The Effects of Discrete Trial Teaching on Students with Autism

Kristine Reardon
The College at Brockport

Follow this and additional works at: https://digitalcommons.brockport.edu/ehd_theses

Part of the Curriculum and Instruction Commons, Elementary Education Commons, Language and Literacy Education Commons, Secondary Education Commons, and the Special Education and Teaching Commons

To learn more about our programs visit: http://www.brockport.edu/ehd/

Repository Citation
Reardon, Kristine, "The Effects of Discrete Trial Teaching on Students with Autism" (2012). Education and Human Development Master's Theses. 833.
https://digitalcommons.brockport.edu/ehd_theses/833

This Thesis is brought to you for free and open access by the Education and Human Development at Digital Commons @Brockport. It has been accepted for inclusion in Education and Human Development Master’s Theses by an authorized administrator of Digital Commons @Brockport. For more information, please contact kmyers@brockport.edu.
The Effects of Discrete Trial Teaching on Students with Autism

By

Kristine Reardon

August 2012

A thesis submitted to
the Department of Education and Human Development of
The College at Brockport State University of New York
In partial fulfillment of the requirements for
the degree of Master of Science in Education
The Effects of Discrete Trial Teaching on Students with Autism

by
Kristine Reardon

APPROVED BY:

Advisor

Date

Chairperson, Education and Human Development

Date
ACKNOWLEDGEMENTS

I would like to thank my husband, Christopher, for his support and patience during the past few years. I would like to thank my parents for showing me the importance of receiving an education and their unending love and support. I would also like to thank Dr. Zhang for her help and advice with this project.
Abstract

Discrete trial teaching (DTT) is one of the most widely interventions used on children with autism spectrum disorder (ASD). It is an intensive and individualized instructional methodology that involves breaking skills into smaller steps and intensely teaching each step until mastered. DTT is known to many as being useful for teaching new forms of behavior and discrimination. The purpose of this study was to investigate if DTT is a useful intervention for increasing communication skills, acquisition, and academic skills in children with ASD, while decreasing their inappropriate behaviors. Data indicated that DTT effectively increased acquisition, academic skills, and communication skills among children with ASD. Children with ASD inappropriate behaviors increased when being instructed with DTT. Results revealed that DTT should be combined with other interventions to enable children to initiate, maintain, generalize, and acquire skills faster.
# Table of Contents

Chapter 1: Introduction

Research Questions ................................................................................. 1

Problem Statement .................................................................................. 2

Significance of Problem .......................................................................... 3

Rationale .................................................................................................... 4

Definition of Terms .................................................................................. 4

Chapter 2: Literature Review

Autism Spectrum Disorder .......................................................................... 9

Communication Impairments in Children with ASD .................................. 10

Social Impairments, Interests, and Compulsivity in Children with ASD .......... 12

Diagnosing Autism Spectrum Disorder ...................................................... 13

Prevalence of ASD ................................................................................... 13

Overview of Effective Interventions for Children with ASD ......................... 14

Applied Behavior Analysis ......................................................................... 14

What is Discrete Trial Teaching .................................................................. 16

Procedures of Discrete Trial Teaching ......................................................... 18

Advantages and Disadvantages of DTT ...................................................... 22

Chapter 3: Methodology ........................................................................... 24

Criteria for DTT studies ............................................................................ 24

Search Procedures for DTT Studies ............................................................ 24

Analyses of Data ....................................................................................... 26
Chapter 4: Findings..................................................................................................................27
  Purpose of Study..................................................................................................................27
  Participants.........................................................................................................................27
  Settings.............................................................................................................................27
  Independent Variables.....................................................................................................28
  Dependent Variables.......................................................................................................28
  Experimental Design........................................................................................................28
  Acquisition Rate Results.................................................................................................29
  Inappropriate Behavior Results.......................................................................................30
  Academic Performance Results......................................................................................31
  Communication Results..................................................................................................32
  Summary of Results.........................................................................................................34

Chapter 5: Summary, Conclusion, and Results.................................................................35
  Summary..........................................................................................................................35
  Limitation.........................................................................................................................36
  Conclusions......................................................................................................................37

References..........................................................................................................................38

Figure 1..............................................................................................................................44

Table 3.1............................................................................................................................45
Chapter 1: Introduction

The number of children diagnosed with autism spectrum disorder (ASD) is on the rise (Steege, Mace, Perry, & Longenecker, 2007). Paralleling the increase of diagnoses of children with ASD has been the evolution of numerous autism-specific instructional approaches. With special education laws mandating educators to use scientifically based practices to teach all students (No Child Left Behind Act, 2002), it is imperative for educators to determine effective, scientifically based practices for students with ASD. The paralleling trend of number of children diagnosed with ASD and increase in autism-specific instructional approaches necessitates the demand for research regarding the best instructional approaches for students with ASD.

More than a half century ago, many children with ASD did not have a diagnosis. Today, children are diagnosed with ASD if they exhibit abnormal or impaired development in social interaction and communication combined with limited repertoire of activities and interests (Holding, Bray, & Kehle, 2010). There are more children today being diagnosed with ASD at an early age than one to two decades ago (Howlin & Moore, 1997). Even though there is no documented cure for ASD, research suggests that it can be managed if the appropriate instructional approach is chosen for children with ASD (Cohen, Green, Howard, Sparkman, & Stanislaw, 2005).

It has become evident through research that it is essential for children with ASD to start receiving effective treatments at a younger age. Effective early intervention will often decrease the public’s cost over a child with ASD’s life (Cohen et al., 2005). There have been numerous instructional approaches used for children with ASD. Evidence-based educational practices have become a necessity in the education realm (No Child Left Behind Act, 2002). Educators have become mandated to implement evidence-based educational programs. However, this is often
difficult for educators who instruct children with ASD because there is a lack of empirical evidence on numerous interventions being used with children with ASD (Heflin, Hess, Ivey & Morrier, 2007).

Applied behavior analysis (ABA) is one of the most widely utilized comprehensive methodologies used to instruct children with ASD (Ghezzi, 2007; Holding et al., 2010). ABA has more empirical support than any other treatment or therapy used for children with ASD. Hundreds of research studies have been conducted on ABA. Most of these research studies have concluded that ABA is an effective method to teach children with ASD language and communication, replacement behaviours, independent functioning, and social skills (Matson, Benavidex, Compton, Paclawskyj, & Baglio, 1996). The Surgeon General of the United States has reported that ABA is the most effective way to treat ASD (Rosenwasser & Axelrod, 2002).

One of ABA’s oldest and most widely used practices is discrete trial teaching (DTT) (Ghezzi, 2007). DTT presents information to children with autism in a clear, concise, and systematic way, while focusing on repetitive, rapid instruction (Gongola & Sweeny, 2011). DTT is an evidenced based practice and is a data driven intervention. It is believed that DTT teaches acquisition, academic, and language skills, as well as appropriate behaviors (Smith, 2001). Surprisingly, it appears that there is a lack of research on the effectiveness of DTT for children with ASD. With the vast use of DTT on students with ASD, it is imperative that more research be done on the effectiveness of DTT on students with ASD.

**Research Questions**

There are four research questions as follows:

1. Does discrete trial teaching increase students with autism acquisition rate?

2. Does discrete trial teaching decreases students with autism inappropriate
behaviors?

3. Does discrete trial teaching increase students with autism academic performance?

4. Does discrete trial teaching increase students with autism communication skills?

**Problem Statement**

The purpose of the study is to determine if discrete trial teaching is an effective instructional approach to increase students with autism communication, academic skills, and acquisition rates, in addition to decrease their inappropriate behaviors. DTT is one of the most widely interventions used on children with ASD. Surprisingly though, there seems to be a lack of research on the effects DTT has on children with ASD. With the growing number of ASD diagnoses a year and the extensive use of DTT on children with ASD, it is imperative that educators be aware if DTT is an effective instructional approach for children with ASD.

**Significance of the Problem**

Currently, I teach a 6:1:1 classroom for children with autism. I have taught in this classroom for the past five years. The children in my class range from eight to eleven years old. Each of my students’ social abilities, academic abilities, and behaviors are diverse. My classroom is based on the theories and principles of ABA. DTT is one method of ABA I implement on a daily basis to most of the students in my classroom.

Ever since I began teaching I was told that DTT is the best instructional practice for teaching students with ASD. I feel like I have been naive for believing this without researching the effectiveness of DTT myself. I have seen positive effects of DTT on various students in the past but I want to explore the current research and see if they have found the same results as I have seen and been told about. If the research does not illustrate the same results then educators need to re-examine the effectiveness of DTT.
Rationale

It is important for me to study the effectiveness of DTT for students with ASD due to my position as a teacher in a classroom that utilizes DTT on a daily basis. I am invested in my students and I want to ensure that I am using an effective instructional practice. By exploring a variety of articles and studies, I will enhance my understanding whether DTT is suitable for teaching acquisition, academics, and communication skills, as well as decreasing behaviors. If I discover that DTT is not the best evidence based practice for teaching one of the previous skills mentioned, I will be able to implement and research an alternate instructional practice.

This thesis will examine the effects of DTT on children with ASD. The initial part of this thesis will provide you with the history of ASD, the history of ABA, and the history of DTT. The thesis will then discuss past studies conducted on DTT, and the main methods and research techniques used in the studies. It will also, state a plan of action to validate whether DTT is an effective instructional approach for children with ASD. Lastly, the thesis will discuss the current gaps within the research on utilizing DTT as an instructional approach for educating children with ASD.

Definition of Terms

**Autism Disorder**- is a disorder of ASD. For an individual to be diagnosed with autism they need to exhibit abnormal or impaired development in social interaction and communication combined with limited repertoire of activities and interests prior to age 3 (American Psychiatric Association, 2000; Heflin & Alaimo, 2007; Holding, Bray, & Kehle, 2010).

**Asperger’s Disorder**- is a disorder of ASD. Asperger’s Disorder is a condition that is characterized by typical language development. The condition demonstrates delays in in the emergence of language for individuals. Individuals with Asperger’s Disorder have impaired use
of nonverbal communication, narrow range of interests, problematic comprehension, socialization difficulty, and ability to function independently. Often times there problematic behaviors are superseded by their excellent vocabularies, memory, and ability to have an extensive conversation on a topic of interest to them (American Psychiatric Association, 2000; Heflin & Alaimo, 2007).

**Applied Behavior Analysis (ABA)**- a highly behaviour analytic treatment that uses empirically supported practices, such as shaping, prompting, incidental teaching, reinforcement strategies, discrete trial teaching, functional communication training, and generalization (Holding et al., 2010).

**Augmentative and Alternative Communication (AAC)**- is utilized so a child with ASD is able to functionally and effectively communicate with others. ACC uses services and devices. Some of these services and devices include: Dynavox, voice recordings, graphics, and text-based flashcards (Heflin & Alaimo, 2007).

**Childhood Disintegrative Disorder (CDD)**- a disorder of ASD. For an individual to be diagnosed with CDD they must display normal development until the age of two. The individual must experience an immediate loss of at least two acquire skills areas to be diagnosed with CDD. Some of the skill areas an individual can lose are as follows: bowel or bladder control, expressive or receptive language, adaptive behaviour, social interaction, self-help skills, and/or play skills (American Psychiatric Association, 2000; Heflin & Alaimo, 2007).

**Classical Conditioning**- is when a conditioned stimulus is paired with an unconditioned stimulus. After pairing the two repeatedly, the unconditioned stimulus elicits the desired response (O’Donohue & Ferguson, 2001).

5
**Conditioned Stimulus**- is a neutral stimulus, it is a stimulus that does evoke responses (O’Donohue & Ferguson, 2001).

**Conditioned Response**- is the response that is learned by a stimulus after condition (O’Donohue & Ferguson, 2001).

**Developmental, Individual, Difference, Relationship-Based model (DIR)**- is a relationship-based approach. It focuses on having the child with ASD develop themselves as an interactive individual. “Floortime” is the strategy that is used in this model. “Floortime” is child directed. The goal of “floortime” is to increase attention, engagement, and communication (Hilton & Seal, 2007).

**Discrete Trial Teaching (DTT)**- an instructional component of ABA. Discrete trial teaching is an intensive instructional methodology that involves breaking skills into smaller steps, intensely teaching each step until mastered, providing repetition, utilizing prompts for the correct responses, and using positive reinforcement procedures (Ghezzi, 2007).

**Evidence-Based Practices**- is an educational practice that is based on scientific evidence. In order for an educational practice to be evidence-based it needs the following components: two experimental or quasi-experimental group design studies carried out by independent researchers, at least five single case design studies from at least three independent researchers, and combination of at least one quasi-experimental and experimental study and three single case design studies from independent investigators (Odom, Collet-Klingenberg, Rogers, & Hattone, 2010).

**Expressive Language**- ability to produce speech and/or communicate a message (Lovass, 1977).

**Functional Communication Training (FCT)**- emerged from the research on Functional Behavioral Assessments (FBA). FCT can only occur after an FBA has been conducted and
identified the function of an inappropriate behavior. The child with ASD educational team can then implement FCT to teach a replacement behavior that is easy for the child with ASD to use. This behavior serves the same purpose as the inappropriate behavior (Heflin & Alaimo, 2007).

**Incidental Teaching**- occurs when a child with ASD natural environment is intentionally organized to teach a skill (Heflin & Alaimo, 2007). For example, a teacher may place a child with ASD favorite toy where the child can see it but not reach it. This makes the child have to communicate their want for the toy.

**Natural Language Paradigm (NLP)**- is a child initiated strategy in which an adult waits until the child with ASD is showing interest in an object. The child takes the lead during this intervention. However, educators will often set up the environment to provide opportunities for the child to want to communicate. NLP enhances communication through the use of the following: stimulus item, prompts, response, and consequence (Delprato, 2001; Heflin & Alaimo, 2007).

**Operant Conditioning**- is a process within behavior modification. The goal is to change the frequency of behavior based on behaviour consequence (O'Donohue & Ferguson, 2001).

**Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS)**- is a disorder of ASD. Individuals are diagnosed with PDD-NOS when they meet some of the criteria for Pervasive Developmental Disorder (American Psychiatric Association, 2000; Heflin & Alaimo, 2007).

**Picture Exchange Communication System (PECS)**- is used to teach children with ASD to spontaneously communicate with others. The child with ASD exchanges objects for pictures to communicate their intent. PECS helps increase functional spoken language (Heflin & Alaimo, 2007).
**Receptive Language** is the comprehension of language. It is listening and understanding what is being said (Lovaas, 1977).

**Rett’s Disorder** is a disorder of ASD. Rett’s disorder is identified as a genetic disorder that primarily affects females. Individual’s diagnosed with Rett’s disorder exhibit similar behaviors to individuals diagnosed with autism (American Psychiatric Association, 2000; Heflin & Alaimo, 2007).

**Students with autism**- children diagnosed with autism, ages ranging from birth to twenty-one years old.

**Technological**- the techniques being used in ABA interventions are clearly defined and identified (Baer, Wolf, & Risley, 1968).

**Unconditioned Response**- a natural response that occurs in the absence of condition (O’Donohue & Ferguson, 2001).

**Unconditioned Stimulus**- is a stimulus that evokes an unconditioned response (O’Donohue & Ferguson, 2001).
Chapter 2: Literature Review

ASD is on the rise (Steege et al., 2007) and our national policy is demanding effective and evidence-based interventions to be utilized within schools (No Child Left Behind Act, 2002). The study conducted defined ASD, discussed the impairments children with ASD exhibit, examined the prevalence of ASD, explored interventions used on children with ASD, researched the history of ABA and DTT, discussed the structure and components, past research, and effectiveness of DTT.

Autism Spectrum Disorder (ASD)

ASD is not a new disability. Most likely, prior to the term ASD being recognized as a disability, children with ASD were diagnosed with a different disability or put in an institution. The definition of ASD has evolved throughout the years. Leo Kanner, a psychiatrist in the twentieth century at John Hopkins University coined the term autism to a group of children (Heflin & Alaimo, 2007). Kanner began noticing similarities among a group of children who had been brought to him for treatment and diagnoses (Kanner, 1943). Kanner viewed the children as self-absorbed and self-satisfied (Heflin & Alaimo, 2007).

According to Heflin and Alaimo (2007):

The Greek root of the term *autism* is *autos* which roughly translates as *self*. *Autos* is also the root for the word *automatic* which is equated with independent functioning without the need for external input (like an automatic transmission or an automatic dishwasher) (p. 49).

Kanner was the first individual to recognize autism as an official clinical disorder (Bradford, 2010; MacFarlane & Kanaya, 2009).
ASD is characterized as a pervasive developmental disorder because of its impact on many areas of functioning (Bradford, 2010; Holding et al., 2010). The main areas of functioning ASD effects are communication and language, social interactions, behavior, compulsivity, and interests (Bradford, 2010; DSM-IV, 1994; Holding et al., 2010; Heflin & Alaimo, 2007). The degree of impairments on individuals with ASD differs tremendously. Due to the variability of impairments in ASD, ASD includes the following five disorders: autism, Asperger's disorder, CDD, Rett's syndrome, and PDD-NOS (Bradford, 2010; Heflin & Alaimo, 2007; Woolfenden, Sarkoz, Ridely, & Williams, 2012).

Communication Impairments in Children with ASD

According to Lovaas (1977), “most children acquire language without anyone knowing how they do so. It is a “natural phenomenon,” and knowledge of the process is usually not needed” (p. 9). However, communication impairment is one of the three core deficits seen in children with ASD (Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998; Kurt, 2011). Communication abilities differ significantly in children with ASD (Heflin & Alaimo, 2007; Kurt, 2011). Communication in children with ASD can vary from total lack of spoken language to a child with ASD having normal language skills. Children with ASD often have a delay or lack in non-verbal communicative actions such as the ability to make and maintain eye contact and facial expressions, delay or lack of development in receptive and expressive language, inability to initiate and maintain a conversation with others, and use idiosyncratic language (Min & Wah, 2011).

Many times children with ASD do not realize the importance of communicating with others or are unable to. A child with ASD can often demonstrate a lack of motivation and/or inability to communicate with others (Heflin & Alaimo, 2007). The difficulties children with
ASD have in language and communication, frequently cause children with ASD to engage in inappropriate behaviors and affect their cognitive and social development (Jennett, Harrie, & Delmolino, 2008; Koegel, Koegel, & Surratt, 1992; Kurt, 2011).

Children with ASD’s cognitive abilities are sometimes impaired due to their impairment in language. Receptive and expressive languages often play a large role in their inability to learn (Lovass, 1977). Along with language affecting a child with ASD’s cognitive ability, often times a child will display inappropriate behaviors because they are unable to communicate their needs/wants. Communication is very difficult for a child with ASD (Heflin & Alaimo, 2007; Koegel et al., 2011; Lovass, 1977). A child with ASD may engage in inappropriate behaviors to escape or avoid a task or because they are unable to make their needs/wants known (Koegel et al., 2011). It is imperative that children with ASD are given the tools to learn how to communicate with others without engaging in inappropriate behaviors.

Social development is frequently affected by a child with ASD’s language impairment. Typically developing children say their first word by the age of one, expand their vocabularies by playing with others and objects, and having conversations with others (Heflin & Alaimo, 2007). Often times a child with ASD does not have the same opportunities, such as playing with others and having conversations, as typically developing children because of their inability to express themselves and/or understand what is being said. Children with ASD may also engage in restricted and repetitive behaviors which, affects their ability to create and maintain relationships with people (Kurt, 2011). The inability to make and maintain eye contact, smile, and utilize body language also affects social development for children with ASD (Heflin & Alaimo, 2007).
It is important that children with ASD receive an intervention to address their communication and language impairments as soon as possible. There are a variety of interventions that can be utilized on children with ASD. These interventions include: discrete trial teaching (DTT), functional communication training (FCT), incidental teaching, natural language paradigm (NLP), picture exchange communication system (PECS), sign language, and/or augmentative and alternate communication (AAC) (Heflin & Alaimo, 2007). The prognosis for a child with ASD can have a positive outcome when one or more of the interventions listed above are utilized (Heflin & Alaimo, 2007; Kurt 2001; McEachin, Smith, & Lovaas, 1993).

**Social Impairments, Interests, and Compulsivity in Children with ASD**

Children with ASD have significant differences in their ability to interact with others (Kanner, 1943). The differences in social impairments can range from a child with ASD having no interest in social interaction to a child with ASD wanting to engage with their peers but is unable to due to their disability (Heflin & Alaimo, 2007). Often times, children with ASD are unable to form relationships with others because of their limited eye contact, developmental level, inability to interpret other’s feelings, lack of social and emotional reciprocity, and impairments in appropriate social and gestural use (Bradford, 2010). It is vital children with ASD be taught social competence because it enhances their ability to function.

Many children with ASD live in a world where only “they” are of importance. Their perseverations affect their ability to participate in activities and/or discuss other subjects with people (Heflin & Alaimo, 2007). It is important for children ASD to have structure and routines. However, they need to be able to adapt to change when it occurs. Numerous times, children with ASD become rigid in their schedule and interests (Bradford, 2010). It is crucial for educators to
attempt to increase their interests and decrease their compulsivity to increase their ability to function within society.

**Diagnosing Autism Spectrum Disorder**

Diagnosing ASD is not an easy task. There is currently no medical test or biological indicator to diagnose ASD (Bristol-Power & Spinella, 1999). It is often misdiagnosed. A few reasons for misdiagnosing ASD may include: the variability of communication and language impairments, social interactions, behavior, compulsivity, and interests (Bradford, 2010; Heflin & Alaimo, 2007). The Diagnostic and Statistical Manual of Mental Disorder, fourth edition (DSM-IV, 1994) is used as a reference by professionals to help them when diagnosing a child with ASD (Heflin & Alaimo, 2007). The DSM-IV is a classification of mental disorders. It provides criteria to help aide in the process of diagnosing ASD in a child (DSM-IV, 1994). Children are now being diagnosed with ASD as young as 18 months old (Woolfenden et al., 2012).

**Prevalence of ASD**

According to the Autism Society of America, autism is the most prevalent developmental disability (Kane, Connell, & Pellecchia, 2010). One in 110 children are diagnosed with ASD (Gongola & Sweeney, 2011). The prevalence of ASD in children has drastically increased over the past decade. An example of this increase was seen in the state of Maine. Maine has seen students diagnosed with ASD increase from 158 in 1995 to 1,255 in 2004. This is almost an 800% increase in just one decade (Steege et al., 2007). The rise in ASD over the past decade may be attributed to the increase in awareness (Nelson & Huefner, 2003), early identification indicators, and more precise diagnostic assessments (Kane et al., 2010). The increase of ASD in the American population requires the need for effective interventions for children with ASD.
Overview of Effective Interventions for Children with ASD

Historically, there have been numerous instructional approaches used for children with ASD. Basing educational practices on evidence-based practices have become a necessity in the education realm. Educators have become mandated to implement evidence-based educational programs (No Child Left Behind Act, 2002). However, this is often difficult for educators who instruct children with ASD because there is a lack of empirical evidence on numerous interventions being used with children with ASD (Heflin et al., 2007).

It is imperative that children with ASD receive effective interventions (Cohen et al., 2005). There are multiple interventions educators can use to teach children with ASD (Heflin & Alaimo, 2007; Kane et al., 2010). However, not all of them are empirically supported. Some evidence-based interventions that are used to teach children with ASD include: discrete trial teaching, picture exchange communication system, natural language paradigm, augmentative and alternative communication, incidental teaching, eclectic, and the developmental, individual, difference, relationship-based model. Many of the interventions utilized to teach children with ASD are within the field of ABA (Kane et al., 2010; Steege et al., 2007).

Applied Behavior Analysis (ABA)

ABA has more empirical support than any other treatment or therapy used for children with ASD (Healy, O., O’Connor, J., Leader, G., & Kenny, N., 2008). Hundreds of research studies have been conducted on ABA. Most of these research studies have concluded that ABA is an effective method to teach children with ASD language and communication, replacement behaviors, independent functioning, and social skills (Matson et al., 1996). The Surgeon General of the United States has reported that ABA is the most effective way to treat ASD (Rosenwasser & Axelrod, 2002).
ABA is a scientific methodology that employs various methods of teaching and techniques to create functional behavior changes in individuals (Healy et al., 2008; Holding et al., 2011; Szapacs, 2006). The process of ABA involves systematically applying interventions that are based on empirically derived principals of behavior (Steege et al., 2007). The goals of ABA is to teach new skills, reinforce and maintain learned skills, generalize skills, and increase positive behaviors for individual (Steege et al., 2007; Szapacs, 2006). The behavioral strategies ABA employs puts an emphasis on increasing academic skills acquisition, verbal communication, and social skills (Gongola & Sweeney, 2012).

ABA is data driven. All the decisions involving a child with ASD in an ABA educational program should be based on data (Szapacs, 2006). All the interventions utilized within ABA have been reviewed and analysed (Steege et al., 2007). According to Baer, Wolf, & Risley, (1968) interventions used within ABA need the following components: (1) the interventions need to be applied to only behaviors that are significantly important for an individual to function within society; (2) once a behavior has been identified, it needs to be defined; (3) data needs to be taken on the data in order to show that the intervention was effective; and (4) the interventions used must be technological. Some of the interventions and techniques associated with ABA include: discrete trial training, errorless learning, incidental teaching, prompting, and fading (Chance, 1998). All the interventions and techniques will be defined later in the paper.

Many educational programs claim to be ABA based (Steege et al., 2007). However, calling it ABA does not necessarily indicate what interventions they use. There is not one specific intervention used. The interventions used in an ABA program, depends on the needs of each individual student (Holding et al., 2010; Simpson, 2005). Often times, individuals confuse ABA with DTT. ABA is not just the implementation of DTT (Gongola & Sweeney, 2012).
ABA encompasses a variety of data driven interventions. If only DTT is being utilized in a program then it is not a "true" ABA based program (Steege et al., 2007).

ABA was pioneered by Ivar Lovaas in the 1960's. Lovass devoted almost half a century studying the most effective techniques to use to better the lives of individuals' with ASD (Smith & Eikeseth, 2010). In order for ABA to be a successful intervention it has to encompass the following components: early intervention, parental involvement, intensive one-to-one teaching, comprehensiveness of program, and individualized programming (Osborne & Reed, 2008). Many of the studies executed by Lovaas reported remarkable outcomes for children with ASD, receiving ABA. Some of these outcomes included gains of 30 IQ points by the participants with ASD (Osborne & Reed, 2008). Many of Lovass' studies have been replicated and have obtained similar results.

**What is Discrete Trial Teaching (DTT)?**

A well-known intervention that is under the umbrella ABA is DTT. DTT has been used to teach people skills for over 60 years (Heflin & Alaimo, 2007). DTT is considered as one of the most effective and important interventions used in the history of educating children with ASD (Holding et al., 2011). It is also one of the most extensively studied interventions used with children with ASD (Smith, 2001). DTT is a well-established intervention that is driven by data (Ferraioli, Hughes, & Smith, 2005 Gongola & Sweeney, 2012). DTT is widely known and frequently requested by parents as an intervention to be used on their child with ASD (Nelson & Huefner, 2003). It is an intervention noted to maximize learning. DTT has been noted to be a successful intervention when it comes to teaching children academic, social, language, self-help, and adaptive living skills (Holding et al., 2010; Smith, 2001).
DTT was initially a research method but developed into a teaching method over time (Ghezzi, 2007). The conception of DTT could be assumed to have started with Ivan Pavlov. Pavlov was a Russian physiologist who made the discovery of classical conditioning. Pavlov’s experiment presented dogs with a ringing bell that was followed by food. Pavlov discovered that the dogs began salivating when they heard the bell. Pavlov’s studied what occurred prior to a response and how these stimuli affected learning (O’Donohue & Ferguson, 2011).

The work of Pavlov led to B. F. Skinner’s development of operant conditioning (Ghezzi, 2007). Operant conditioning is one of the defining features of behavior analysis (O’Donohue & Ferguson, 2001). A classic example of operant conditioning is Skinner’s experiment on rats. Skinner placed rats in a box that was equipped with a bar. In some experiments when the rat pushed on the bar it would receive food (reinforcer) and in other experiments the rat would receive a shock (punisher). Skinner identified three types of responses that follow a behavior. The three types of responses include: reinforcers, punishers, and neutral operants. Skinner ultimately studied the cause of a behavior and the behavior’s consequence (O’Donohue & Ferguson, 2001).

Pavlov and Skinner’s work activated the turn of discrete trials as a research method to the development of discrete trials as a teaching method (Ghezzi, 2007). The turn of DTT as a research method to a teaching method was for the teacher to be able to achieve control over the teacher-learner interactions (Ghezzi, 2007). Many classic studies of DTT began in the middle of the 1900’s. It is believed that in 1949, Paul Fuller used one of the first methods of DTT to teach an adult with a developmental disability who was in a vegetative state to raise his arm when he wanted milk (Fuller, 1949). Another classic study of DTT was by Montrose Wolf in the 1960’s. Wolf and his colleagues began using DTT with a child named Dicky. Dicky had autism but was
able to learn verbal behavior and interpersonal interactions through the use of DTT (Ghezzi, 2007).

The methodology of DTT is organized, controlled, and structured. DTT's teaching approach involves breaking skills into the smallest steps, teaching each step of the skill intensively until mastered, providing repetition, prompting responses, and using reinforcement (Gongola & Sweeney, 2001; Smith, 2001). DTT is an intense, repetitive, and fast paced intervention (Gongola & Sweeney, 2001) that allows for numerous training trials (Steege et al., 2007). DTT is conducted in a distraction free environment, one on one (Holding et al., 2010) and is teacher initiated (Delprato, 2001). Rote skills are often the first skills taught through DTT. Once a child with ASD masters rote skills they can then begin higher level skills (Gongola & Sweeney, 2001). There are several procedures that need to be followed to effectively implement DTT.

Procedures of Discrete Trial Teaching

DTT is a highly structured intervention. There are five basic components in DTT. The basic components for DTT include: cue, prompt, response, consequence, and intertrial interval (Ferraioli et al., 2005; Ghezzi, 2007; Heflin & Alaimo, 2007; Smith, 2001):

1. **Cue:** This is often called a discriminative stimulus (Sd). The teacher will present a brief demand or question. Some examples include: “Do this,” “What is it,” or “Point to _____.”

2. **Prompt:** A prompt is provided by the teacher when a student is initially learning a skill or when the student gives an incorrect response to an instruction. Some examples include: verbal prompts, textual prompts, positional prompts, point prompt, model prompt, physical prompt, and hand-over hand assistance. A prompt should always include the
least intrusive measures. It is important the least intrusive measures are utilized because as the child advances in the skill they are learning, the prompt should begin to be faded out. See Figure 1.

3. *Response:* A response comes from the student. A student can give a correct response, incorrect response, or no response.

4. *Consequence:* The consequence is given by the teacher. If the student correctly responds to the instruction then the teacher will immediately reinforce the response with praise, edibles, access to a toy, and/or access to a preferred activity. If the student incorrectly responds, the teacher will prompt the correct response.

5. *Intertrial interval:* The intertrial interval is a pause that lasts from 3-5 seconds. It is given after the consequence. It cues the student for the next trial.

Below is an example of how the 5 components of DTT work (Ferraioli et al., 2005; Ghezzi, 2007; Heflin & Alaimo, 2007; Smith, 2001). The examples teaching objective below is identifying colors receptively. This child is working on identifying the color green.

**Teacher:** "Touch green."

*The teacher takes the child’s hand and has him/her point to the green object.*

**Teacher:** "Yes! That is green."

*The teacher records on the data sheet that the child was unable to independently identify the color green.*

[End of first trial.]

**Teacher:** "Touch green."

*The child does not respond. After a few seconds, the teacher takes the child hand and has him/her point to the green object.*
Teacher: "You’re right. That is green."

The teacher records on the data sheet that the child was unable to independently identify the color green.

[End of second trial.]

Teacher: "Touch green."

The child points to the green object.

Teacher: "Good job! That is green."

The teacher records on the data sheet that the child was able to independently identify the color green.

[End of third trial.]

In the first and second trial, all five parts of the discrete trial are present: the discriminative stimulus (the teacher’s asking the child to touch green), a prompting stimulus (the teacher prompting the child to the correct answer, a response (the child gave a prompted response), the reinforcing stimulus (verbal praise given by the teacher), and the inter-trial interval (the period between each trial). In the third trial, there was no prompting stimulus because the child was able to independently perform the task.

Prior to the implementation of DTT, it is critical to evaluate whether DTT would be an effective intervention to teach students’ with ASD (Gongola & Sweeney, 2001). If students’ with ASD present the inability to attend, difficulty following 1-step directions, or limited motivation then DTT would be an appropriate tool (Ghezzi, 2007). DTT helps increase students with ASD motivation by the numerous learning opportunities DTT provides to them (Smith, 2001). Instruction through DTT can begin for a student with ASD once it is decided by an education team that DTT would be an effective intervention for the student.
An educational team should determine the skills a child with ASD needs to acquire. Once a skill is identified, the DTT program on a specific teaching objective can be developed (Ferraioli et al., 2005). Baseline data is then taken on the objective chosen. From the baseline data, the team can determine the sequence of phases that need to be mastered to reach the objective (Ferraioli et al., 2005). The program should also include an operational definition of the student response (Holding et al., 2011). It is extremely important that each student response is clearly defined because it ensures all individuals working with the child with ASD can identify the response (Ferraioli et al., 2005). In DTT there are only three possible responses, incorrect, correct, or no response (Heflin and Alaimo, 2007). DTT programs typically consist of ten trials. Mastery criteria of each phase, is usually 80%, across two days and two people (Ferraioli et al., 2005). Children enrolled in an educational program that offers DTT, may receive DTT from a few minutes to several hours a day (Smith, 2001).

The organization and management of DTT can begin for a student with ASD once it has been determined that DTT would be an effective intervention for the student. Each student should have their own DTT binder created for them. The binder should be organized with labelled tabs to separate each program. Each tab should be labelled with the program and should include the following: instructions for implementing DTT (this includes the discriminative stimulus, student response, and materials needed for the program), program list (this includes a list of the phases), and data sheets (Gongola & Sweeney, 2011). Along with materials, the environment where a DTT session will be taking place should be structured. DTT sessions should occur in an extremely structured area with minimal distractions (Gongola & Sweeney, 2001; Holding et al., 2011). An example of a structured area used during the implementation of DTT could consist of dividers with a table. The dividers are important to limit the distractions.
(e.g. other children, instruction, and visuals). It is sometimes best to schedule DTT sessions when the other students in the classroom will be doing the same activity or when transitions will not be taking place (Gongola & Sweeney, 2001). Once the environment is structured in a controlled location, the implementation of DTT can begin.

Advantages and Disadvantages of DTT

DTT is considered one of the most effective and important intervention being provided for children with autism in the educational realm (Holding et al., 2011). One of the benefits of DTT is how it produces a controlled environment that many children with ASD require (Ghezzi, 2007). DTT is a highly effective intervention when teaching small units of behavior (e.g. 1-step commands, identifying objects, making sounds) (Steege, 2007). The data collection, detailed curriculum, and the clearly defined progressive steps in the DTT programs allows for easy implementation. The structure and repetitiveness of DTT often establishes ready to learn behaviors (Steege, 2007). DTT also helps increase learning and motivation for students with ASD through the precise format of each DTT program, constant reinforcement, and multiple learning opportunities provided (Smith, 2001). DTT also allows for students to be successful and receive a reinforcer immediately after responding to the discriminative stimulus (Ghezzi, 2007). The benefits of DTT numerous and it shows by the declaration that DTT is considered one of the most effect interventions for children with ASD (Holding et al., 2011).

Even though DTT provides a multitude of benefits, there are some disadvantages. One of the disadvantages of DTT is that it is not an appropriate intervention when it comes to teaching sequential behaviors (e.g., washing dishes, tying a shoe, or putting on a coat) (Ghezzi, 2007). The set-up of the controlled environment during DTT sessions do not allow for children with ASD to easily transfer the skills learned to different environments (Smith, 2001). Children with
ASD would need to be taught how to generalize what they learned in DTT to additional settings (Seege et al., 2007). Many children with ASD are also unable to initiate behaviors without clear cues because they are taught to only respond when given a cue from their teacher (Smith, 2001).

It is clear that there are both advantages and disadvantages of DTT. All the research stating how effective DTT is for children with ASD would make formulate the belief that the advantages outweigh the disadvantages. If DTT was utilized in combination with the other interventions in ABA, then most likely children with ASD would have a positive outcome.

According to Smith (2001):

- DTT is a necessary but not sufficient element of ABA treatment for children with autism....other instructional approaches will be needed to teach them how to initiate the use of the skills they have acquired, transfer those skills to new settings, and reduce their reliance on cues from the teacher (p. 91).

It is apparent that educators believe ABA and DTT are effective interventions for teaching children with ASD. The results of past research and assumptions from researchers on the effectiveness of DTT gave me the desire to research a variety of studies completed on DTT. I wanted to see if DTT is truly as effective as researchers and my colleagues say it is. The next part of this thesis examined the methods and procedures utilized in this analytical review.
Chapter 3: Methodology

My literature review proved that DTT is considered one of the most well known interventions in the realm of educating children with ASD. The analytical review evaluated the relative effectiveness of DTT as an intervention for children with ASD by investigating a collection of studies completed on DTT. This chapter discussed the criteria and search procedures that were followed while completing the analytical review.

Criteria for DTT Studies

The DTT studies selected meet the four criteria as follows:

1. Purpose of study- This study investigated one or more of the following purposes: whether DTT increases students with ASD acquisition rate, academic performance, and communication, and decrease students with ASD inappropriate behaviors.

2. Intervention- This analytical review selected studies that utilized OTT and/or combination of DTT and other interventions.

3. Participants- The participants ranged from birth to twenty-one years old. All the participants have been diagnosed with ASD.

4. Peer-reviewed- All the studies reviewed have been peer-reviewed journal articles.

Search Procedure for DTT Studies

Relevant articles were searched using PsycINFO, Education Research Complete, and Educational Resources Information Center (ERIC) databases by using various combinations of the following search terms: discrete trial teaching, discrete trial, DIT, autism, and ASD. The search was first completed in the Education Research Complete database. A total of forty articles were found in the Education Research Complete database. Three of the forty articles found were usable for the analytical review. The search was then completed in ERIC’s database,
a total of fifty articles were found. Six articles were usable for the analytical review. Three of the six articles were repeats from the Education Research Complete database. The last search completed was in PsychINFO database, a total of fifty-four articles were found. Four of the articles were usable but were repeats from Education Research Complete’s and ERIC’s databases. A hand search was conducted and five additional articles were found to be used in the analytical review. A total of ten articles will be used for the analytical review.

Some studies did not meet the inclusion criteria for the analytical review. These studies were excluded largely because they didn’t specify the diagnosis of the participants. Most of the studies retrieved from Education Research Complete, PsychINFO, and ERIC databases did not discuss the effects of DTT but rather focused on the teaching individuals how to implement DTT.

A table was designed to help organize the information for this analytical review. The table focuses on the references, participants, settings, independent variables, dependent variables, results, experimental design, and duration of each study. “Participants” is defined as the number of individuals being studied, their age range, and their gender (if noted in the article). “Settings” is defined as the place the study took place. The “independent variables” include DTT or combination of DTT and another intervention. The “dependent variables” included gestural responses, verbal responses, reciprocity, social affective signaling, symbolic behavior, retention, acquisition of nouns and colors, eye contact, independent requesting, inappropriate behaviors, spontaneous language, sound production, receptive skills, and overall participant’s mood. The “results” discuss the effects of DTT. The “experimental design” included ABABA design, multiple schedule design, parallel treatment design, reversal design, multi probe design, experimental design, multiple-baseline across-responses design, comparative trials, and standard
alternating treatment design. The “duration” included the length of each study. Refer to Table 3.1.

Analyses of Data

The researcher analyzed descriptive data such as the participants’ age, gender, diagnosis, the number/percentage of the studies with certain dependent variables, independent variables, and the experimental design of each selected study and reported each category by both number and percentage.

The effectiveness of each study was analyzed by observing the relationship between the independent and dependent variables. Determination of whether DTT is an effective intervention was established through the results of each study. It was also determined if DTT is more effective used in combination with another intervention or by itself. The following chapter analyzed and discussed the finding of the study.
Chapter 4: Findings

Purpose of Study

The purpose of this study was to research the following four questions:

1. Does discrete trial teaching increase students with autism acquisition rate?
2. Does discrete trial teaching decrease students with autism inappropriate behaviors?
3. Does discrete trial teaching increase students with autism academic performance?
4. Does discrete trial teaching increase students with autism communication skills?

The participants, settings, independent variables, dependent variables, experimental design, and each of the four questions stated above were analyzed.

Participants

A total of 31 participants participated in the study. All the participants in the study received educational services and met the following criteria: (1) a diagnosis of ASD, and (2) a chronological age below 13 years. The average age of the participants that participated within the study was 5.5 years old. Four out of the thirty-one participant’s genders were not stated (13%). Of the twenty-seven genders stated, 74% of the participants were male (n=23) and 13% (n=4) of the participants were female. 100% of the participants had a diagnosis of ASD.

Settings

The sessions for the studies were conducted in several different locations. These locations included: school, home, clinic/treatment room, and participant’s home. Some of the studies took place in a combination of settings. Of the thirty-one participants, 16% of the participants participated in a study that took place in a school (n=5), another 16% participated in a study that was conducted in their home (n=5), 39% participated in a study that took place in a
clinic/treatment room (n=12), 16% participated in a study that took place in a clinic room, their home, and school (n=5), 6% participant's study took place in a classroom and their home (n=2), and 6% of the participant's settings were not stated (n=2).

**Independent Variables**

The independent variables within the study are DTT in isolation or DTT combined with another intervention. 60% of the studies independent variable was DTT (n=6). The other 40% of the studies independent variable was DTT combined with another intervention (n=4). These interventions included: mand training, NLP, naturalistic condition, and the use of gestures.

**Dependent Variables**

The dependent variables within the study are inappropriate behaviors, correct responding, mood, acquisition, retention, receptive skills, communication (gestural, verbal, and independent responses, production of target sounds, and unprompted words and requests), eye contact, and social behavior. 30% of the articles dependent variables are inappropriate behaviors (n=3), 10% of the articles dependent variable was correct responding (n=1), 10% of the articles dependent variable was participants mood (n=1), 20% of the articles dependent variable was acquisition (n=2), 20% of the articles dependent variable was retention (n=2), 10% of the articles dependent variable was receptive skills (n=1), 60% of the articles dependent variables was communication (n=6). There were instances were an article had more than one dependent variable.

**Experimental Design**

There was not one experimental design used twice in the peer-reviewed articles used for this study. The experimental designs used in the studies include: multiple-baseline across response design (n=1, 10%), comparative trials (n=1, 10%), standard alternating treatment design (n=1, 10%), experimental design(n=1, 10%), multi-probe design(n=1, 10%), reversal design
(n=1, 10%), ABA design (n=1, 10%), parallel treatment design (n=1, 10%), multiple schedule design (n=1, 10%), and ABABA design (n=1, 10%).

**Acquisition Rate Results**

DTT effectively increases students with ASD acquisition rates. Miranda and Melin (1992) and Holding et al., (2010) conducted studies that demonstrated the increase of acquisition rates by children with ASD through the implementation of DTT. The studies' independent variable was DTT and the studies dependent variable was acquisition.

Miranda and Melin (1992) designed a multiple schedule design study for two participants, investigating acquisition rates of color adjectives through DTT. Their study compared the effectiveness of DTT and incidental teaching when teaching color adjectives to children with ASD. According to Miranda and Melin (1992), “the color adjectives taught by traditional discrete-trial procedures were learned more quickly by both children” (p. 200). The mean baselines for both children in the beginning of the study were 0% correct. The means of the last five sessions prior to the participants meeting criteria was 96% correct for participant one and 100% correct for participant two. Both participants went from identifying color adjectives 0% of the time to identifying color adjectives 96% or higher over approximately 60 sessions (Miranda & Melin, 1992).

Holding, Bray, and Kehle (2010) designed an alternating-treatment design study for four participants, investigating acquisition rates of noun labels through DTT. Their study compared the effectiveness of DTT and fluency training. All four participants demonstrated a mean of 0% correct during baseline. After four weeks participant one had increased its noun acquisition from the baseline mean of 0 to a total of 21 nouns learned, participant two increased its noun acquisition from the baseline of 0 to a total of 15 nouns learned, participant three increased its
noun acquisition from the baseline of 0 to a total of 6 nouns learned, and participant four increased their noun acquisition from a baseline of 0 to a total of 3 nouns learned. Holding et al., (2010) study shows that the implementation of DTT increases a student with ASD acquisition rate.

**Inappropriate Behavior Results**

Four of the ten articles used in this analytical review discussed the effect DTT had on inappropriate behaviors (40%). The results from the four articles showed that inappropriate behaviors increased drastically when DTT was being used to teach children with ASD (Jennett et al., 2008; Koegel et al., 1998; Koegel et al., 1992; Sigafoos et al., 2006). These results are surprising given the fact that DTT is based on the principles of ABA, and it is well known that one of the goals of ABA is to increase positive behaviors for individual (Steege et al., 2007).

Sigafoos, O’Reilly, Ma, Edrisinha, Cannella, and Lancioni (2006) designed an ABABA design study to see if the participant’s self-injurious behaviors increased when given instruction through DTT. The participant engaged in their self-injurious behaviors 74% of the time when being taught through DTT. The study also examined the participant’s self-injurious behaviour when given instruction through embedded instruction. When being taught through embedded instruction, the participant engaged in self-injurious behaviors 3.2% of the time. This data suggests that DTT is not an effective instructional format in terms of self-injurious behaviors (Sigafoos et al., 2006).

Koegel et al., (1992) designed a study to see the difference in the participant’s inappropriate behaviors when receiving DTT or NLP. The participant’s engaged in inappropriate behaviors 50% of the time when being taught through DTT. The participant’s engagement in inappropriate behaviors when being taught through NLP was 4%. The above data
suggests that DTT is an ineffective instructional practice when teaching children with ASD (Koegel et al., 1992).

In a study by Koegel et al., (1998) stated, “it is also noteworthy that Child 5 exhibited large increases in disruptive and avoidance behaviour during the analog conditions” (p. 246). Inappropriate behaviors were not a dependent variable within Koegel et al., (1998) study but the researchers felt it was important to discuss the large increase of the participant’s inappropriate behaviors. Jennett et al., (2008) showed an increase in inappropriate behaviors in two of the six participants. According to the results, the inappropriate behaviors impacted the two participant’s learning significantly (Jenett et al., 2008).

The above data proves that DTT is an ineffective method when teaching children with ASD. The results have implications that inappropriate behaviors are less when instruction is done in naturalistic environments (Koegel et al., 1998; Koegel et al., 1992).

**Academic Performance Results**

For the purpose of this study, academic performance is defined as the ability the participants are able to retain and generalize the skills they acquired through DTT. Two of the ten articles discussed retention and generalization (20%). The articles concluded that the participants had a difficult time performing the skills they learned through DTT (Holding et al., 2010; Miranda-Linne & Melin, 1992).

Holding et al., (1992) standard-alternating treatment design study was designed to compare retention and generalization of noun labels. The dependent variables, retention and generalization were studies post intervention (six weeks past the intervention phase). All four participants in the study were unable to retain and generalize all the noun labels they had acquired through DTT (Holding et al., 1992). Miranda-Linne and Melin (1992) also showed
similar results in their study. Participant one in Miranda-Linne and Melin (1992) study showed about a 20% decrease in the ability to generalize the skill they learned through DTT. Participant two maintained the same results from DTT to generalization. However, participant two showed little to no growth acquiring the skills taught through DTT (Miranda-Linne and Melin, 1992).

The data proves that even though the participants retained and generalized some of the skills they had previous learned through DTT, they were unable to generalize the skills independently. These results show that DTT is an effective method teaching skill but it should be combined with other interventions in order for the students to maintain and generalize the skills they learned.

Communication Results

Communication is one of the core deficit skills in children with ASD (Jennett et al., 2008). Six out of ten articles in the analytical review studied the effect DTT had on communication (60%) (Buffington et al., 1998; Hilton & Seal, 2006; Jennett et al., 2008; Jones, Feeley, & Takacas, 2007; Koegel et al., 1998; Koegel et al., 1992). The communication skills these articles studied include: making requests, use of sign, speech intelligibility, produce sounds and/or words, and gestural and/or verbal responses. The articles showed minimal to moderate gains in communication.

Children with ASD can be taught spontaneous speech (Jones et al., 2007). Jones et al., (2007) created a multiple probe design study to investigate communicative responses with two participants. Communicative responses included: "bless you", "what", "shh", "coming", and/or "OK." DTT was used during the initial teaching of the specific target response. Once the participants were able to perform the target response with 80% accuracy the teaching began to take place in more naturally occurring situations. The results proved that both participants
learned the communicative responses quickly and were able to generalize the responses across novel settings and persons (Jones et al., 2007).

Hilton and Seal (2007) conducted a comparative study. The dependent variables in the study were the imitation of single words and use of signs. The participant use of sign increased 60% and imitation of single words increased 13% (Hilton & Seal, 2007). Buffington et al., (1998) also produced a study to research the effects DTT had on verbal and gestural target responses for four participants. All four participants showed an increase in verbal and gestural responses. All four participants showed low rates of gestural and verbal responding during baseline. The participants showed an increase in their verbal and gestural responding once treatment began. For example, participant one’s appropriate gestural and verbal responses increased from 0% during baseline to an average of 100% during the last four sessions of treatment (Buffington et al., 1998).

Koegel et al., (1998) created a reversal design study, Koegel et al., (1992) created an ABA design study, and Jennett et al., (2008) created an experimental design study to see the different effects DTT and a Naturalistic intervention had on a child with ASD communication. All studies proved that children with ASD communication increased more during a naturalistic intervention (Jennett et al., 2008; Koegel et al., 1998; Koegel et al., 1992). All three studies showed DTT affected the dependent variables minimally (Jennett et al., 2008; Koegel et al., 1998; Koegel et al., 1992).

These results prove that DTT is an effective intervention for teaching communication skills to children with ASD. However, the results show that DTT may not be the most effective method and should not be the only intervention utilized when it comes to teaching children with ASD communication skills.
Summary of Results

DTT has a positive effect when it comes to teaching children with ASD acquisition (Miranda & Melin, 1992; Holding et al., 2010). The results demonstrated an increase in children with ASD inappropriate behaviors when DTT was begin utilized (Jennett et al., 2008; Koegel et al., & Smith, 1998; Koegel et al., 1992). The results also show that DTT is an effective method teaching academic skill but it should be combined with other interventions in order for the students to maintain and generalize the skills they learned (Holding et al., 2010; Miranda-Linne & Melin, 1992). DTT is also proved to be an effective intervention when it comes to teaching children with ASD communication skills (Buffington et al., 1998; Hilton & Seal, 2006; Jennett et al., 2008; Jones et al., 2007; Koegel et al., 1998; Koegel et al., 1992). These results should make educators become more aware of the effects of DTT as an intervention. DTT is proven to be an effective intervention. However, it may not be beneficial if it is used in isolation. The next chapter will discuss the implications of the results and current gaps in research.
Chapter 5: Summary, Conclusions, and Recommendations

Previous literature demonstrates the effectiveness of DTT on children with ASD. This analytical review confirmed results of previous research that state DTT is an effective intervention for children with ASD. This chapter discussed the findings and recommendations of the analytical review.

Summary

The present analytical review research results proved the following:

1. Discrete trial teaching increases students with autism acquisition rate (Miranda and Melin, 1992; Holding et al., 2010).

2. Discrete trial teaching increases students with autism inappropriate behaviors (Jennett et al., 2008; Koegel et al., 1998; Koegel et al., 1992; Sigafoos et al., 2006).

3. Discrete trial teaching is an effective method teaching academic skill, but it should be combined with other interventions in order for the students to maintain and generalize the skills they learned (Holding et al., 2010; Miranda-Linne & Melin, 1992).

4. Discrete trial teaching increases students with autism communication skills (Buffington et al., 1998; Hilton & Seal, 2006; Jennett et al., 2008; Jones et al., 2007; Koegel et al., 1998; Koegel et al., 1992).

All the results of this analytical review are not consistent with previous literature. The analytical review is consistent with previous literature, proving that DTT is a highly effective intervention when teaching small units of behavior (e.g. 1-step commands, identifying objects, making sounds) (Miranda and Melin, 1992; Holding et al., 2007), increasing communication skills (Buffington et al., 1998; Hilton & Seal, 2006; Jennett et al., 2008; Jones et al., 2007; Koegel et al., 1998; Koegel et al., 1992), and teaching academic skills (Holding et al., 2010; Miranda-
Linne & Melin, 1992). The analytical review is not consistent with previous literature when considering inappropriate behaviors. Unlike previous research, the analytical review demonstrated an increase in inappropriate behavior when DTT was being utilized on children with ASD (Jennett et al., 2008; Koegel et al., 1998; Koegel et al., 1992; Sigafoos et al., 2006).

Some results of the analytical review suggest that even though DTT proved an increase of acquisition, communication, and academic skills in children with ASD, combining DTT with other interventions is more beneficial. Previous research and this study show that DTT is a great intervention for teaching children with ASD. However, the question is, should it be the only one? No! The prognosis for a child with ASD can have a positive outcome when one or more interventions discussed in this analytical review are utilized (Heflin & Alaimo, 2007; Kurt 2001; McEachin et al., 1993). DTT should not be the only intervention used in an ABA program. ABA treatment is dynamic. In order for a child with ASD to be successful a comprehensive program should be used in child’s education.

Limitations

Although DTT is known to have many important uses for a child with ASD, it also has some limitations. This study had four limitations. First, I found that the search engines yielded limited results. It was surprising how few studies I found in the databases. I have heard dozens of times in my current teaching position how beneficial DTT is to a child with ASD. However, there were a limited amount of studies completed on the effects it has on a child with ASD. In spite of much of the positive findings, it should be kept in mind that the study had a limited age span among participants. Most of the participants were under the age of eight. In addition, there was not a variety of studies completed that compared dependent variables.
Lastly, the researcher adds an additional variable that could have impacted the results of the study.

Conclusions

Considering the study's limitations and findings, suggestions can be made for further research. It can be suggested that studies be performed that study a greater age range of participants. It can also be suggested that similar studies be repeated on dependent variables. Collecting data on the same dependent variable in a variety of studies would produce validity. If more studies are done on the effects of DTT the databases would yield more results.

Overall, the results proved positive effects for children with ASD receiving DTT. These results have major implications for educators working with children with ASD. This study proved that DTT is effective when combined with other interventions.
References


Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; 1994).
American Psychiatric Association.


<table>
<thead>
<tr>
<th>Prompt Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Prompt (VP)</td>
<td>Using a verbal reminder for the student to respond correctly.</td>
</tr>
<tr>
<td>Textual Prompt (TP)</td>
<td>Cue card with the written response to elicit the correct verbal response.</td>
</tr>
<tr>
<td>Position Prompt (PP)</td>
<td>When the requested item is positioned closer to the student than the distracter item(s)</td>
</tr>
<tr>
<td>Point Prompt (PtP)</td>
<td>Pointing to the item the student should choose.</td>
</tr>
<tr>
<td>Model Prompt (MP)</td>
<td>Modeling the appropriate behaviour for the student.</td>
</tr>
<tr>
<td>Physical Prompt (PhP)</td>
<td>Physically helping the student to respond to the discriminative stimulus correctly. For example, tapping the student’s elbow to induce a response.</td>
</tr>
<tr>
<td>Hand-Over-Hand (HOH)</td>
<td>Taking the student’s hand to perform the task or respond the discriminative stimulus.</td>
</tr>
</tbody>
</table>

Table 3.1: Summary of Ten Studies investigating the effectiveness of OTT and a combination of OTT with another intervention

<table>
<thead>
<tr>
<th>References</th>
<th>Participants</th>
<th>Setting</th>
<th>Independent Variables</th>
<th>Dependent Variables</th>
<th>Experimental Design</th>
<th>Results</th>
<th>Durations</th>
</tr>
</thead>
</table>
| Buffington, Krantz, McClannahan, & Poulson (1998) | 4 participants (gender is not stated) with diagnoses of autism (ages 4 to 6) | small classroom          | DTT                   | 1. Gestural responses  
2. Verbal responses)                                                                    | Multiple-baseline across-responses design | 1. Gestural and communication responses increased  
2. Generalization occurred to some extent in the presence of novel stimuli | Each participant participated in 55-70 sessions |
| Hilton, J., & Seal, B (2007)          | 2 participants (monozygotic twin brothers) with diagnoses of autism (age 2)  | Is not included in study | DTT                   | 1. Reciprocity  
2. Social-affective signaling  
3. Symbolic behavior  
4. Vocal, gesturaly | Comparative trials | 1. Drop in reciprocity  
2. Increase in social-affective signaling  
3. Drop in symbolic behavior  
4. Increase in vocal and gestural communication | 16 of 18 sessions |
| Holding, Bray, & Kehle (2010)         | 4 participants with diagnoses of autism. The participants included 1 girl and 3 boys (ages 3 to 6) | Participant's home     | DTT                   | 1. Acquisition of nouns  
2. Retention | Standard alternating treatment design | 1. There was an increase in acquisition of nouns through DTT  
2. Limited transferability of skills learned through DTT | Intervention phase was 4 weeks. Post intervention was conducted 6 weeks after the intervention phase |
<p>| Jennett, Harris, &amp; Delmolino           | 6 participants (5 boys and 1 room)                                           | Small clinic room       | Combination of DTT and mand | 1. Independent requests | Experimental design | 1. DTT facilitated increased | 8-10 sessions |</p>
<table>
<thead>
<tr>
<th>2008</th>
<th>girl with diagnoses of autism (ages 3 to 6)</th>
<th>training</th>
<th>2. Eye contact</th>
<th>3. Inappropriate behaviors</th>
<th>spontaneous requesting. The spontaneous requesting during DTT was at a slower pace than during mand training.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jones, Feeley, &amp; Takacs (2007)</td>
<td>2 participants (both males) with diagnoses of PDD-NOS (ages 3)</td>
<td>Clinic room with table and two chairs</td>
<td>DTT</td>
<td>Unprompted spoken words produced within 5 seconds of the presentation of SD</td>
<td>Multi probe design</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koegel, Koegel,</td>
<td>3 participants</td>
<td>treatment room</td>
<td>Combination of Disruptive Reversal design</td>
<td>1. The participants 3-month</td>
<td></td>
</tr>
</tbody>
</table>

Does not say the length or duration of the study.
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Setting</th>
<th>Intervention</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surratt (1992)</td>
<td>2 males and 1 female with diagnoses of autism (ages 3-5)</td>
<td>DTT and NLP</td>
<td>showed an increase in their inappropriate behaviors during DTT</td>
<td>period with a 9-month break before the follow-up session</td>
</tr>
<tr>
<td>Koegel, Koegel, Ben-Tall, &amp; Smith (1998)</td>
<td>5 participants (4 males and 1 female) with diagnoses of autism (ages 3-8)</td>
<td>3 settings: separate room in the clinic building, at home with family members, at school with peers</td>
<td>1. DTT followed by naturalistic condition 2. Naturalistic condition followed by DTT</td>
<td>The sessions took place twice a week. The duration was not discussed in the study</td>
</tr>
<tr>
<td>Kurt (2001)</td>
<td>2 participants (both males) with diagnoses of autism (age 5 and age 12)</td>
<td>One of the participant’s sessions were carried out at his home. The other participant’s sessions were carried out at a research institute</td>
<td>1. DTT in combination with gestures 2. DTT with only verbal instructions</td>
<td>The sessions ran until each participant met their criterion</td>
</tr>
<tr>
<td>Miranda-Linne &amp; Melin (1992)</td>
<td>2 participants (both males) with diagnoses of autism (ages 12)</td>
<td>Classroom, hallway, and participant’s house</td>
<td>DTT</td>
<td>1.DTT resulted in acquisition of color adjectives 2.Decrease in acquisition after an elapsed time</td>
</tr>
<tr>
<td>Sigafoos, O'Reilly, Ma, Edrisnha, Cannella, &amp; Lancioni (2006)</td>
<td>12 year old boy with autism and severe intellectual disability</td>
<td>Private school for children with autism, DTT conducted at a table in his classroom and EI was conducted at the same DTT table for music, swing in the corner of the classroom, and outside path</td>
<td>DTT</td>
<td>Self injury Correct responding Mood</td>
</tr>
</tbody>
</table>