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Applied Behavior Analysis Techniques: Discrete Trial Training & Natural Environment Training

Amy K. Mosier Ms.
akmosier@siu.edu

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APPLIED BEHAVIOR ANALYSIS TECHNIQUES: DISCRETE TRIAL TRAINING &
NATURAL ENVIRONMENT TRAINING

by

Amy Katherine Mosier

B.S., Purdue University, 2009

A Research Paper
Submitted in Partial Fulfillment of the Requirements for the
Master of Science Degree

Department of Communication Disorders & Sciences
in the Graduate School
Southern Illinois University Carbondale
May 2012

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Approved by:

Dr. Kenneth O. Simpson, Chair

Dr. Valerie E. Boyer

Kirsten Schaper M.A., M.S., CCC-SLP

Graduate School
Southern Illinois University Carbondale
May 2012

DEDICATION

I dedicate this research project to the Communication Disorders and Sciences Department and the Center for Autism Spectrum Disorders. Thank you for the support and encouragement throughout this process.

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INTRODUCTION

In recent years, applied behavior analysts and speech-language pathologists (SLPs) have collaborated to facilitate language learning and communication skills throughout treatment for children with autism spectrum disorders (ASD). There are many different types of intervention techniques that are thought to play a significant role in developing effective communication skills and appropriate behaviors in children with ASD. Discrete Trial Training (DTT) and Natural Environment Training (NET) are types of Applied Behavior Analysis (ABA) that fall under the rubric of therapy, which was first noted by B.F Skinner in 1957 (as cited in Sundberg & Partington, 1999). Applied Behavior Analysis (ABA) is a science devoted to investigating factors that influence behavior. ABA investigates people's interactions with their environment while developing intervention strategies to decrease inappropriate behavior and increase socially appropriate skills (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2011). ABA techniques discussed in this paper focus on helping children with disabilities by teaching in small, measureable units (Smith, 2001). It is important to note that DTT and NET are not the only components of ABA used by analysts and SLP's. Additional ABA methods are often used by these professionals to facilitate therapy (Ghezzi, 2007). In addition, other healthcare professionals can implement both DTT and NET, not just behavior analysts and SLP's. To eliminate confusion, the term "trainer" is used throughout this paper to encompass the many different professionals involved in implementation. This research paper investigated literature pertaining to the application of DTT and NET with children with ASD in order to determine the best practices for intervention.

AUTISM SPECTRUM DISORDERS

Common characteristics of Autism Spectrum Disorders (ASD) are identified as the presence of stereotyped or repetitive behaviors, communication deficits and social interaction deficits (Ryan et al., 2011). According to Holding, Bray, and Kehle (2011), children with ASD have a reduced quality of life because of social and communication barriers created by any combination of the previously mentioned deficits. Holding et al. (2011) notes that the deficits in children with ASD that create barriers include difficulty participating in the community, developing relationships with school-aged peers, and thriving within the educational setting. Professionals have agreed that the communication shortfalls present in children with ASD are pervasive and cause drastic deficits not just in communication but also in other developmental areas (Cummings, 1999).

DISCRETE TRIAL TRAINING

Building off B.F Skinner's Applied Behavior Analysis (ABA) techniques was

clinical psychologist Ivar Lovaas; he was the first to research the effectiveness of ABA

programs in children with ASD (Ryan et al., 2011). Lovaas believed that the

characteristics of DTT were pivotal in developing skills in children with ASD (as cited in

Weiss, 2005). Sundberg and Partington (1999) discuss the advantages of utilizing DTT

therapy in children with ASD. "DTT is well suited for teaching skills requiring repetition,

for teaching skills that are not intrinsically motivating, and for building solid repertories of

tacting, imitation, and receptive skills" (Sundberg & Partington, 1999, p. 145). DTT

allows the client and the clinician an opportunity to present many different trials in one

session, thus increasing exposure and learning (Sundberg & Partington, 1999).

Olgetree (1998) gives this description of DTT:

> During a traditional discrete trial training session, a person with autism and a
>
> trainer would sit facing each other to minimize distractions and facilitate
>
> behavioral control. If the goal were the production of a specific speech sound,
>
> the trainer would produce the sound, request it of the child or adult, and possibly
>
> use light physical prompts to assist with production. Productions would then be
>
> shaped and reinforced until acceptable to the trainer. (p. 228)

This ABA technique ensures that the child is learning in a distraction free environment

while working one-on-one with the trainer (Ghezzi, 2007). Overall, DTT has specific

components and a tight protocol for implementation making it highly controlled by the

trainer (Ghezzi, 2007). As with all therapy techniques, this technique has its set of pros

and cons causing it to be highly scrutinized by many other professionals in the field.

Mainly, theorists disagree on whether or not the tight protocol used in DTT makes it easier or more difficult to implement across different settings with different children (Ghezzi, 2007). This also brings into question the ability of the children with ASD to generalize learned information and whether or not the children learn to initiate appropriate interaction.

Implementation

In order to facilitate the best therapy possible, the trainer collects a list of skills to incorporate into therapy. These skills are based off a criterion-referenced checklist or from a developmental milestones checklist. The trainer should conduct a baseline skills assessment (Holding et al., 2011) before initiating any treatment. The baseline assessment ensures effective and efficient therapy is being implemented (Holding et al., 2011). While it is important to gather baseline data, it is also important to collect information about the child's preferences. Assessing the child's preferences allows the trainer the ability to incorporate these preferences into teaching activities centered on the child and the items the child enjoys (Smith, 2001). There are many ways to collect this information, but the most common are parent interviews, child interviews (dependent on child's age), and direct assessment methods. These assessments can be conducted in a variety of places such as the child's natural setting, like the child's home or school; where a formal asessment of preferences can be completed (Ghezzi, 2007). These preferences may serve as reinforcers and include items like toys, puzzles, play-doh, food, drinks, activities, stimulatory items, etc. The reinforcers used in DTT are not necessarily related to the stimuli or the response elicited by the child and can change from session to session, even task to task (Ghezzi, 2007).

Sundberg and Partington (1999) described implementation of DTT as,

> The main aspect of DTT, also called analog training, is that language intervention is conducted in a highly specified and structured manner. The instructor chooses and presents a specific stimulus related to a target skill, and when the student responds correctly, the response is reinforced with a strong reinforcer. Incorrect responses typically result in a correction procedure and training on a specific skill is often repeated until a mastery criterion is met (p. 141).

DTT is widely used by behavior analysts and SLP's for a variety of reasons; however, the primary reason for its popularity is because it almost directly mimics the three-term contingency Antecedent, Behavior, and Consequence (ABC). The antecedents (A) are techniques used by the trainer before a response from the child. The antecedent creates a cue to attend to a task in order to elicit a desired response. Once the trainer delivers the antecedent, the behavior (B) is observed as the child's response to the instruction. Depending on the child's response, one of two things happens; the trainer either delivers a reinforcer or prompts a correct response and then delivers the reinforcer. This is known as the consequence (C) and occurs after the behavioral response is observed. Access to the reinforcer occurs when the desired response or an approximation of the desired response is elicited. Denial of the reinforcer, and prompting for a more correct response, occurs when the child does not give the desired response or gives an inaccurate approximation of the response. Understanding the basics of the ABC model allows the trainer to increase the likelihood that the child's correct response occurs again due to correct reinforcing of the target behavior.

Language development directly correlates to interactions in everyday environments, specifically what a child sees and hears on a daily basis (Sundberg & Partington, 1999). Throughout these interactions, the following language components are exhibited: receptive language, tacting (labeling), echoics (repeating what the trainer says), manding (requesting) and intraverbals (conversation skills). Each component is evoked by the presented stimuli intentionally or spontaneously by the trainer (Sundberg & Partington, 1999). DTT directly uses these components, also known as nonverbal and verbal stimulus control with nonspecific or specific reinforcement, to facilitate language in children with ASD (Sundberg & Partington, 1999). Simply stated, the trainer prompts the response of the child, the response can be either verbal or non-verbal, like previously mentioned, and the prompt can be a verbalization, an object, or a picture (Smith, 2001). The goal of the trainer is to elicit a target response from the child (Ghezzi, 2007). Responses fall into three categories; correct and incorrect responses and no response (Smith, 2001). It is important to note that the response does not have to be the desired behavior exactly but it should include an approximation of the desired response (Ghezzi, 2007).

Specifically, the ABC contingency is useful with difficult skills or steps in a chain of responses being taught to children with autism. Once the child is taught the initial correct response in the chain, other responses can be learned through prompting and training. Ultimately, after the stimulus is presented, the desired response is elicited; the trainer presents a consequence to the behavior or target (Smith, 2001). For example, in a receptive language task, a trainer may present an array of three pictures. The trainer then instructs the child to, "Touch the cat." If the child responds correctly by touching

the picture of the cat, the stimuli are removed, and the child is allowed access to a preference. If the child responds incorrectly, the trainer corrects the child by physically prompting him/her to touch the cat card. Simultaneously, the trainer says, "That's touching the cat!" The trainer then re-presents the chain again until the child responds correctly or responds with a lesser prompted response.

If the child responds incorrectly or no response occurs, the trainer then error-corrects and prompts the direct response from the child (Smith, 2001). Once the trainer has evoked the target response, he/she should provide immediate, contingent, differential reinforcement. By providing reinforcement, the trainer is increasing the likelihood the behavior or target response occurs again (Ghezzi, 2007). Immediate positive reinforcement allows the child to be aware of what task was done well (Ghezzi, 2007). Differential reinforcement may also be used. When differential reinforcements are used, the trainer increases the level or intensity of the reinforcement for a spontaneous independent response (Ghezzi, 2007). If the trainer tells the child to clap his/her hands, and the child responds correctly with a gestural prompt rather than a physical prompt, he/she receives more time with reinforcer. Each time the child responds correctly, or needs a lesser prompt, he/she gets more time with the reinforcer. Any time the child completes a task that is more difficult than the one the child was prompted to complete a more intense reinforcement is provided (Ghezzi, 2007). The trainer must be prudent when providing reinforcement. If too much time is allowed with the reinforcer, the effectiveness of the reinforcer may be reduced due to satiation (Ghezzi, 2007).

It is important for the trainer to be aware of and use prompting hierarchies when implementing DTT. The trainer should always use the least intrusive prompt necessary to gain the best possible response (Smith, 2001). There are two different approaches to implement prompting hierarchies for tasks being taught with DTT. The first is an acquisition task, which uses a most-to-least prompting hierarchy (e.g., physical→ partial→ gestural). The second is known as a maintenance task, which uses a least-to-most prompting hierarchy (e.g., gestural →partial → physical) (Ghezzi, 2007). Utilizing prompting hierarchies can be important in children with autism, but the trainer needs to recognize when to fade the prompts so the child does not become prompt dependent (Ghezzi, 2007). The trainer can fade prompts by gradually increasing the delay between presentation of stimulus and prompt and reducing the properties of the prompt (length, intensity, etc) (Ghezzi, 2007).

Evidence

DTT is an intervention that focuses on creating learning opportunities for the child by implementing observable and measurable tasks until the child has reached a desired level of response (Ghezzi, 2007). DTT has been proven to help increase cognitive, language, adaptive, and compliance skills (Ryan et al., 2011, p. 60). DTT is also considered the "best-studied approach in the following discriminations: imitation, receptive language, expressive language, conversation, sentences, grammar and syntax" (Smith, 2001). Weiss (2005) believes that DTT builds the foundation of tacting, manding, imitation and receptive skills in addition to teaching skills that are not intrinsically motivating. Furthermore, Ryan et al. (2011, p. 60) determines, "…ABA and DTT have an extensive body of research that supports its use in academic and behavior

interventions for children with ASD…". Finally, Delprato et al. (2001) found that after comparing many different studies, "DTT procedures might be more effective in teaching acquisition of language structure in children with ASD" (p. 323).

Jennet et al. (2008) conducted a study directly comparing DTT versus Mand-model training to teach requesting to children with ASD. Within the study, Jennet et al. implemented a language program with the two teaching models and compared the results. The study procedures used specific, functional, highly preferred items to reward a correct response in both teaching procedures (Jennett et al., 2008). To ensure a valid experimental design, the order of treatment was varied with three of the six participants receiving DTT initially and then Mand training, and the other three receiving Mand training first and DTT second; each participant received 1:1 instruction during all daily sessions. Sessions were conducted twice a day with 8-10 sessions per week (Jennett et al., 2008). She found that participants in her DTT study, on average, had more eye contact when trained with DTT than when trained with mand-modeling. Jennet et al. (2008) noted that an advantage of implementing DTT is that the child is exposed to more trials and can potentially learn to request a great variety of items. More significant, the parents of the children involved in the study noted that four of the six participants had increased spontaneous eye contact and requesting in settings other than the therapy environment throughout training, indicating that overall both interventions were successful in teaching generalization. (Jennett et al., 2008).

Hume, Bellini and Pratt (2005) surveyed a group of 195 parents of children with ASD from ages 2-8 year-olds to examine the services received by young children with ASD and their families. The survey included questions about demographics of the

family, types and amount of intervention used, strategies and curricular areas assessed, settings, evaluation of interventions used, evaluation of service delivery and outcomes of intervnetions used. The results releaved that 26.2% of families surveyed used discrete trial training with their child on average of 16.2 hours per week, the highest amount of hours used for any intervention surveyed. In addition, the survey also found the following services directly and effectively contributored to their child's overall development: speech therapy (76%), sensory integration (69%), discrete trial trianing (68.4%) and social supports (67.5%) (Hume et al., 2005). Only 7.1% of parents surveyed expressed disagreement towards the use of DTT as an effective intervention in the growth and development their child.

In addition, Jones, Feeley and Takacs (2007) conducted a study wherein young children with ASD were taught spontaneous reponses using multiple interventions including DTT using specific prompts, and error correction. Jones et al.(2007) focused on very young children with autism and aimed on extending behavioral intervention to tackle spontaneous communication. The participants included two children, Harry and Steven, three years of age; both children were enrolled in preschool and were referred for participation in this study by their classroom teacher due to their lack of spontaneous communication in the classroom (Jones et al., 2007). The participants were familiar with the intervention procedures because they attended a center-based preschool that incorporated multicomponent procedures. Jones et al. (2007) determined that these intervention methods were sufficent for teaching spontaneous communication in the participants due to the familiarity and successful acquistion of other behaviors. Both participants did not produce any of the target responses during baseline testing (Jones,

Feeley, & Takacs, 2007). Harry had mastered his first response by the end of 10 intervention sessions. Steven mastered his first response at the conclusion of the fifth intervention session (Jones et al., 2007). By the end of intervention session 15 both Harry and Steven had mastered their second and third responses (Jones et al., 2007). Jones et al. (2007) tested generalization across persons and settings and found that both participants generalized the spontaneous responses. Jones et al. (2007) concluded communication behaviors can be taught and generalized across settings using beahvioral treatment, such as DTT.

Finally, it is important to note the work done by the National Autism Center (NAC), the goal of the NAC is to incorporate and promote best practices, by providing trustworthy information in addition to familial, practioner and community support for those serving children with ASD. Most recently, the NAC published results of the National Standards Project. The purpose of this project was to inform parents, caregivers, and services providers of vital information about ASD including identifying effective versus ineffective treatment methods and the current limitations of these treatments. (National Standards Project, 2009). Due to the large number of interventions, the NAC developed several different packages to encompass similar treatments. The NAC also created a classification system of the different treatments and interventions collected throughout the study and divided them into the following categories: established, emerging, unestablished and ineffective/harmful (National Standards Project, 2009). The NAC encompassed DTT in the Behavior Package, recognizing the effectiveness as an intervention technique to treat children with ASD. The Behavioral Package is considered an "established" intervention by the NAC. To

become classified as an established intervention, the following criteria must be met: [the intervention must] be included in several published, peer reviewed studies; have a Scientific Merit Raing Scale between 3 to 5, and prove treatment was effective for a specific target group (National Standards Project, 2009). The NAC, stated in the National Standards Project, recommends that serious consideration of the treatments falling to the established category occur between parents, professionals and caregivers due to the success in long-term outcomes. (National Standards Project, 2009). Spefifically, the National Standards Project identified that the use of DTT and other behavioral interventions increased the following skills in children with ASD: academic, communiction, interpersonal, learning readiness, personal responsibility, play and self-regulation. In addition the following behaviors decreased when DTT was used; problem behaviors, restricted, repetitive, nonfunctional behaviors and sensory/emotional regulation (National Standards Project, 2009). All of these skill increases and behavioral decreases were shown in children with ASD between the ages of 0-21 years of age (National Standards Project, 2009).

ADVANTAGES AND DISADVANTAGES OF DTT

Sundberg and Partington (1999) summarized the advantages and disadvantages of DTT. DTT allows many repetitions to occur over time, making progress, or lack thereof, observable and measurable (Sundberg & Partington, 1999). DTT teaches the child imitation skills, attention skills, the relationship between work and reinforcement; these skills are important for children with ASD to acquire because each skill teaches the child how to learn from their environment (Holding et al., 2011). These classroom and life skills can be very important for a child with ASD who is often lost in the shuffle of daily classroom activities. DTT can be implemented in the classroom setting and properly trained staff can reliably record accurate data, primarily because the stimuli and curriculum requirements are outlined (Sundberg & Partington, 1999). This makes data collection straightforward for classroom trainers and aides, creating the ability for progress to be easily tracked. Finally, and maybe the most important advantage of DTT within the classroom, is that DTT promotes and establishes good learning habits (Sundberg & Partington, 1999). DTT establishes these good learning habits by increasing the child's ability to attend to a task, responding appropriately because of reinforcement, discriminating, sitting, and working but most importantly by increasing the child's tolerance to increased demands (Sundberg & Partington, 1999). DTT can also be used in a group setting, which allows for peer interaction and learning in a group, both of which are deficits typically associated in children with ASD (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2011).

Advantages are significant for DTT, but it is important to understand the disadvantages of DTT as well. Steege, Mace, Perry and Longnecker (2007) discussed

the significance of misapplication of DTT with children with ASD discussing that trainers make the following common mistakes upon implementation: timing of trials, inadequate positive reinforcement for correct responses, unnecessary harsh consequences for incorrect responses and not varying the stimuli over sessions. First, the trainer thus making interaction between trainer and child rote and not spontaneous, mainly initiates DTT (Smith, 2001). To ensure generalization across settings, stimuli and persons, special procedures need to be implemented. Sundberg and Partington (1999, p. 148) also note, "Trials that are presented in a scripted manner reduce the trainer's ability to expand on responses or mix the verbal operant's, as in typical verbal interactions." To train for generalization, the trainer should expand the stimulus class or group of stimuli that evoke the same response (Ghezzi, 2007). For the same reason, the trainer should expand the response class evoked by the same stimulus. Ways to expand a stimulus class are to train by using different stimuli and instructions with advanced children (Ghezzi, 2007). One of the best ways to facilitate generalization is to train across settings and trainers, placing the child in different environments with multiple trainers to allow for the context of sessions to be facilitated across settings and environments (Olgetree & Oren, 1998).

Some researches argue that DTT is too controlled and places too much emphasis on trainer-directed therapy rather than child-directed therapy (Peterson, 2004). It is also important for the trainer to know that DTT does not have to include mass drillings of the same targets and that DTT can take place in any setting, not just at a table (Ghezzi, 2007). In addition, some researchers argue that children with ASD do not have the opportunity to generalize and transfer learning across settings within the

child's daily environment (Smith, 2001). Ghezzi (2007) believed, much like Sundberg

and Partington that the advantages and disadvantages of DTT should be known to the

trainer and conveyed to the child's guardians. He also made this statement,

> Although the procedures [of DTT] have a number of disadvantages and
>
> advantages, most can be offset by using DTT in conjunction with other ABA
>
> methods that teach skills requiring sequential behaviors and promote
>
> generalization of skills across people and natural context. (Ghezzi, 2007, p. 95)

NATURAL ENVIRONMENT TRAINING

Sundberg and Partington (1999) discuss Natural Environment Training and the variation of presentation and implementation for this type of training. Natural Environment Training (NET) is known by many other names in the Applied Behavior Analysis community. These include Natural Language Paradigm, Natural Environment Teaching and Natural Teaching Strategies—for the purpose of this paper, Natural Environment Training or NET is used in reference to encompass the many different terms. NET is built on the ideas of four types of naturalistic methods and procedures: the incidental teaching method, mand-model procedure, time-delay/delay-prompt procedure and milieu language teaching. These teaching methods/procedures are the foundation of NET, and it is important to understand the implementation of these strategies as separate entities in order to use NET successfully.

The distinctive feature of NET is that it uses the child's natural environment to facilitate language learning moments by using the child's interests to guide the session (Sundberg & Partington, 1999). The trainer creates a stimulus by using objects that naturally occur in the child's daily environment; these could vary from the kitchen table to a baby doll. The child's response, at least initially, is not as important as the child's natural gravitation to items that are naturally reinforcing (Peterson, 2004). NET offers many opportunities for data collection of the child's progress; in addition to implementing NET, the trainer has the opportunity to use the child's own motivating factors or interest to facilitate therapy and guide instruction (Sundberg & Partington, 1999). NET creates the ability to create much more verbal interaction than is typical for the child throughout their daily activities while therapy is being implemented (Sundberg

& Partington, 1999). This is because NET is focused around play, since NET is done in the child's most natural setting; it is believed by many theorists that this environment is the most effective for facilitating skills crucial for communication and language development. Thus this teaching method would naturally lead to spontaneous production of those skills in that environment.

Incidental Teaching

Incidental teaching is the simplest form of NET. An incidental teaching moment occurs when the child shows interest in a certain object and attempts to communicate a need based on the object (Delprato, 2001). Next, the trainer responds as a typical communication partner would, proclaiming a question or statement about the object (Delprato, 2001). After the child displays an appropriate response, the trainer allows the child to have access to the desired object (Delprato, 2001). After the teaching moment is over, it is up to the trainer to elaborate on the communication target by prompting and modeling with naturalistic reinforcers. Peterson (2004) states that, " [upon] implementing incidental teaching, naturally occurring learning situations are taken advantage of by the trainer to provide a teaching moment to the child; this allows for teaching to occur across contexts and across interactions" (p.405). Hart and Risley defined incidental teaching and the four different prompts caregivers or trainers use to increase verbal behavior and communication (as cited in Peterson, 2004). Incidental teaching uses naturally occurring situations to spark the child's interest and facilitate language within natural context (Peterson, 2004). When the child displays an interest in a toy or object, the caregiver/trainer waits 30 seconds before interaction, (Level 1) (Peterson, 2004). The next level, Level 2, the child is prompted by the caregiver to ask

for the preferred object (Peterson, 2004). In Levels 3 & 4 the prompts become more intricate; asking the child, "What is this?" (Level 3) and mand-modeling the correct response followed by prompting the child to repeat the correct response (Level 4) (Peterson, 2004, p. 406). Peterson (2004 p. 406) conveys the importance of not over-prompting; "Trainers need to be taught to use the lowest level of prompt that would encourage the correct response by the child".

Mand-Model Procedure

Mand-model integrates the same levels of prompting, Levels 2-4, used in the incidental teaching procedure previously discussed (Peterson, 2004). Manding is requesting by the child and are prompted by the trainer, such as "Tell me what you want" or "Use your words", that require a verbal response from the child (Peterson, 2004). Modeling involves elaboration of the child's immediate interest. If the child displays interest in a doll, the trainer states, "That's a doll!" demonstrating or modeling the correct verbalization of the desired interest (Peterson, 2004). The trainer can reinforce the response in many ways as long as the child is given access to the desired object once a correct approximation of the desired response is demonstrated by the child (Peterson, 2004).

Ultimately, the trainer or caregiver knows the child's preferred item and then mands the response from the child (e.g., "tell me what you want") (Peterson, 2004, p. 407). Once the child makes the correct response, the preferred object/reinforcer is given to the child; however, if an incorrect response is given, the correct response is modeled (e.g., "say fire truck") (Peterson, 2004, p. 407). The mand-model procedure focuses on trainer initiation of the language learning moment and it is the trainer who

has control over the child's access to naturalistic reinforcers; therefore, requiring the trainer to initiate and create the communication moment (Peterson, 2004). This puts the trainer in control of the learning environment, differing from incidental teaching in this regard. Mand-model procedure was developed specifically for children that have a difficult time initiating communication moments so that they too could develop and learn the significant skills required for communication development (Peterson, 2004).

Time-Delay/Delayed-Prompt procedure

Time-delay or delayed-prompt procedure is another branch of natural environment teaching. Time-delay procedures are set up signals to mand-model training but tend to have a "looser" format (Goldstein, 2002). Peterson (2004) describes the basic outline of the time-delay procedure and delayed-prompts stating, "In the time-delay procedure, the trainer or caregiver identifies a situation in which the child wants an object or assistance and then waits for the child to make a response. Peterson (2004, p.407) states, "If the child does not respond appropriately; another delay is instituted". It is important for the trainer to understand that the length of time-delay can vary between therapy sessions (Goldstein, 2002). In the time-delay procedure the trainer needs to start with the least intrusive or restrictive prompt (e.g., point to the desired object), if the child continues to respond incorrectly, a more intrusive prompt is used (e.g., taking the child's hand and moving it to the desired object) (Peterson, 2004). Following this hierarchy provides a better way to understand the child is learning acquisition and ensure learning is occurring across different settings (Peterson, 2004).

Implementation begins by placing the child's preferred toys or items out of reach or only giving access to part of the toy the child enjoys. The environment is set up in

this fashion to facilitate communication based on the child's need or desire of the object being withheld (Peterson, 2004). The idea behind this procedure is to create opportunities for functional communication between the child and the trainer in this contrived environment (Peterson, 2004). Children are forced to make some type of request or gesture to communicate wants and needs (Peterson, 2004).

Milieu Language Teaching

Milieu Language Teaching, or MLT, combines most of the techniques of the previously mentioned procedures. The primary characteristic of MLT procedures is that the trainer enters the child's physical environment and uses items in that environment to facilitate therapy (Goldstein, 2002). Like the other naturalistic therapy techniques, MLT uses reinforcers that the child enjoys and that occur naturally in the child's environment (Goldstein, 2002). Peterson (2004) identifies three steps in the implementation of milieu language teaching. First, the trainer needs to arrange the environment to facilitate language; next, the trainer uses responsive and interactive techniques to facilitate language interaction and finally, the trainer must incorporate the prompting levels previously discussed (Peterson, 2004). MLT is considered one of the most effective types of naturalistic techniques because it offers high motivation due to the use of highly desirable objects (Goldstein, 2002). The purpose for using these highly desired objects is two-fold; the first being that these objects initiate or help initiate a communication moment and second, they help reinforce the child's willingness to respond (Goldstein, 2002).

Evidence

Peterson (2004) reviewed many different studies involving different techniques of NET and reported on the evidence to support their efficacy in use with a child with ASD. NET has been found by multiple researchers to be more effective than other forms of therapy in training children with mental retardation, developmental delays, autism, and children from at-risk and low-income families (Peterson, 2004). The studies Peterson (2004) reviewed found that children taught with NET methods were more likely to acquire and generalize across a range of language targets— such as single words, combinations of words, complex sentences, initiations, requesting and signing (Peterson, 2004). Additionally Delprato (2001) noted that two studies revealed NET was significantly more effective in reducing disruptions from children than DTT. Cummings (1999), after reviewing Sundberg and Partington's works, found that while implementation of specific NET procedures may be lengthy compared to DTT, in the long run children had increased accurate responses that surpassed those measured in DTT training.

Peterson (2004) also reviewed studies to determine the effectiveness of the mand-model procedure. He found increased rates of verbalization, rates of novel word usage and novel word combinations when NET methods were used in the course of treatment. Sundberg and Partington (1999) believe that the greatest advantage of NET lies within the environment. Conducting therapy within the child's natural environment allows for specific reinforcement because the child's external motivators can be identified and used (Sundberg & Partington, 1999). Peterson also found, for a number of children in different home settings and from different socioeconomic backgrounds, NET increased the likelihood of generalization, which is always a desired goal of any

therapy (Peterson, 2004). This evidence tends to indicate that training in the child's natural setting could be more functional to children and increase their ability to absorb and generalize language (Peterson, 2004). Finally, Delprato states that of all the studies reviewed in his article, the NET method was more successful in facilitating language criterion response than DTT for children with ASD (Delprato, 2001).

The National Autism Center (NAC) also classified NET, as an established treatment program to use in children with ASD. The included NET strategies fell under the Naturalistic Teaching Strategies package, summarizing these interventions as, "[Being able to] provide a stimulating environment, [by] modeling how to play, encouraging conversation, providing choices, utilizing direct/natural reinforcers and rewarding reasonable attempts" (2009, p. 14). The National Standards Project identified that NET increased communication, interpersonal skills, learning readiness, play and self-regulation in children with ASD between the ages of 0-9 years of age.

ADVANTAGES AND DISADVANTAGES OF NET

Sundberg and Partington (1999) also summarized the advantages and disadvantages of NET in comparison to DTT. The advantages of NET may seem obvious after discussing the evidence of the training procedures but it is important to look at the specific operations of the trainer and the stimulus in order to gain a better perspective on the pros and cons of implementing this type of training (Sundberg & Partington, 1999). Maybe the most obvious advantage of NET is using the child's own motivating items and reinforcers to guide language learning and acquisition (Sundberg & Partington, 1999). NET procedures reduce the need for the trainer to gain total control of the environment because therapy is conducted in the child's naturally occurring daily environment (Sundberg & Partington, 1999). This type of environment is predictable and comfortable for both trainer and child (Sundberg & Partington, 1999). The reinforcers also naturally motivate the child, minimizing the amount of negative behavior that occurs during the therapy session (Sundberg & Partington, 1999). Once the trainer is trained on implementation of NET, it is easier to teach intraverbals, nonverbal and verbal skills along with labeling and requesting; teaching these skills in the child's natural environment can lead to generalization across settings and context (Sundberg & Partington, 1999). Finally and maybe, the most important advantage described by Sundberg and Partington (1999) is that this type of training in the child's natural environment is parallel to that of a Pre-K or Kindergarten classroom, which prepares the child for future interaction with a trainer and peers (Sundberg & Partington, 1999).

As with any type of teaching or training disadvantages, arise—especially when compared to a specific type of training. NET and DTT both have disadvantages and advantages; it is up to the trainer to determine how much those factors play into implementation and treatment of children with ASD. There are significant disadvantages outlined when using NET in children with ASD. The most significant disadvantage may in fact be the very thing that many proponents purport to be NET's strongest advantage—the child's natural environment (Sundberg & Partington, 1999). While it is important to use the child's natural environment in training it can also be thought of as a disadvantage when it comes to reinforcers (Sundberg & Partington, 1999). The context of the training may be limited to certain categories of stimuli because of the child's limited interests, making it difficult to expand and elaborate on teaching activities (Sundberg & Partington, 1999) It may be difficult for the trainer to deliver specific reinforcement with such specific objects (Sundberg & Partington, 1999). As many SLPs know child's interest change day to day, even hour to hour, keeping up with a child's interest from session to session can be difficult and it may take away from teaching moments (Sundberg & Partington, 1999). Unlike DTT, NET does not use a script or curriculum to base therapy, this open structure makes it difficult for trainers to implement consistently, track data and increase trials with children (Sundberg & Partington, 1999). Essentially, this means that more specific and intense training is needed for trainers before effective and efficient implementation of NET can occur (Sundberg & Partington, 1999). While the child's lead and interest can be followed to create a learning environment, intervention is not conducted in terms of language skills

or acquisition curriculum rather only based on the child's interest which can limit the

amount of targets created, thus limiting the trials completed (Peterson, 2004).

RECOMMENDATIONS FOR IMPLEMENTATION AND INTEGRATION

After taking into consideration the procedures, implementation and evidence presented for both DTT and NET it is clear that both offer distinct advantages over the other in specific circumstances. Due to this, it is important to take an in-depth look into using these two techniques in an integrated manner to achieve superior results. First, there is no uniform recommendation on which type of intervention is most effective. Professionals have formulated ideas and general guidelines to follow—more specifically Olgetree & Oren (1998), Sundberg and Partington (1999) and Weiss (2005) have developed a body of research devoted to the implementation of therapies and trainings between environment and context in children with ASD. While one definitive implementation procedure integrating both NET and DTT has yet to be developed, several approaches, guidelines, and suggestions for integrating are being discussed throughout the two scientific communities. These integrated approaches are examined in the rest of this paper.

Upon implementing either of these strategies, it is important to first adapt the intervention to the needs of the child and caregiver(s). Sundberg and Partington (1999, p. 150) say it best with this statement about Discrete Trial Training and Natural Environment Training, "Language intervention for children with ASD should involve teaching all the different elementary and verbal operants, under a variety of environmental contexts, while being assured that each type of verbal behavior can stand on its own, and be mixed together". Sundberg and Partington (1999) believe that, DTT and NET, offer advantages and disadvantages to language learning and acquisition; however, it is their belief that the best of both approaches can be achieved

when DTT and NET are used in conjunction with each other (Sundberg & Partington, 1999). Ultimately, implementation of a teaching method is based on many different factors, including the objects of treatment, environment, functionality of reinforcers, and the child's deficits just to name a few (Goldstein, 2002). It is important to consider the specific emphasis on language learning and acquisition when implementing DTT and NET because both intervention programs facilitate different types of language teaching (Cummings, 1999). Sundberg and Partington (1999, p.153) state this about NET and DTT in relation to language learning,

> NET is primarily based on mand training and incorporating the child's current established operations and the delivery of specific reinforcement, while DTT is primarily based on tact, receptive, echoic and imitative training by using nonverbal and verbal stimuli and nonspecific reinforcement.

Many clinicians, trainers, and parents are still concerned with the balance or lack thereof, between DTT and NET throughout treatment. Olgetree and Oren (1998) argue for a middle ground between interventions like DTT and NET and note the significance of focusing on the structure of therapy and the child with ASD. Olgetree and Oren (1998, p. 231) first discuss implementing an interactive training context: "To provide structured yet functional communication-based training, trainers must create interactive contexts, apply training techniques of varied directiveness, and pursue practical communication and language goals". To create interactive contexts, the trainer must contrive the environment and create routines throughout the day (Olgetree & Oren, 1998). Incorporating routines allows the trainer and the child to predict what is happening throughout the day; this allows the trainer to communicate via narration

using different language markers and for the children the ability to incorporate verbal language with non-verbal language and objects (Olgetree & Oren, 1998). Upon implementation of the training contexts, the trainer both within the environment and within language must create teaching moments. In order to implement and integrate strategies effectively the trainer needs to create functional communication moments where the following strategies can be used, creating an expectant delay, using objects or actions, leaving out or withholding an object or sabotaging the environment (Olgetree & Oren, 1998).

Finally, trainers need to select and pursue practical communication and language objectives that build on the child's known strengths and preferences while incorporating language learning and communication skills (Olgetree & Oren, 1998). Olgetree and Olen (1998) believe that in order for effective intervention to take place structure and functionality are always a factor, even in the most natural of environments and that these two considerations should be strategically placed to create a balanced and effective treatment program (Olgetree & Oren, 1998). Prior to implementation, it is important to keep an open mind to the process, look at the child and the intervention, and then make your best judgment as a trainer. Understanding the ability to change and adapt interventions is essential during the course of treatment and considered an option (Smith, 2001).

By implementing and using both ABA teachings during language learning therapy the trainer is creating and developing a flexible learning environment. It is important to remember that the proportions of DTT and NET can be changed and adapted over time (Olgetree & Oren, 1998). This also means that SLPs need training in both DTT and

NET since the SLP is accountable for the accuracy and effectiveness of implementation. On the upside to learning multiple interventions, clinicians also learn the best way to facilitate the treatment approaches and tailor them specifically to the child. After conducting extensive research, Sundberg and Partington (1998) outlined five phases for integrating DTT and NET into effective treatment. Phase 1 includes a greater emphasis on NET over DTT, concentrating mostly on early manding, compliance, pairing, and stimulus control (Sundberg & Partington, 1999). Phase 2 focuses on mand, tact, receptive, imitation, echoic and intraverbal language that creates equal emphasis on both NET and DTT (Sundberg & Partington, 1999). Phase 3 places a greater emphasis on academic activities and specific skill development, which is a focus of DTT (Sundberg & Partington, 1999). Phase 4 narrows in on learning from group instruction and from peers in a less structured environment; this phase allows for a more natural environment typically seen in a kindergarten or 1st grade classroom thus concentrating mainly on NET procedures (Sundberg & Partington, 1999). Finally, Phase 5 focuses on using DTT while helping the child focus on academic skills and structured learning characteristics of later elementary classrooms (Sundberg & Partington, 1999). These phases should be used as a guide for clinicians; ultimately, the best balance of the two occurs on a case-by-case basis, leaving a wide range of variability for implementation (Sundberg & Partington, 1999). To facilitate the best language development and communication, it is important to use structured and functional interventions in complimentary combinations instead of separately.

CONCLUSION

The clinical implications of the literature suggest that both DTT and NET are significant to the field of communication disorders and sciences. While it is apparent that SLPs are working with each child to facilitate language learning and acquisition, it is also important to realize the clinical implications of those interactions. The findings of the literature reviewed should encourage SLPs to not only implement DTT but also implement NET in conjunction with DTT. Implementation of these two types of therapies allows for practical application and for evidence-based practice to occur (Sundberg & Partington, 1999).

As previously mentioned, the implementation and use of these different techniques should not raise doubt about the efficacy or delivery of treatment to ASD patients. Rather after comparing the research, it is apparent that both DTT and NET play significant roles in teaching language skills to children with ASD. In general, separately both techniques can contribute greatly to language learning in children with ASD, but more importantly, together these techniques have been proven to facilitate language in this population, which can help lead to a successful, happy life within their community. As interventionist it is important know that success is not determined by one intervention, but by a variety of intervention services and delivery methods. Severity of disability, age, parental support, hours of engagement, participation and resources all need to be taken into account to develop the best possible intervention strategy for any child, especially one diagnosed with Autism Spectrum Disorders. Therefore, while structure and function matter, most importantly helping an atypically developing child achieve developmental milestones is the ultimate goal of treatment.

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VITA

Graduate School
Southern Illinois University

Amy K. Mosier

akmosier@gmail.com

Purdue University
Bachelor of Science, Speech, Language and Hearing Sciences, May 2009

University of Southern Indiana
Teacher Certification, Elementary Education, Spring 2010

Southern Illinois University Carbondale

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