



# Faculty Forum



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## STEPPING OUT OF THE SKINNER BOX: BEHAVIOR ANALYSIS FROM THEORY TO PRACTICE

By

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As in other sciences, some researchers in the discipline of psychology work in laboratory settings in order to study a phenomenon of interest under rigorous experimental control. Others work in the field, applying what has been discovered in the laboratory to address real-world problems. The former psychologists are *basic* researchers, while the latter are *applied* researchers and/or clinicians. This distinction between basic and applied easily can be discerned in behavioral psychology or *behavior analysis*. Behavior analysis is divided into two subfields: The *experimental analysis of behavior* (EAB) and *applied behavior analysis* (ABA). Psychologists studying EAB are basic researchers who study general principles of learning in humans and animals. General principles refer to basic principles of learning and behavior that apply to all species; therefore, the particular species being studied in the laboratory often is rather arbitrary. For example, no matter the species of the subject (human, pigeon, rat, fish, or palmetto bug), following a behavior with something pleasurable will strengthen, or increase, the future occurrence of that behavior. This is termed *positive reinforcement*. In all species, the process of reinforcement can be disrupted simply by delaying the rein-

forcer or making the reinforcer less frequent. Understanding general principles such as reinforcement helps psychologists to explain (and ultimately modify) behavioral problems in humans. The finding that delayed rewards are less effective in strengthening behavior, for example, explains in part why so many of us have problems with impulsivity, or a lack of self-control; it is much easier to succumb to the temptation of a Krispy Kreme™ doughnut, when available to us immediately, than it is to wait for the much-delayed reward of losing a few pounds.

Psychologists practicing ABA (or behavior modification) apply the principles of learning studied by basic researchers in the laboratory to address problems of social significance. An applied behavior analyst may work in the area of organizational behavior management (OBM). An OBM consultant may, for example, help an organization to increase its efficiency by better managing the performance of its employees through the implementation of incentive systems. Applied behavior analysts also work as consultants to zoos, helping staff train animals to voluntarily undergo veterinary procedures and arrange enriched habitats, both of which improve the overall quality of life of animals in captivity. They work in the area of education, helping to design individualized curricula for students who have fallen behind and/or who have a learning disability. They work to implement *contingency management* with drug addicts. In this form of therapy, drug addicts

may receive a voucher upon each negative drug test that later can be exchanged for various goods or services within a facility and sometimes within the community. And, as a final example, applied behavior analysts provide one of the most effective therapies for children with developmental disabilities such as autism.

While the opportunity to gain experience in application was available to me during my graduate career, my training was exclusively in the area of EAB. This never is presented as being an important omission in the graduate training of basic researchers; it generally is assumed (and demonstrated by students who studied EAB and then obtained jobs in ABA) that having a background in basic research positions someone to learn about application rather easily.

I was able to put this theory to the test recently. Last summer, I was given the opportunity to assist a friend who works as a behavioral consultant in Charleston and its surrounding counties. My friend, with whom I had gone to graduate school several years ago, was due to deliver a baby in late May and taking maternity leave seemed unfeasible given her responsibilities as the sole consultant in her business: she is hired by the families of children with developmental disabilities, particularly autism spectrum disorders<sup>1</sup>, to provide assessment; to train and periodically evaluate in-home therapists; and in some cases to work with schools to ascertain the best ways to manage the behavior and education of their children. With the passage of Ryan's Law by the state of South Carolina just last year, her already successful business has been steadily growing. Ryan's Law requires that South Carolina insurance companies cover up to \$50,000 a year toward the costs of behavioral therapy for autistic children until the age of 16.

As a new assistant, I worked as a therapist assigned to children of three families. I also assisted in consulting responsibilities, including making preliminary behavioral observations, meeting with teachers, developing behavioral recommendations, and writing programs (consisting of specific behavioral goals) to be used in therapy. I found this experience to be both highly informative and challenging. In this essay I will discuss the nature of autism spectrum disorders, some of the specific challenges I faced in my brief tenure as a therapist, and how the experience has helped me to gain an appreciation for the journey from basic research to application.

The National Autism Association reports that currently 1 out of every 150 people is being diagnosed with autism and that while the disorder is diagnosed four times more often in boys, it does not occur differentially with respect to a person's race, geography, or socio-economic status (<http://www.nationalautismassociation.org/definitions.php>). According to the *Diagnostic and Statistical Manual of Mental Disorders* (2000), there are three general categories of dysfunction that are used to diagnose the disorder. The first involves impaired social interactions with others.

Autistic children typically do not make eye contact with others, seek attention from others, or reciprocate expressions of emotion and social interest. For example, if during recess a group of children run over to see a lizard that has made its way onto the playground, a child with autism is not likely

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<sup>1</sup> In this paper, I primarily refer to autism. Autism, however, is just one diagnosis falling under the heading of Autism Spectrum Disorders. Other Autism Spectrum Disorders include Asperger Syndrome and Pervasive Developmental Disorder Not Otherwise Specified. See <http://www.nichd.nih.gov/health/topics/asd.cfm> for more information on nomenclature.

to show interest in joining in on the excitement. If the autistic child is the one to see the lizard first, he or she may attend to it for a few seconds with minimal curiosity but would not proceed to point it out to anyone else.

The second category of impairment involves delayed (or an absence of) spoken communication. If and when language develops, it does not occur in the form of back-and-forth conversation. When someone says, "Hi! How are you?" most people respond by saying, "I'm fine. How are you?" An autistic child, in addition to avoiding eye contact, is not likely to respond to such a statement, even if he or she has the ability to do so. In fact, the child may not even acknowledge the greeting. When communication does occur, it often is in the form of repetitive statements. For example, autistic children may engage in *echolalia* in which they continually repeat statements made by an adult or a character on television.

The final category of impairment involves repetitive behavior (or stereotypy). An individual with autism may engage in repetitive movements such as rocking or hand flapping. Beyond physical movement, this repetition may take the form of a preoccupation with the manipulation and/or movement of objects. For example, I witnessed a child who often expressed a desire to listen to music. When he would go over to the CD player, however, he would become so preoccupied with pushing the buttons that he rarely listened to more than a few seconds of a song. In the absence of having something else to do, this child would gravitate toward the air conditioner and proceed to press its buttons until he was redirected to a different activity. I also witnessed a child with a preoccupation with shapes and another who once was stopped in his tracks by the sound and movement of a door stopper.

While it is true that the cause(s) of autism remain largely unknown and that no cure currently exists, the notion that it is untreatable is now known to be false. There are a number of treatments available for children with autism. They include a wide range of approaches, including special diets and hyperbaric oxygen therapy, sensory integration therapy (which is based on the theory that autistic individuals are unable to properly integrate sensory information), occupational therapy, speech therapy, and music therapy, among others. Another form of therapy is behavior modification therapy or, more specifically, ABA. Of the various therapies for autism, ABA has been shown to have the most scientific support (e.g., Green, 1996), and for this reason it is the method of treatment recommended by the Surgeon General (U.S. Department of Health and Human Services, 1999). While ABA can be subdivided into different specific approaches to treatment, I will focus on the method that I used this past summer, known as Lovaas therapy.

Lovaas (1987) introduced an intensive form of behavior modification which took place during most of the participants' waking hours and involved "all significant persons in all significant environments" (p. 3). Parents were trained in the methods so they could incorporate therapy into every waking hour. Some critical components of the therapy included (1) the young age of the children (all were below the age of 4); (2) Forty or more hours per week of one-on-one therapy with a trained therapist; (3) the incorporation of reinforcement theory (as is in any therapy involving behavior modification)—more specifically, inappropriate behavior (e.g., stereotypy, aggression, etc.) was ignored or punished using non-aversive (non-painful) means such as time-out, while appropriate behaviors were *consistently* reinforced; (4) Skills to be taught were broken down into manageable components, with each component taught

(using differential reinforcement) until mastered; (5) Therapy occurred in the home, school, and community with the goal of increasing the likelihood that skills would generalize to multiple environments. After two years, Lovaas found that of the children receiving this intensive therapy, 47% were described as *normally* functioning and later found success in a typical first-grade classroom. This is compared to just 2% in a control group who received therapy for 10 or fewer hours per week.

I worked as therapist in the homes of three children. For one of the children, I also spent time in his preschool. While 40 hours of therapy per week typically is not feasible given the fact that the children were involved concurrently in other forms of therapy, we did aim to achieve as many hours per week as possible. With two or more therapists assigned to a child, and with one or both of them conducting one-on-one therapy in the home as well as providing support in the school, usually 20 or more hours per week was achieved. This, of course, was enhanced if the parents chose to incorporate the skills being learned into other aspects of daily life (outside of formal therapy).

While I faced many challenges as a therapist, I have narrowed my biggest challenges as a therapist to three things: Keeping therapy “fun,” adhering to the process of *errorless learning*, and dealing with problem behaviors that often occur in children with developmental disabilities. First, a key component of ABA therapy is *always* to follow correct responses or “appropriate behavior” with positive reinforcement. Behavior is strengthened the most when reinforcement is immediate and when it is varied (otherwise, boredom with the same old reinforcer may result). One task of the therapist is *constantly* to find novel ways (with each child) to reward behavior in order to keep therapy fun

and maximize learning. For example, the “best” responses were to be followed with enthusiastic praise, tickling, spinning, or a high-five. Because the behavior of children with autism may not be as sensitive to social praise, a token economy also was employed in which a child was given a token (perhaps a poker chip) for a correct response. Once a set number of tokens were earned (e.g., 10), a bigger reward was provided. This often consisted of a break from therapy to play with toys, read books, or watch videos. In my experience, the challenge here was not the practice of rewarding behavior but rather the fact that what is reinforcing for one child may not be for another. Each child is different.

Errorless learning procedures allow a child to learn a skill in the absence of making mistakes. This is done by prompting correct responses and then by fading these prompts until a skill can be performed independently. For example, in teaching a child to make eye contact, when a child is told to “look at me,” a therapist should immediately lift the child’s chin and get close enough to force eye contact, even if it is only for a fraction of a second at first. This response is then followed by a reward. This full prompt continues until the prompt can be faded to a partial prompt, which may involve just a slight touch to the child’s chin. Once this is performed reliably, the final step is for the child to perform the task independently. I found it quite difficult to ask for a particular response and then to allow the child the opportunity to independently perform that response while at the same time being ready to prompt in order to prevent a mistake. It takes practice, and in my brief time as a therapist, I certainly did not master this skill.

When inappropriate behavior (tantrumming, noncompliance, aggression) occurs during or outside of therapy, it is important for therapists and parents alike to try

to discover *why* it is happening. Such behavioral problems usually occur for the following reasons: To gain attention from others (and it does not have to be in the form of praise—sometimes children do things for any form of attention, positive or negative); to gain access to a toy or preferred object; or to escape from the demands of a task (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). In the case of attention, children with autism often will tantrum because they are unable to effectively communicate their needs and have to be taught to ask for help (using words or pictures). In the case of access to tangibles, children often want access to a toy that is being reserved for occasional use as a reward or they may want an object that elicits self-stimulatory behavior. In the case of escape, children often misbehave during difficult tasks in an attempt to “get out of” doing the work. For example, on a couple of occasions, I sat before a child who was screaming, throwing things, and swinging at me. This happened during particular transitions between activities (discussed below) or during a difficult task. I knew that—no matter what—I could not let him get out of the task at hand while he was behaving in this manner. If I did so, the only thing that he would learn is that this is an effective way to escape a situation that he disliked. These situations are never easy, but if handled appropriately, it does not take long for the children to discover that the only way to “escape” from a task is to behave and work on that task with good effort.

From my experience I have learned to have a greater appreciation both for basic research and for the goal of applying knowledge to help others. As a graduate student, I adamantly believed that the basic research I conducted was to satisfy my curiosity as a scientist and not necessarily to serve any larger purpose in terms of immediate application. While I still believe that basic research provides the foundation for scientific pro-

gress, as the result of my recent experience I have developed a greater appreciation for basic *translational* research. Translational research refers to basic research that has a more direct bearing on the prevention and treatment of disease as opposed to merely expanding upon the knowledge base (Breckler, 2006). In 2004, the National Institute of Mental Health announced that it was placing a greater emphasis on the funding of translational research.

An example of translational research in behavior analysis is provided by the study of *negative incentive shifts*. Negative incentive shifts involve signaled shifts, or transitions, from a relatively favorable situation to a relatively unfavorable one. In the typical laboratory procedure, a hungry pigeon is placed into an operant chamber (sometimes referred to as a Skinner box). The pigeon is required to peck a lit circular disk a certain number of times in order to earn grain. Sometimes completion of the work requirement ends in a large amount of grain (a large reinforcer) and at other times it ends in a small amount of grain (a small reinforcer). The color of the disk tells the pigeon what the size of the upcoming reinforcer will be (e.g., green for small and red for large). It has been found that pigeons’ behavior (disk pecking) becomes disrupted in the transition from a large to a small reinforcer. When the pigeon earns a large reinforcer and then the key color indicates that now it has to do the work again for a small reinforcer, the pigeon will stop pecking the disk for an extended period of time. Sometimes this disruption in disk pecking is accompanied by “emotional” behavior such as wing flapping. When given the opportunity, pigeons will even peck another disk to turn off the experiment (Perone, 2003). There are a few important points regarding these findings: First, these disruptions in responding postpone receiving food and therefore are counterproductive; in the

particular procedure used, the faster the work requirement is completed, the sooner the pigeon can eat. Second, the disruption in behavior does *not* occur in the transition from a small to another small reinforcer. There is something about going from “good” to “bad” (but not from “bad” to “bad”) that is particularly aversive and makes it difficult to stay on task. Finally, it is commonly assumed that a situation involving positive reinforcement is necessarily a desirable state of affairs. This research showed that animals would escape from situations involving positive reinforcement!

These findings have since been demonstrated in many species, including humans. In an everyday example, children may have no problem going from science class to math class, but have trouble regaining focus when transitioning from recess to math class. While the child may receive lots of positive reinforcement in the classroom in the form of praise and good grades, this does not always make the shift from recess to class any easier.

My graduate advisor, along with other behavior analysts (both basic and applied), received funding from the National Institute of Child Health and Human Development (NICHD) to continue to study this phenomenon in both basic laboratory studies with non-human subjects and in applied studies with developmentally disabled individuals. I was involved in some of the basic laboratory studies funded by this grant, so it was especially interesting to see firsthand the effects of these negative incentive shifts in autistic children during therapy. Children often showed non-compliance and tantrums in the transitions from lunchtime to the start of therapy or in the transitions from a relatively enjoyable (or easy) skill to one that was less enjoyable (or more difficult). In preschool, one child I worked with often would begin to cry when his favorite activity of the day (singing) was

about to end. After all, the end of singing meant heading back to the classroom. From my basic research and familiarity with applied research findings on this topic, I knew that in order to prevent this from happening, I had to make the transitions from easy to difficult activities more fun. I also had to notify the child in advance (rather than right when it was time to “get to work”) when a particular unfavorable activity was about to begin. Another tactic I employed was to follow a break in therapy with a more enjoyable activity to make it less likely that behavioral obstacles would occur.

As a final note, I learned to have a greater appreciation for how professionals in the field of psychology (including researchers and clinicians) succeed in helping others. The parents (as well as other family members) I met throughout this experience were willing to listen, do anything asked of them, and compromise in the face of disagreement. The only thing that mattered to them was seeing their child improve—or, as parents often would say, to “be like other kids.” It was, of course, rewarding for me to see results during therapy. It was just as rewarding for me, however, to hear from parents that their child had a brief exchange with a family friend for the first time; had started to respond to his name (including making eye contact); had started to show some interest in playing with another child; or had started using the pronoun “I” rather than referring to himself in the third person. It is for these reasons that parents often come to give priority to behavioral therapy above other forms of therapy and it is for these reasons, above all else, that I was proud to be a part of it, whether in their homes (directly involved) or in the laboratory.

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