extreme disruption. Specific instructions are given in which the word *not* is absent (e.g., "You need to sit down"). As the child gains control, provide reinforcement. If the child enters the final stage, or becomes a danger to himself and/or others, hands-on procedures are used.

Sleep Problems and ABA Therapy

Because difficulties with sleep can lead to difficulties during therapy, eliminating a child's sleep problems is vital. Training begins with the creation of a nighttime routine which signals to the child that bedtime is near. The routine is done every night without deviation until a consistent sleep pattern is established. Examples include taking a bath or reading a story. Activities that are distressing to the child should be done earlier in the day. A parent laying with the child until the child falls asleep is not an appropriate routine because the child will seek his parents when he awakes in the middle of the night. Once a routine is created, a proper bedtime should be selected. In the beginning of training, start the routine at a much later hour and gradually push the bedtime to earlier in the evening. Most importantly, the child must remain in his own bed. If the child strays, parents should continuously place the child in his bed in a neutral manner with as little physical contact as possible. With adherence to these guidelines, sleep problems can typically be eliminated with one week of training.

Toilet Training with ABA Therapy

Prior to training, the child should meet several pre-requisites including – minimal noncompliance, awareness around voiding, and the ability to communicate the need for the toilet. The goal of toilet training is to teach the child to void when placed on the toilet and to withhold voiding at other times. At the beginning of training, the child is placed on the toilet every 90 minutes for a total of 15 minutes. As the child sits on the toilet, reinforce for good sitting every three minutes. If the child voids in the toilet, give a highly rewarding reinforcer that is only

earned for toileting. The reinforcer for proper voiding must be more motivating than reinforcers earned for good sitting. As the child masters voiding on a 90 minute schedule, the schedule is slowly lengthened by 15 – 30 minutes. If the child does not void while sitting on the toilet, the schedule is shortened to placement every 60 minutes, and if the child voids while not on the toilet, the child helps with clean up and practice going from the location of the accident to the toilet.

To train independent toileting, place the child, unclothed, on a chair next to the toilet, and reinforce the child every three minutes for good sitting or for voiding in the toilet. The child should independently move himself from the chair to the toilet. As the child becomes successful, slowly move the chair farther from the toilet while retaining a piece of clothing each time. Once the child can independently use the toilet with the chair placed far away from the toilet and with all his clothes on, the toilet training process is complete. As before, if the child voids while sitting on the chair, employ a correction procedure and practice going from the chair to the toilet.

Behavior Intervention for Young Children with Autism: A Manual for Parents and Professionals

Overview of the Manual

Behavior Intervention for Young Children with Autism, published in 1996, was edited by Catherine Maurice, a mother of two children diagnosed with autism in the 1990s. As a parent, Catherine Maurice recounts the confusion she experienced identifying the best treatment for her children. Because of her struggle, Catherine Maurice initiated the compilation of this manual which outlines empirically validated ABA methods for the treatment of autism. Catherine Maurice is also the author of *Let Me Hear Your Voice: A Family's Triumph Over Autism* and *Making a Difference: Behavior Intervention with Autism.*

Programmatic Considerations

ABA therapy begins with a skill assessment to determine the child's proficiency of a skill set. Skills should be reliable, complete, and generalized. To be reliable, the skill must be performed with 80% consistency, and a skill is considered complete when all parts are demonstrated. Generalized refers to the child exhibiting the skill with different people in different contexts. Once the skill set is determined, behavioral objectives are written which set the condition for the behavior (e.g., the prompt), the expected behavior, and the criteria for attainment. The following is an example of a behavioral objective – "When prompted with "Do this," Chad will imitate the therapist's movements with at least 80% accuracy across three consecutive sessions." Typically, 15-20 behavioral objectives are targeted over 3-6 months.

Behavioral objectives are taught in three types of instructional settings – direct, activity-based, and incidental. Direct instruction involves tight control over teaching activities. Direct instruction is commonly associated with ABA therapy as it involves sitting fact-to-face with rapid presentation of trials. In activity-based instruction, the learning trials are embedded within an activity. For example, while playing with blocks, the therapist intentionally withholds blocks, so the child is forced to communicate with the therapist. Incidental instruction is characterized by child-directed, natural activities the consequences of which are naturally reinforcing. An example of incidental instruction is a child pointing to a water fountain for a drink, and the child must imitate a model of appropriate language to receive the reinforcer (e.g., water).

The skills sets targeted by behavioral objects are organized into curriculum guides. The beginning and intermediate curriculum guides focus on the following behaviors – attending, imitation, receptive language, expressive language, pre-academic (e.g., , colors, numbers, etc),

and self-help (e.g., dressing skills, toilet training, etc). The advanced curriculum guide adds other skills, such as abstract language, social skills, and school readiness.

Promoting Language Acquisition

When promoting language acquisition, there are several techniques used by speech-language therapists that can be used by families. Minimize direct questions which are known as "what" questions (e.g., "What are you doing?"). Also, commenting, or verbally narrating a child's play, promotes language development. When an adult waits for a response while looking with anticipation, the wait and signal technique is employed. Additionally, communicative situations should be created. A communicative situation forces the child to communicate to have needs met. For example, if the child is eating crackers, giving only one cracker at a time forces the child to request more crackers. Modeling, or the provision of appropriate language, also promotes language. Reducing the length of adults' sentences and, instead, using language that matches the child's ability promotes linguistic development. Expansion increases linguistic complexity. For example, if the child says "Truck," the adult adds one word, such as "Red Truck," and signals to the child to repeat the model. The use of exaggerated intonation, volume, and rate of speech can increase interest in language. Lastly, always provide reinforcement when a child uses language, especially if the speech is newly acquired.

Research-Based Evidence

Lovaas (1987) and McEachin, Smith, & Lovaas (1993)

Lovaas (1987) reported the results of "a behavioral-intervention project that sought to maximize behavioral treatment gains" (p. 3) in young children diagnosed with autism. The study included two treatment conditions and one control condition. The Experimental Group (n=19) received intensive one-to-one ABA therapy as outlined in *The ME Book* for an average of 40

hours per week for at least two years. Control Group 1(n=19) received Lovaas' ABA therapy at a much lower intensity – at most 10 hours per week for at least two years in addition to any community services. Control Group 2 (n=21) served as the control condition. The purpose of Control group 2 was to ensure that recipients of the ABA therapy did not constitute "a subgroup with particularly favorable or unfavorable outcomes" (Lovaas, 1987, p. 5).

Pretreatment and posttreatment assessment data were collected on the Experiment Group and both control groups. Posttreatment measures were administered between the ages of six and seven and included the first-grade placement and IQ score of the subject. Based on the posttreatment measures, a subject was considered "best outcome" if the subject completed first-grade in a normal class, obtained an IQ score in the normal range and was advanced to the second grade. Another outcome occurred if the subject was placed in an aphasia class (e.g., language delayed, language handicapped, or learning disabled) while in the first-grade. If the first-grade placement for the subject was in a class for the "autistic/retarded" (Lovaas, 1987, p. 5) with an IQ score in the "severely retarded range" (Lovaas, 1987, p.5), the subject did not respond to treatment.

Results indicated that the Experimental Group was significantly higher than both control groups on educational placement (p<0.001) and IQ (p<0.01) at posttreatment. Nine subjects (47%) completed normal first-grade with average or above average IQ scores, and these best-outcome subjects were described as "indistinguishable from their normal friends" (Lovaas, 1987, p. 8) by school personnel. A total of eight subjects (42%) completed first-grade in an aphasia class. The remaining Experimental Group subjects were placed in "autistic/retarded" (Lovaas, 1987, p. 6) classes with an IQ less than 30. Of the control group subjects, 2% completed normal first-grade with an average IQ score, 45% were placed in aphasia classes in first-grade, and 53%

were placed in classes for the “autistic/retarded” (Lovaas, 1987, p. 7). Compared to Control Group 1, the Experimental Group gained an average of 30 IQ points; whereas, the scores of the control groups did not change significantly.

While Lovaas (1987) considered the effects of treatment “substantial” (p.8), he questioned whether or not “certain residual deficits may remain in the normal functioning group” (p.8) that would be detectable as the subjects matured. McEachin, Smith, and Lovaas (1993) provided answers by examining long-term outcomes of subjects in the Lovaas (1987) study. At the time of follow-up, the mean chronological age of subjects in the Experimental Group was 13 years (range = 9 to 19 years), and the length of time that the subjects had been out of treatment was an average of five years (range = 0 to 12 years). The mean age for subjects in Control Group 1 was ten years (range = 6 to 14 years), and these subjects had been out of treatment for an average of three years (range = 0 to 9 years). Assessment measures included an intelligence test, an adaptive behavior measure, and a personality inventory.

As compared to Control Group 1, subjects in the Experimental Group remained in normal classrooms ($p<0.05$), achieved higher IQ scores ($p<0.01$), and displayed higher levels of adaptive behavior. The authors conducted a separate analysis on the best-outcome group, or those subjects who had completed normal first-grade with an average or better IQ score. The scores of the best-outcome group were compared to a Nonclinical Comparison Group of typically developing subjects. Overall, the Nonclinical Comparison Group displayed at least average functioning in all areas. Similarly, the best-outcome group maintained their level of intellectual functioning (range = 99 – 136), did not display clinically significant levels of maladaptive behavior, and scored in the normal range on the personality inventory. One best-outcome subject no longer met criteria for normal-functioning as evidenced by low scores on the verbal section of

the intelligence test, low scores on the communication subscale of the adaptive behavior measure, and deviance in scores on the personality measure. Despite the regression of one best-outcome subject, McEachin et al. (1993) concluded that "the favorable outcome of the experimental subjects can be attributed to the treatment they received" (p. 369).

Schopler, Short, & Mesibov (1989) and Lovaas, Smith, & McEachin (1989)

Schopler, Short, and Mesibov (1989) published a critique of Lovaas' (1987) study in which Schopler and colleagues disagreed with the outcome measures, subject selection methods, and control group. With regards to the outcome measures, Schopler and colleagues claimed the outcome measures were not specific enough to support Lovaas' (1987) claims of normal functioning. Additionally, the use of mainstream classroom placement as evidence of recovery was questioned because of variations in school policy and family advocacy. The use of improvement in IQ performance was also considered inappropriate because higher scores may reflect improvements in compliance. Schopler et al. (1989) claimed that the inclusion criteria for Lovaas (1987) excluded too many low-functioning children, which resulted in higher IQ scores at intake as compared to a random sample of children with autism.

Lovaas, Smith, and McEachin (1989) disputed the comments in the critique. Regarding outcome measures, Lovaas et al. (1989) stated that global measures of outcome were intentionally used to document "significant, generalized improvement" (p. 165). While the authors did assist in preschool placement, any educational advancement after preschool was based on the child's own merits. Also, improvements in IQ scores do not reflect improvement in compliance because children with autism have intellectual deficits regardless of compliance abilities. Children with low PMA scores were excluded because of difficulties with differentiating children with autism from "other profoundly retarded children" (Lovaas et al.,

1989, p. 166). Additionally, the authors cite other experimental samples that reported similar IQ scores at intake as compared to the Lovaas (1987).

Gresham & MacMillan (1997) and Smith & Lovaas (1997)

Gresham and MacMillan (1997) authored an article in which threats to the experimental validity of Lovaas (1987) were cited. Lovaas' (1987) instrumentation procedures were questioned. More specifically, the authors claimed that the use of different measures at pretreatment and posttreatment made the IQ scores uninterpretable. Moreover, since subjects were reinforced for compliant behavior only during pre-treatment assessment, the scores are uninterpretable because of different experimental conditions. Lack of random assignment was cited as another threat. Because children with "severe or profound mental retardation" (p. 192) were excluded, Gresham and MacMillan (1997) claim that the applicability of the intervention with severely disabled children is unknown. Lastly, because Control Group 1 made few gains when exposed to the same but less intensive intervention, the authors question if improvements in the Experimental Group were due to increased attention and contact.

Smith and Lovaas (1997) rejected the claim that the results of the Lovaas (1987) were threatened due to lack of experimental validity. Regarding the instrumentation procedures, the authors replied that no one assessment procedure existed that could evaluate all children on all developmental levels; thus, the use of different assessment tools was essential. Although reinforcement procedures were used at preintervention, optimizing scores at pre-test yields a conservative estimate of improvement; whereas, the optimization of scores at post-test would have yielded a liberal estimate. Pure random assignment to conditions was not permitted due to ethical considerations. Low-functioning children were excluded because "no valid procedure exists for diagnosing autism in children who have severe or profound mental retardation" (Smith

& Lovaas, 1997, p. 209). As for the few gains made by Control Group 1, Smith and Lovaas (1997) cited other studies which concluded that low-intensity ABA intervention is inadequate.

Reichow and Wolery (2008)

Reichow and Wolery (2008) conducted a synthesis of studies using Lovaas' method. The synthesis included fourteen experimental samples (n=251). Descriptive analysis revealed that 18% of experimental participants met Lovaas' (1987) recovery criteria and warranted a diagnostic reclassification. An effect size analysis was also conducted. Effect sizes (g_c) were calculated for IQ, adaptive behavior, expressive language, and receptive language. The effect sizes ranged from -0.19 to 1.58 for IQ improvement and ranged from -0.25 to 0.86 for improvement on an adaptive behavior measure. The largest effect size ranges were found for expressive language and receptive language (g_c = 0.23 to1.72 and g_c = 0.45 to 1.79, respectively). The mean effect size for treatment was 0.69 (p <0.001). The authors also conducted a moderator analysis with change in IQ score as the dependent variable. Findings indicated that significantly higher IQ scores were obtained at post-intervention when the supervisory personnel were trained under the UCLA model. Although the authors warn that results should be interpreted with caution due to the small number of included research reports, the findings suggest that ABA is an effective intervention for children with autism. Greater treatment effects were reported in the areas of receptive language, expressive language, and IQ performance.

Virués-Ortega (2010)

Virués-Ortega (2010) published a meta-analysis the purpose of which was to report on the effectiveness of ABA therapy. The meta-analysis included 22 research trials with 323 participants in intervention groups. Treatment effect sizes (ES) were calculated for IQ, adaptive behavior, and language skills. For IQ, the effect size across studies was 1.19 (p < 0.001), and

effect sizes tended to be stronger for clinic-based programs as compared to parent-managed programs (ES = 1.23 and 1.02, respectively). The effectiveness of treatment on non-verbal IQ was calculated to be 0.65 (p = 0.008).There were no clear effects for treatment intensity or duration on IQ performance which indicates an "exhaustion of intervention effects" (Virués-Ortega, 2010, p. 397).

The adaptive behavior composite score comprised of the following subscales – communication, daily living skills, motor skills, and socialization. The effect size for the composite score was 1.09 (p <0.001) and tended to be stronger for clinic-based programs as compared to parent-managed programs (ES = 1.17 and 0.97, respectively). Of the subscales, the largest effect size was found for communication (ES=1.45). Communication effect sizes tended to be stronger for the UCLA model as compared to general models of ABA (ES=1.73 and 1.17, respectively). The remaining adaptive behavior subscales – daily living skills, motor skills, and socialization – had lower effect sizes (ES=0.62, 0.95, and 0.71, respectively). Adaptive behavior effect sizes increased with intervention intensity but not with the duration of treatment.

The effect size of ABA intervention on general language skills was 1.07 (p = 0.004). Similar effect sizes were found for receptive and expressive language (ES = 1.48 and 1.47, respectively). Language skills showed dose-response trends for total duration of treatment indicating that language skills have "great potential for continuous treatment gains" (Virués-Ortega, 2010, p. 397). Overall, language outcomes were superior to improvements in IQ and adaptive behavior.

Early Start Denver Model for Young Children with Autism: Promoting Language, Learning, and Engagement

About the Authors

Dr. Sally Rogers specializes in autism research at the University of California, Medical Investigation of Neurodevelopmental Disorders Institute, and her interests include early diagnosis of and intervention for ASDs. Dr. Rogers developed the original Denver Model for autism treatment (University of California-Davis, Department of Psychiatry and Behavioral Sciences, *Sally J. Rogers, Ph.D.*). Dr. Geraldine Dawson also conducts early detection and intervention research, and she served as the first chief science officer at Autism Speaks (Diament, 2013). Together, Drs. Rogers and Dawson developed the Early Start Denver Model as an extension of the Denver Model (Autism Speaks, *The Early Start Denver Model [ESDM]*).

Theoretical Foundations

The Early Start Denver Model (ESDM) was developed from several approaches designed to understand and treat autism. According to the Denver Model, autism is a failure of social-communication development. In typical children, close relationships foster development of social and communication skills; thus, autism interventions should target building close relationships. The Model of Interpersonal Development in Autism focuses on the presence of imitation impairments in infants with ASDs. Imitation serves as the first communication tool between infant and caregiver. The ability to imitate is considered essential to the development of social skills and language skills. The Social Motivation Hypothesis maintains that children with ASDs do not experience intrinsic rewards from social interactions, so these children avoid social interactions and miss the inherent learning opportunities.

From the aforementioned approaches, the ESDM maintains that early interpersonal experiences of infants with autism obstruct the development of typical social-communication abilities. As the infant matures, an increasing number of social learning opportunities are lost resulting in the features of autism. The purpose of the ESDM is to end the loss of social learning

opportunities. The ESDM seeks to increase social learning by "bringing the child into coordinated, interactive social relations . . . so that the transmission of social knowledge and social experience can occur" (Rogers & Dawson, 2010, p. 17) with "intensive teaching to fill in the learning deficits that have resulted for the child's past lack of access to the social world" (Rogers & Dawson, 2010, p. 17).

Teaching Procedures

Similar to the theoretical foundations, the teaching procedures of the ESDM were developed from different approaches, including ABA, Pivotal Response Training (PRT), and the original Denver Model. The ESDM uses the following ABA strategies – manipulating antecedent-behavior-consequence sequence, prompting, reinforcement, fading, shaping, and chaining. PRT is a behavioral treatment, derived from ABA techniques, delivered in a natural setting rather than in a discrete trial training format. PRT teaching strategies include – using natural reinforcers; allowing child choice in activities; mixing maintenance and acquisition tasks; reinforcing attempts made by the child; engaging in highly motivating activities; and allowing the child to direct interactions. These teaching strategies aim to increase the child's motivation to participate in social activities. The original Denver Model utilized the previously described teaching strategies and added turn taking and dyadic engagement with the child; that is, the child is actively engaged with the therapist in all teaching activities. The elaboration of teaching activities is used to vary the learning objectives addressed within a single activity.

Unlike traditional ABA therapy which is delivered in a discrete trial format, teaching in the ESDM occurs in a joint activity routine, or an elaborated play theme with multiple teaching opportunities, where play is the foundation for the intervention. A joint activity begins when a child exhibits interest in an activity. As the play activity progresses, the therapist elaborates the

activity as the child practices target skills. For example, if the child shows interest in cars and blocks, the therapist demonstrates how to build a tower with the child helping by imitating the therapist. Then, the therapist crashes a car into the tower and says "Oh, no!" with the child expected to imitate the speech. The activity is repeated several times as different goals are addressed, such as eye contact, turn taking, and sharing. If the child becomes tired of the current play theme, the therapist elaborates the theme by building a bridge with the child while addressing additional skills such as vocabulary (e.g., "over" and "under") and cognitive skills (e.g., colors, shapes, etc). As illustrated by the example, joint activities involve a unifying theme, joint focus and attention, logical sequence of events, turn taking, and planned variation.

Research-Based Evidence for the ESDM

Dawson et al. (2010)

Dawson et al. (2010) conducted the first study to assess the effectiveness of the ESDM. The study included 48 subjects diagnosed with ASD between 18 and 30 months of age. Subjects were randomly assigned to the ESDM intervention group (n=24) in which participants received at least 25 hours of ESDM intervention a week for two years or to the assess-and-monitor (A/M) group (n=21) in which subjects received intervention from the community. After receiving the ESDM intervention, cognitive ability increased, on average, by 17.6 points as measured by the Mullen Scales of Early Learning; whereas, cognitive ability of the A/M Group increased by 7.0 points on average. The ESDM group exhibited a steady rate of adaptive behavior development while the A/M Group showed an average 11.2 point decline in adaptive behavior. The communicative abilities of the ESDM Group showed improvement with an average of 18.9 and 12.1 point increases in receptive and expressive language, respectively. The diagnostic status of both ESDM and A/M subjects changed at post-intervention. In the ESDM Group, the diagnoses

of 29% of the subjects changed from ASD to PDD-NOS compared to only 5% of the A/M Group. Conversely, 8% of the ESDM Group and 23% of the A/M Group diagnoses became more severe (e.g., changed from PDD-NOS to ASD).

Dawson et al. (2012)

Dawson et al. (2012) measured EEG activity in the brain while exposed to social stimuli (e.g., faces) and nonsocial stimuli (e.g., toys). The study included subjects from the ESDM Group and A/M Group, as described in the previous study, along with typically developing, same-aged peers. The subjects who received the ESDM intervention displayed similar brain activity as compared to the typically developing group. The ESDM subjects also devoted greater attentional and cognitive resources to the social stimuli as compared to the nonsocial stimuli. The EEG measurements were correlated with the level of social behavior measured at outcome; thus, the "normalized brain activity patterns related to social attention and engagement" (Dawson et al., 2012, p. 1158) found in ESDM subjects are "correlated with improvements in social behavior" (Dawson et al., 2012, p. 1158).

Vismara, Colombi, and Rogers (2009)

Vismara, Colombi, and Rogers (2009) published a study the purpose of which was to train parents in ESDM techniques immediately following an ASD diagnosis while families waited for intensive services to begin. The goal was to determine if the ESDM could improve ASD symptomatology within a short period of time. The study included eight families of toddlers, ages 10-36 months, recently diagnosed with autism. Parents participated in one hour weekly training sessions for a total of 12 weeks and four follow-up sessions of one hour each. During the training sessions, parents were taught ESDM strategies. Results indicated that the majority of parents (88%) were able to master ESDM techniques by the fifth or sixth

intervention session. The children made "consistent and sustained gains" (Vismara et al., 2009, p. 109) from baseline to post-intervention in spontaneous functional verbal utterances, imitative behavior, and sustained attention. Vismara et al. (2009) concluded that ESDM intervention lasting one hour per week can "result in significant change in children with autism" (p. 110) if the intervention involves "significant parent training and parent implementation" (p. 110).

Vivanti, Dissanayake, Zierhut, and Rogers (2013)

Vivanti, Dissanayake, Zierhut, and Rogers (2013) investigated the predictors of ESDM treatment response. The study included 21 preschoolers who received ESDM in a group setting for one year. Early social learning skills were analyzed to determine how much variance was accounted for on the subscales of the Mullen Scales of Early Learning (MSEL). Early learning skills include the functional use of objects, social attention, goal understanding, and imitation ability. The subscales of the MSEL include Visual Reception, Fine Motor, Receptive Language, and Expressive Language. Results indicated that functional use of objects accounted for 70% of the variance in Visual Reception gains; whereas, imitation accounted for 50% of the variance in Fine Motor gains. Goal understanding explained 30% of the variance in Receptive Language gains, and symptom severity accounted for approximately 40% of the variance in Expressive Language gains. Social attention was not related to treatment response. The authors concluded that the ESDM may be most effective for children who understand goals as evidenced by goal-directed use of objects, understanding others' goals, and imitation of goal-directed behavior.

National Standards Report

The purpose of the National Standards Report is to provide "comprehensive information about the level of scientific evidence that exists in support of the many educational and behavioral treatments currently available" (The National Autism Center, 2009, p. 1) to treat

ASDs. The report identified a total of 38 interventions available for the treatment for ASDs, and the effectiveness of each treatment was categorized into established, emerging, unestablished, and ineffective/harmful. The treatment packages associated with traditional ABA intervention and the ESDM will be described below.

ABA Intervention

All of the treatment packages associated with traditional ABA intervention are considered to be established treatments, indicating that the "treatment produces beneficial treatment effects for individuals on the autism spectrum. That is, these treatments are established as effective" (The National Autism Center, 2009, p. 32). Several treatment packages involved the use of ABA techniques including – the Antecedent Package, the Behavioral Package, the Comprehensive Behavioral Treatment for Young Children package, and the Modeling Package. Interventions in the Antecedent Package modify behavior by altering the antecedents that occur before the target behavior. Specific techniques include behavioral momentum, prompting, and errorless learning procedures. The Behavioral Package includes interventions that change problem behaviors and teach new behaviors through the principles of behavior change. Specific techniques include discrete trial training, reinforcement, and task analysis. The Comprehensive Behavioral Treatment for Young Children package includes treatments commonly referred to as ABA programs and/or early intensive behavioral intervention. The Lovaas (1987) model of ABA intervention is included in this package. The Modeling package includes procedures which aim to increase the imitative capacity of the child by providing a demonstration of the target behavior.

The ESDM

The majority of the intervention techniques associated with the ESDM are established treatments and include the Joint Attention Intervention, Naturalistic Teaching Strategies, and the Pivotal Response Treatment. The Joint Attention Intervention teaches the child to respond to nonverbal bids and to initiate joint attention interactions. Naturalistic Teaching Strategies promote interactions that are child-directed to teach functional skills in the natural environment. Specific techniques include modeling, providing choices, and natural reinforcers. Pivotal Response Training increases the child's motivation to engage in social communication while also increasing self-initiation, self-management, and responsiveness to multiple cues.

The Developmental Relationship-Based Treatment is a treatment package connected with the ESDM that is considered to be an emerging treatment. With emerging treatments, "studies suggest that [the] treatment produces beneficial treatment effects. . .additional high quality studies must consistently show this outcome before. . .firm conclusions" (The National Autism Center, 2009, p. 32) can be made about the effectiveness of the treatment. Developmental Relationship-Based Treatments involve a number of procedures that target building the child's social relationships. The original Denver Model is considered a developmental relationship-based intervention.

Conclusions

When considering the numerous treatment options, professionals and parents should first consider established treatments because of the beneficial effects produced which can yield positive long-term outcomes. The National Standards Report concluded that approximately 66% of the established treatments were developed from behavioral methods, and at the time of its publication, treatments derived from the behavioral literature have the strongest empirical support.

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