THE COMPARISON OF SENSORY INTEGRATIVE THERAPY (SPECIFICALLY WEIGHTED VESTS) AND APPLIED BEHAVIORAL ANALYSIS (SPECIFICALLY A DIFFERENTIAL SCHEDULE OF REINFORCEMENT) IN THE TREATMENT OF CHILDREN WHO HAVE AUTISM SPECTRUM DISORDER

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CHAPTER I

INTRODUCTION

Autism is a very complex disorder, which has a long history in its development as well as shared characteristics with other developmentally pervasive disorders. In the early 1940's an American psychiatrist, Leo Kanner and Austrian pediatrician Hans Aspberger described the developmental disorder, which afflicts about one in every 150 American children (Lindsay, Oberman & Ramachandran, 2007). The two were first to independently publish the first accounts of the disorder (Autism Society of America, 2007). According to the Autism Society of America (2007), these publications, Kanner's in 1943 and Aspberger's in 1944, both contained detailed descriptions and also attempted a theoretical approach to explain the disorder. Both of the authorities believed that from birth a fundamental disturbance was present which fuel highly characteristic problems (2007).

The name autism was also derived years ago. The label was first introduced by Eugen Bleuler and originally referred to a basic disturbance in schizophrenia (Autism Society of America, 2007). This basic disturbance was namely the narrowing of relationships to people in the outside world, a narrowing so extreme that it seemed to disregard everything except for the person's own self (2007). This basic disturbance was namely the narrowing of relationships to people in the for the person's own self (2007). The word autism was derived from the Greek word autos, which means self (Lindsay et. al., 2007). The exact translation of autism means "self state" or "self-ness" (Aylott, 2000). It has been argued that the words may have come about to reinforce the idea and describe the stereotypical view that people with autism may have an aversion to other people. This name applied

well because the most distinctive feature of the disorder involves the withdrawal from social interaction (2007).

According to Lindsay et. al (2007) most doctors have now adopted the term "autism spectrum disorder." This term was applied because it was important to make it clear that the illness has many related variants that range in their severity but still share many characteristic symptoms (2007).

Autism Spectrum Disorder at a Glance

As stated before, Autism is quite a complex disorder with a very descriptive definition. According to the American Psychological Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, 2000), Autistic Disorder is described as:

> The presence of markedly abnormal impaired development in social interaction and communication and a markedly restricted repertoire of activity and interests. Manifestations of the disorder vary greatly depending on the developmental level and the chronological age of the individual (pg. 70).

According to this definition it appears that the main feature of the disorder is the abnormal development of social interactions.

According to the National Institute of Child Health and Human Development (2005) autism is a neurobiological disorder of development, which will last throughout the duration of a person's life. The disorder is considered a pervasive developmental disorder and a child may begin to display symptoms by or before the age of three (2005). This disorder can be considered a pervasive developmental disorder because it causes problems or delays in many different skills that should normally arise during the stages of infancy and throughout childhood (2005).

Researchers have even found that autism has different levels of severity. Before implementing and developing treatments for a child, it seems quite important that their level of

functioning and severity are closely observed and compared. Researcher Kraft (2007) made several assertions about children who have autism:

> Autism affects a wide variety of developmental traits. Some young autistic children speak; others do not. Some possess almost average intellectual abilities; others are severely limited. As they grow older, certain autistic individual display incredible talents in very specific domains. Known as savants, they can memorize an entire book in hours or solve complex math problems faster than people using a calculator (pg. 2).

It appears most important to understand that all autistic children have their own capabilities, talents and intellectual abilities.

Researchers have found several common behaviors displayed in most people diagnosed with autism. Some of the most shared behaviors of those diagnosed with are displays indifference, participates only in one-sided interactions, shows no eye contact, has a preference of sameness, will not participate in pretend play, will only join in activities if an adult will assist, parrots words, behaves in unusual ways, laughs and giggles inappropriately, indicates needs by using an adults hands, and prefers sameness (Frith, 2007). According to the National Institute of Child Health and Human Development (2005) the main characteristics which are lacking in children diagnosed with autism, are communication skills involving both verbal contact, such as spoken language, and non verbal contact, such as pointing, eye contact or smiling. The social interactions which are lacking include sharing emotions, holding conversations, and developing an understanding about how people think and feel (2005). Finally, routines and repetitive behaviors which are also referred to as stereotyped behaviors, are also common in children diagnosed with autism (2005). These children repeat words and specific actions several times and engage in behaviors such as playing with toys in inappropriate ways while displaying a very specific and inflexible way of arranging items.

Though the behaviors mentioned have been associated with those diagnosed with autism, the same behaviors are also found in other pervasive developmental disorders. According to the American Psychological Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, 2000) pervasive developmental disorders are characterized by both pervasive and severe impairment in several different areas of development. These areas include reciprocated social interaction skills, communication skills, and the evidence of stereotyped behaviors, activities or even interests (2000). The disorders which have been listed as developmentally pervasive include Autistic Disorder, Rett's Disorder, Childhood Disentegrative Disorder, Aspberger's Disorder, and pervasive Developmental Disorder Not Otherwise Specified (2000). Much like autism, all of these disorders are usually quite evident in the first years of life and are frequently associated with some degree of Mental Retardation (2000).

Prevalence and Presumed Causes of Autism

According to the American Psychological Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, 2000) epidemiological studies have found that there are five cases of autism per 10,000 individuals. Currently, researchers Oberman and Ramachandran (2007) have found that the disorder afflicts and affects about one in 150 American children. The number of cases that have been reported seem to have increased throughout the years.

Even though researchers are beginning to see an increase in the number of autism cases reported, it is also important to consider why the numbers have increased over the years. Layne (2007) asserts that it is important to take into account the controversy which surrounds the reported increase in autism cases because of the many ways in which autism diagnosis are made. Layne (2007) also made the assertion that the following reasons are causes for the heightened amount of reported autism cases: a) heightened public awareness of the disorder due to an increase of education of the parents, clinicians and teachers; b) diagnostic substitution of autism instead of the diagnosis of

mental retardation; and c) the proclivity of the clinicians to assign the diagnosis of autism rather than other developmental disability because those who provide care may gain more helpful services. The clinical diagnosis of autism is most certainly rising, however it appears that researchers are unsure of whether the actual incidence of autism is actually increasing (2007).

There have also been theories developed about what cause autism. The National Institute of Child Health and Human Development (2005) reports that much evidence supports that genetic factors, or genes, and their interactions and functions are the main cause for autism. Researchers believe that autism is not the result of just one gene, but as many as twelve genes on multiple chromosomes (2005). All of these genes are believed to be involved in autism to different degrees (2005).

Diagnosis and Screening

There are several screeners which are used to effectively diagnose children with autism. Tests that are used include the Checklist for Autism in Toddlers (CHAT), Modified Checklist for Autism in Toddlers (M-CHAT), the Autism Diagnostic Observation Schedule (ADOS), the Diagnostic Interview Toddler Form (ADI-Toddler Form), the Autism Diagnostic Interview-Revised (ADI-R), the Childhood Autism Rating Scale (CARS), the Repetitive Behavior Scale Revised (RBS-R), Early Screening of Autistic Traits Questionnaire (ESAT), Social Communication Questionnaire (SCQ), and finally clinical judgment. All of the listed scales are widely used by practitioners and clinicians and some are more reliable and better measures for particular populations of children who could possibly be diagnosed with autism.

In order to be diagnosed with Autism Spectrum Disorder, many diagnostic criteria must be met. According to the American Psychological Association, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV-TR, 2000), the criteria includes a total of six (or more) items from the sections (1), (2) and (3) of the overall criteria and at least two from the section (1), and

one each from (2) and (3). There must be qualitative impairment in social interaction, as manifested by marked impairment in the use of most non-verbal behaviors, failure to develop peer relationships at developmental level, a lack of interest in normal activities and objects and lack of social or emotional feedback. There must be qualitative impairments in communication including delay in or lack of spoken language, marked inability to initiate or sustain conversation, stereotyped or repetitive use of language, lack of spontaneous, make-believe or social imitative play appropriate for developmental level. There must also be restrictive repetitive and stereotyped patterns of behaviors, interests and activities. Furthermore, there must be marked delays or abnormal functioning with onset before the age of 3 years in one of the areas: social interaction, language as used in social communication or symbolic or imaginative play. Finally the disturbance must not be better accounted for by Rett's Disorder or Childhood Disintegrative Disorder (American Psychological Association, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, DSM-IV-TR, 2000).

Treatments for Autism

There are many different treatments that have been used to alleviate some of the problematic behaviors associated with autism. Some of these treatments have been researched and are empirically validated treatments while other treatments utilized by practitioners lack empirical support. Since autism is such a complex disorder, children who have it may display a wide array of characteristics and symptomology. For that reason, there are several different treatments that are implemented for these children, which may address different characteristics of their displayed behaviors. According to Autism Speaks, Incorporated (2007, Treatments page), there are several common or widely utilized treatments for autism including Applied Behavior Analysis (ABA), Floortime Therapy, Gluten Free, Casein Free Diet (GFCF). Speech Therapy, Occupational Therapy, PECS, SCERTS, Sensory Integration Therapy, Relationship Development Intervention, Verbal Behavior Intervention, and the school-based TEAACH method.

Many researchers and practitioners have developed their own reasons for utilizing particular treatments for children with autism, however, Applied Behavioral Analysis (ABA) is one of the most widely utilized treatments for autism. ABA is a natural science of behavior, which was first described by B.F. Skinner in the 1930's (Autism Speaks, Incorporated, 2007, para 1). ABA is a very intensive system of reward-based training that focuses on teaching particular skills. It has been extensively researched with this population and is the most effective treatment for autism to date (2007). For this reason this treatments has been used with many children in this population.

Sensory Integration Therapy (SIT) is another widely used treatment for children with autism. SIT is a treatment which is used to facilitate the development of the nervous system's ability to process sensory input in a more normal way (Autism Speaks, Incorporated, 2007, para. 19). SIT is taught by many professionals such as occupational and physical therapists and it is believed that it does not teach higher levels of skills, but does improve the sensory processing abilities which allow the child to obtain these skills (2007). SIT examples include brushing the body, compressing the elbows and knees, swinging from a hammock suspended from a ceiling, spinning around and around on a scooter board, wearing a weighted vest or wristbands, putting a body sock on the participant, or massaging the child's mouth or other body parts (Association for Science in Autism Treatment, 2008, para 1). According to the Association for Science in Autism Treatment (2008, Treatments Page) even though Sensory Integrative Therapy has been a popular intervention for people with autism since the 1970's reviewers have found that there are not enough studies to validate the usefulness and effectiveness of the treatment therefore conclusions about its effectiveness with treatment of the autistic population can't be drawn.

The treatments used for the autistic population must be well thought out and based on effectiveness which is proven through research. These particular treatments should be evidence-based and practitioners should be using scientific evidence to inform practice, which will increase the likelihood of providing effective treatments (Cicchetti, Reichow and Volkmar, 2007). For many

years several different treatments have been used and all have not been proven through research. Applied Behavioral Analysis has been a treatment shown to improve some of the problematic behaviors displayed by children with autism. This is the reason why it is used so widely. On the other hand Sensory Integrative Therapy specifically the use of weighted vests to eliminate stereotyped behaviors is also a treatment utilized with this very population, however there is insufficient research regarding SIT to determine if it is an effective treatment. One must begin to question the use of such a treatment if it has not been proven to work effectively; however, practitioners continue to utilize SIT. Furthermore it's important to see how such a treatment compares to another widely used treatment. Even if research identified SIT as an effective or evidenced based treatment, it would be important to determine the effectiveness of such a treatment relative to the most researched and accepted intervention so that practitioners may closely examine reasons for utilizing one particular treatment over another.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this review is to explore what the current literature states about the history of Autism Spectrum Disorder, the underlying behaviors of the disorder, the increase in cases of the disorder and the variation of age range in which the disorder can be correctly diagnosed. This review will also discuss how popular the disorder has become and how many diagnosis have been made in the past years. Most importantly this review will focus on discuss the most common treatments and more specifically two of the most used treatments, Sensory Integrative Therapy and Applied Behavioral Analysis. Finally this review will also discuss the behaviors of Autism Spectrum Disorder, which overlap with behaviors of similar disorders and make it harder to correctly diagnose and distinguish the disorder from those that are also developmentally pervasive.

Autism is quite a complex disorder, which has a history of developments and research to better assist those who have been diagnosed. The disorder has quite a descriptive definition and fits under the umbrella of disorders described as Pervasive Developmental Disorders (PDD). According to the American Psychological Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV-TR, 2000), Pervasive Developmental Disorders are:

> Characterized by severe and pervasive impairment in several areas of development: reciprocal social interaction skills, communication skills, or the presence of stereotyped behavior, interests, and activities. The qualitative impairments that define these conditions are distinctly deviant relative to the individual's developmental level or mental age (pg. 69).

The DSM-IV-TR (APA, 2000) describes Autistic Disorder as:

> The presence of markedly abnormal impaired development in social interaction and communication and a markedly restricted repertoire of activity and interests. Manifestations of the disorder vary greatly depending on the developmental level and the chronological age of the individual (pg. 70).

This description of the disorder assists in understanding the main features of the disorder, which are the abnormal development of social interactions and the restrictions to certain activities.

Many researchers have described the components of autism as well. According to the National Institute of Child Health and Human Development (NICHD, 2005), autism is a complex neurobiological disorder which will last throughout a person's life. NICHD (2005) also asserts that autism is often referred to as a developmental disability because it will usually start before the age of three and will cause problems or delay in several different skills that may arise throughout infancy and well through childhood.

Some researchers have found that autism has different level of severity. Before implementing and developing treatments for a child, it seems quite important that their level of functioning and severity are closely observed and compared. Researcher Kraft (2007) made several assertions about children who have autism:

> Autism affects a wide variety of developmental traits. Some young autistic children speak; others do not. Some possess almost average intellectual abilities; others are severely limited. As they grow older, certain autistic individual display incredible talents in very specific domains. Known as savants, they can memorize an entire book in hours or solve complex math problems faster than people using a calculator (pg. 2).

These descriptions show that there are several levels of complexity of the autistic child. It is important that all aspects of their lives and abilities are considered. It appears most important to understand that all autistic children have their own capabilities, talents and intellectual abilities.

As stated before, autism affects many critical aspects of a child's development. Communication is one of the main skills that are affected (NICHD, 2005). Both the verbal and non-verbal aspects such as pointing, eye contact and smiling are affected (NICHD, 2005). Social interaction skills such as sharing emotion, understanding how others feel and think, holding normal conversations and time spent interacting with others may be areas which are also lacking in a child with autism (NICHD, 2005). NICHD (2005) found that routines and repetitive behaviors such as repeating words or actions, having very inflexible ways of arranging items and obsessively following routines or schedules are all characteristic of the autistic population.

Prevalence

The prevalence of autism has changed greatly throughout the years. Many researchers do not know the cause for such a great increase in children diagnosed with autism, however, it is apparent that the numbers are growing. According to the DSM-IV-R (APA, 2000), the rate if autism in epidemiological studies indicates there are five cases per 10,000 individuals and reported rates ranging from two to twenty cases for every 10,000 individuals. Currently, researchers Oberman and Ramachandran (2007) have found that the disorder afflicts and affects about one in 150 American children.

Monastersky (2007), has also reported that autism affect one in every 150 American children. Researcher Pope (2007), reports that the rates of autism are on the rise affecting one in 166 births. In the year 2000 Aylott (2000) reported that there was a reported one out of 333 children with autism. The number of autism cases have grown over the years and researchers are unsure of why that may be.

Age and Gender Differences

As children with autism progress in years, their behaviors may change. According to the DSM-IV-TR (APA, 2000), the nature of impairment in social interactions may change over time in an individual with autism and may diverge depending on the developmental level of the individual. In the infant stage a child may fail to cuddle, may show aversion to most physical contact and may lack eye contact, facial responsiveness, failure to respond to familiar voices, and socially directed smiles (APA, 2000). Very young children with the disorder may only cling to one specific person, or may use an adults hand to gain access to an object without making eye contact, showing that the hand is the object of their attention rather than the person as a whole (APA, 2000). As the child gets older, they may become more passively engaged in social interactions and may become even more interested in becoming involved in social interactions (APA, 2000). Though this may be excellent, the child may treat people in unusual ways by having little sense of personal boundaries and asking ritualized questions (APA, 2000). As a individual with autism gets older, tasks that include usage of their long-term memory may be great, but the information they obtain may be repeated over and over again, in spite of how relevant the information may be to the social context (APA, 2000).

Researchers have found that autism is more prevalent in certain populations. Aylott (2000) has found that more boys that girls are affected by autism with the ratio of 4:1. This ratio is greater towards boys at the more able end of the spectrum (Aylott, 2000). The DSM-IV-TR

(APA,2000) states that "rates of the disorder are four to five times higher in males than in females" (pg. 73). The females with the disorder are more likely to also display more severe Mental Retardation (APA, 2000). Black, Conner, Connolly, Kadlee Tewani and Tager-Flusberg (2007) found that consistent with previous findings, boys and girls evidenced a relative strength in visual reception and fine motor skills that had been compared with gross motor skills, receptive and expressive language, with language being the weakest domain of functioning. Black et. al. (2007), also found that their generated hypothesis that girls would evidence poorer performance in all aspects of developmental functioning was not supported. In this same study, it was found that girls and boys with autism definitely display different developmental profiles (Black et. al., 2007). Black et. al., reported that different areas of functioning were essentially weaker for one gender while much stronger for the other:

> Consistent with the expectation that boys would show more advanced development, boys evidenced stronger verbal and motor skills, particularly once differences in visual reception were covaried. Controlling for language level, girls evidenced significantly stronger skills in visual reception, or the nonverbal problem-solving domain. In addition, boys were described as having more advanced social functioning than girls (pg, 94).

These findings do suggest that girls and boys do differ in successful functioning of some skills. However, the study goes on to report that these findings may be true for younger children diagnosed with autism however the findings do contrast with previous reports that older boys and adult men with autism consistently display better performance than females in all the domains of cognitive functioning assessed (Black et. al, 2007). It appears that while the children are younger, both the boys and girls tend to function just as well as one another, however as they get older, girls perform poorer in most all of the cognitive domains of functioning.

Popular Notions about Autism

Many researchers have found it hard to understand the rising number of autism cases. In the year 2000, Aylott (2000) reported that there was one out of 333 children with autism. Since then the numbers have grown significantly. Researcher Pope (2007), reports that the rates of autism are on the rise affecting one in 166 births. The latest numbers reported by Monastersky (2007), has reported that autism affect one in every 150 American children. As one can see, the number of cases has increased significantly.

In recent years, researchers have found that the numbers of people diagnosed with autism and related disorders have shot upward (Monastersky, 2007). The government has also expressed how much the numbers have risen, reporting that the condition now affects one in 150 American children (2007). According to Monastersky (2007) the surge has truly raised fears that an epidemic is sweeping through the nation, with some parents blaming vaccines for their children's autism. Of course this claim has been rejected by most doctors and some claim that the epidemic is an illusion (2007). It is believed that the rates have only increased because doctors have broadened the diagnosis to include more people (2007). It is also believed that more people have become more accepting of autism as well as other developmentally pervasive disorders (2007).

It seems clear that no one truly knows why there has been a considerable increase in the number of autism cases. It seems that the number of cases have risen in part because of more popular exposure. Perhaps many of the diagnoses are accurate, however, with an increase so large, one must question if every diagnosis has been lasting.

Behaviors

There are several features and behaviors that are recognized when children are diagnosed with autism. Some of the behaviors are specific to autism while others are related to other disorders. Carrona and Tager –Flusberg (2007) refer to the main functional impairments as a triad of symptoms: (1) limited reciprocal social interactions, (2) disordered verbal and nonverbal

communication, and (3) restricted, repetitive behaviors or circumscribed interests. According to Frith (2007), the most characteristic traits of autistic people include aloneness, repetitive behavior, insistence on sameness and the liking for elaborate routines. It has also been asserted that even though many of the behaviors are standard, some autistic individuals can perform complicated tasks, provided the activity does not entail them to judge what another person could be thinking (Frith, 2007). The behaviors cited by Frith (2007) are displays indifference, participates only in one-sided interactions, shows no eye contact, has a preference of sameness, will not participate in pretend play, will only join in activities if an adult will assist, parrots words, behaves in unusual ways, laughs and giggles inappropriately, indicates needs by using an adults hands, and prefers sameness (Frith, 2007). Layne (2007) adds to this lists by with other observed behaviors such as lacks response to name, poor motive imitation, and also a lack of verbal and nonverbal communication as well as an inability to participate in any pretend play activities. According to the NICHD (2005):

> People with autism might have problems talking with you, or they might not want to look you in the eye when you talk to them. They may have to line up their pencils before they can pay attention, or they may say the same sentence again and again to calm themselves down. They may flap their arms to tell you they are happy, or they might hurt themselves to tell you they are not. Some people with autism never learn how to talk (pg. 2).

As mentioned in the description, those with autism find different ways than normally developing children to express themselves and seem to socially limit themselves. The behaviors that are displayed by those with autism appear to make life harder for those diagnosed with the disorder and may also complicated the lives of those who interact with and care for them.

Some researchers have found that there are in fact some very early onset behaviors that children who are likely to develop autism display. According to Arehart-Treichel (2007), when

infants display a limited level of complex babbling, word production, and declarative or definite pointing at rates much lower than those produced by normal developing children at about a year of age, early onset of autism may be occurring or developing. However in the latter type they behave normally in the first year of life, however by age two, the children use fewer words, are less likely to respond to their own names and look at children less often than normal children (Arehart-Triechel, 2007).

Characteristic of the autistic child is the rise in stereotypical behaviors. Kennedy, Knowles, Meyer and Shukla (2000), assert that since the discovery of autism was first described in the 1940's, the presence of stereotypical movements has been a main behavioral feature of the disorder. Stereotypy is usually characterized by repetitive movements that do not appear to serve any adaptive function (Kennedy et. al., 2000). NICHD (2005) describes stereotyped behaviors as simply routine and repetitive behaviors such as repeating words and actions over and over, having specific or inflexible ways of arranging items, and playing with objects or toys in quite repetitive or inappropriate ways. Occurrence of this behavior or stereotypy has been associated with impaired social development and impaired learning (Kennedy et. al., 2000). Numerous theories have been made about the conditions associated with stereotypy, however complete understanding of the causes of it have yet to be explained. Some of the specific stereotyped behaviors are hand flapping or waving, body rocking, and head weaving (Kennedy et. al., 2000).

The DSM-IV-TR (APA, 2000), found that individuals with the disorder have display a range of behavioral symptoms which may include hyperactivity, very short attention span, impulsivity, aggressiveness, self-injurious behavior and temper tantrums. These children may display odd or abnormal reaction to sensory stimuli (APA, 2000). The child may display abnormal eating habits and irregular mood or affect (APA, 2000). Children with autism may also display fearlessness in potentially dangerous situations and fearfulness of harmless objects (APA, 2000). There may also be participation in self-injurious behaviors such as finger, hand, or wrist

biting and possibly head banging (APA, 2000). In the adolescence or early adult life, those with autism who do have some intellectual capacity, may become depressed due to their realization of their serious disability (APA, 2000).

Presumed Causes of Autism

There have also been theories developed about what may cause autism. The National Institute of Child Health and Human Development (2005) reports that much evidence supports that genetic factors, or genes, and their interactions and functions are the main cause for autism. Researchers feel that autism is not the result of just one gene, but as many as twelve genes on multiple chromosomes (2005). All of these genes are believed to be involved in autism to different degrees (2005). Some genes may put a person at greater risk or make them more susceptible to autism (2005). These same genes could also determine just how severe the symptoms of the disorder may become due to mutations in the genes (2005). Environmental factors such as viruses may also play a role in an individual's susceptibility to autism (Lindsay et. al., 2007; NICHD, 2005). Researchers have also found that other factors such as immunologic factor, possible neurological factors, and metabolic factors may also be possible causes for the disorder (2005).

Lindsay et. al. (2007), asserts that there may be a connection between autism and a newly discovered class of nerve cells in the brain which are referred to as mirror neurons. The researchers made this assertion because these neurons appeared to be involved in the abilities such as empathy and reading the feelings of others so it seemed reasonable to hypothesize that the dysfunction of these neurons could be the cause of some of the symptoms of autism (Lindsay et. al., 2007). More research in the area of the mirror neurons may help lead to an explanation of how autism arises, which can assist in the development of better methods to successfully diagnose and treat the disorder (Lindsay et. al., 2007). It appears that researchers have taken

several different approaches to gaining more knowledge on what may be the cause of autism. According to NICHD (2005), since no two people who have autism are exactly the same, and because autism is such a complex disorder, the disorder could be caused by many different factors.

Autism and Other Pervasive Developmental Disorders

There are several disorders, which share some of the same behaviors and characteristics as autism. Throughout the research many of the symptoms of other similar disorders seem to overlap with those of autism, which could make it difficult to ensure the diagnosis of a person as autistic is completely accurate. According to the DSM-IV-TR (APA, 2000), Autistic Disorder must be distinguished from form other Pervasive Developmental Disorders.

There have been several disorders that have been noted to have overlapping behaviors similar to those behaviors characteristic of people diagnosed with autism. According to the DSM-IV-TR (APA, 2000), these disorders include Aspberger's Disorder, Mental Retardation, Rett's Disorder, Child Disintegrative Disorder, Schizophrenia, Selective Mutism, Expressive Language Disorder and Stereotypic Movement Disorder. These disorders all share characteristics similar to autism and there may be some difficulty ensuring that the proper diagnosis is made.

Aspberger's Disorder is a disorder which is commonly mistaken for autism. According to Mayes, Rhodes, Tryon and Waldo (2006), the validity of Aspberger's disorder as a distinct diagnosis from autism, remains an ongoing issue in the literature. Researchers have continued to question whether or not the disorder was a high functioning version of autism (Mayes et. al. 2006). The DSM-IV-TR (2000) lists several criterion which are to help clinicians distinguish whether or not a child has Asperger's disorder or autism because the two seem nearly the same in descriptions of behaviors. Aspberger's disorder is mainly distinguished from autism by the lack

of delay or deviance in early language acquisition (APA, 2000). Aspberger's disorder will not be diagnosed if the criteria are met for autism (APA, 2000).

Children diagnosed with Mental Retardation also share several characteristic behaviors with those children diagnosed with autism. Many of the characteristics are the same and a diagnosis of autism could also be accompanied by Mental Retardation, which is distinguished by the significant sub-average intellectual functioning and coexisting impairments in their present adaptive functioning with an onset before eighteen years of age (DSM IV-TR, APA, 2000). According to the DSM-IV-TR (APA, 2000), it is sometimes quite difficult to determine if an additional diagnosis of autism is needed in individuals with Mental Retardation. The diagnosis of autism with Mental Retardation should only come about if there is a significant amount of social and communication skill deficits and specific behaviors of autism must be present in the individual. Metzke and Steinhausen (2004) emphasize that:

> Given the considerable overlap between autism and mental retardation including the differential diagnosis between the two disorders, there is further need to clearly differentiate the behavioral features in the two types of disorders. More specifically, the study of genotype-phenotype relations needs to separately consider those aspects that are clearly autism-related and those that deal primarily with mental retardation (pg. 215).

Since the disorders are so closely related, it is important that clinicians consider all facets of each of the disorders to ensure that the correct diagnoses are made.

Rett's disorder is characterized by the pattern of skill deficits observed in a child after birth and its characteristic sex ratio (DSM-IV-TR, APA, 2000). Rett's Disorder has only been diagnosed in females where autism occurs more recurrently in males (APA, 2000). The young females diagnosed with this disorder experience a deceleration in their head growth, loss of purposeful hand movements, which had been previously acquired and poor management of trunk

and gait movements (APA, 2000). In preschool children with this disorder may experience difficulties in social interactions just as children who have autism, however children with Rett's disorder tend to remain in this phase temporarily.

Childhood Disintegrative Disorder has a distinctive pattern of severe developmental deterioration in several areas of functioning following at least two years of normal development (DSM-IV-TR, APA, 2000). The DSM-IV-TR (APA, 2000) reports that autism differs from Childhood Disintegrative Disorder because the abnormalities in development of autistic children are usually noted within the first year of life. If information about a child's early development cannot be attained and if normal development of the child has not been properly noted, the diagnosis of autism should be made (DSM-IV-TR, APA, 2000).

Children who have autism may also be given an additional diagnosis of Schizophrenia. Schizophrenia differs from Autism because it usually develops after a child has had years of normal and healthy development rather than early stages of life (DSM-IV-TR, APA, 2000). An autistic person may in later stages of life be diagnosed with Schizophrenia if symptoms of hallucinations or overpowering delusions appear and last for at least one month (APA, 2000).

Children who have autism also have notable speech impairment. Though this may be the case, autism differs from the Pervasive Developmental Disorders which also share this characteristic. The DSM-IV-TR (APA, 2000) accounts that children with Selective Mutism differ from those with autism and can be found displaying appropriate communication skills in some contexts and also do not display a restricted pattern of behaviors and impaired social interactions. The same seems be true for children diagnosed with Expressive Language Disorder and Mixed Receptive-Expressive Language Disorder. Though these children display language impairment, this characteristic does not coexist with severe deficits in social interactions nor is it paired with restrictive, repetitive and stereotyped behaviors (APA, 2000).

The stereotyped movement of an individual is a marked behavioral characteristic of those with autism. Though these movements are characteristic, sometimes an additional diagnosis of Stereotypic Movement Disorder is warranted (DSM-IV-TR, APA, 2000). However the diagnosis of Stereotypic Movement Disorder is not given if the behaviors presented are better accounted for by the actual presence of autism (APA, 2000).

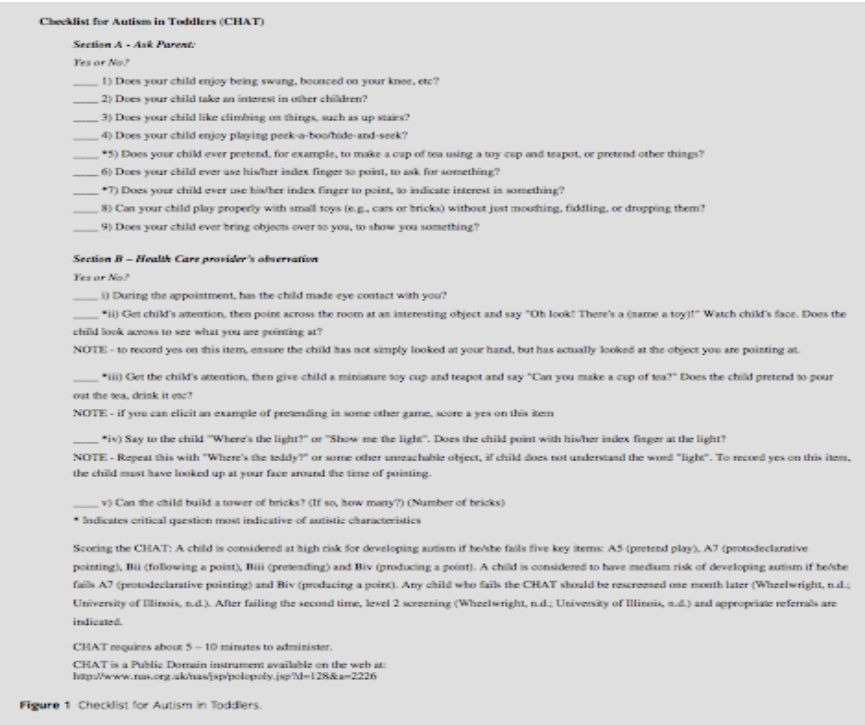
There have been other disorders which have been closely compared to autism due to the overlap in behaviors or because the disorder could be a possible addition to the autism diagnosis. According to Hurley and Pary (2002), it is believed that ten percent of individuals with Down Syndrome may also have autism. Even though this is the amount of those who have both of the disorders the studies are believed to be too small and sample sizes need to be larger (Hurley et. al., 2002).

There are several disorders in the DSM-IV-TR which are closely related to autism. These disorders share many similarities and it is important that the characteristics and behaviors are closely observed so that a correct diagnosis can be made. If clinicians are not attentive and educated on the similarities and differences of these disorders a child may not receive the proper services and may not be given the opportunity to find ways to cope with difficulties they may encounter.

Diagnosis, Screening Process and Early Detectors

There are several screeners which are used to effectively diagnose children with autism. Tests that are used include the Checklist for Autism in Toddlers (CHAT), Modified Checklist for Autism in Toddlers (M-CHAT), the Autism Diagnostic Observation Schedule (ADOS), the Diagnostic Interview Toddler Form (ADI-Toddler Form), the Autism Diagnostic Interview-Revised (ADI-R), the Childhood Autism Rating Scale (CARS), the Repetitive Behavior Scale Revised (RBS-R), Early Screening of Autistic Traits Questionnaire (ESAT), Social

Communication Questionnaire (SCQ), and finally clinical judgement. All of the listed scales are widely used by practitioners and clinicians and some are more reliable and better measures for particular populations of children who could possibly be diagnosed with autism.



Checklist for Autism in Toddlers (CHAT)

Section A - Ask Parent:

Yes or No?

____ 1) Does your child enjoy being swung, bounced on your knee, etc?
____ 2) Does your child take an interest in other children?
____ 3) Does your child like climbing on things, such as up stairs?
____ 4) Does your child enjoy playing peek-a-boo/hide-and-seek?
____ *5) Does your child ever pretend, for example, to make a cup of tea using a toy cup and teapot, or pretend other things?
____ 6) Does your child ever use his/her index finger to point, to ask for something?
____ *7) Does your child ever use his/her index finger to point, to indicate interest in something?
____ 8) Can your child play properly with small toys (e.g., cars or bricks) without just mouthing, fiddling, or dropping them?
____ 9) Does your child ever bring objects over to you, to show you something?

Section B – Health Care provider's observation

Yes or No?

____ i) During the appointment, has the child made eye contact with you?
____ *ii) Get child's attention, then point across the room at an interesting object and say "Oh look! There's a (name a toy)!" Watch child's face. Does the child look across to see what you are pointing at?
NOTE - to record yes on this item, ensure the child has not simply looked at your hand, but has actually looked at the object you are pointing at.

____ *iii) Get the child's attention, then give child a miniature toy cup and teapot and say "Can you make a cup of tea?" Does the child pretend to pour out the tea, drink it etc?
NOTE - if you can elicit an example of pretending in some other game, score a yes on this item

____ *iv) Say to the child "Where's the light?" or "Show me the light". Does the child point with his/her index finger at the light?
NOTE - Repeat this with "Where's the teddy?" or some other unreachable object, if child does not understand the word "light". To record yes on this item, the child must have looked up at your face around the time of pointing.

____ v) Can the child build a tower of bricks? (If so, how many?) (Number of bricks)
* Indicates critical question most indicative of autistic characteristics

Scoring the CHAT: A child is considered at high risk for developing autism if he/she fails five key items: A5 (pretend play), A7 (protodeclarative pointing), Bii (following a point), Biii (pretending) and Biv (producing a point). A child is considered to have medium risk of developing autism if he/she fails A7 (protodeclarative pointing) and Biv (producing a point). Any child who fails the CHAT should be rescreened one month later (Wheelwright, n.d.; University of Illinois, n.d.). After failing the second time, level 2 screening (Wheelwright, n.d.; University of Illinois, n.d.) and appropriate referrals are indicated.

CHAT requires about 5 – 10 minutes to administer.

CHAT is a Public Domain instrument available on the web at:
http://www.nas.org.uk/nas/jsp/polopoly.jsp?d=128&a=2226

Figure 1 Checklist for Autism in Toddlers.

One scale used to measure for and possibly lead to a diagnosis of autism is the Checklist for Autism in Toddlers (CHAT). This measure can be found on Figure One (Nadel and Poss, 2007). According to Chung, Hiu, Ho, Lee, Leung, and Wong (2004), the original version of CHAT was a simple screening tool used identification of autistic children at 18 months of age. The section A of the CHAT is a self-administered questionnaire for parents or a variety of

individuals, with nine yes or no questions which address several areas of development including rough and tumble play, social interest, motor development, social play, proto-imperative pointing, functional play and showing (Chung et. al., 2009; New York State Department of Health, 2005). The section B of the CHAT consists of five yes/no items, which are recorded by observations of a child made by general practitioner (Chung et. al., 2009). Items that are observed are gaze monitoring, the child's eye contact, pretend play, proto-declarative pointing and ability to make a tower of blocks.

Modified Checklist for Autism in Toddlers (M-CHAT)

Please fill out the following about how your child **usually** is. Please try to answer every question. If the behavior is rare (e.g., you've seen it once or twice), please answer as if the child does not do it.

1.	Does your child enjoy being swung, bounced on your knee, etc.?	Yes No
2.	Does your child take an interest in other children?	Yes No
3.	Does your child like climbing on things, such as up stairs?	Yes No
4.	Does your child enjoy playing peek-a-boo/hide-and-seek?	Yes No
5.	Does your child ever pretend, for example, to talk on the phone or take care of a doll or pretend other things?	Yes No
6.	Does your child ever use his index finger to point, to ask for something?	Yes No
7.	Does your child ever use his/her index finger to point, to indicate interest in something?	Yes No
8.	Can your child play properly with toys (e.g., cars or bricks) without just mouthing, fiddling, or dropping them?	Yes No
9.	Does your child ever bring objects over to you (parent) to show you something?	Yes No
10.	Does your child look you in the eye for more than a second or two?	Yes No
11.	Does your child ever seem oversensitive to noise? (e.g., plugging ears)	Yes No
12.	Does your child smile in response to your face or your smile?	Yes No
13.	Does your child imitate you? (e.g., you make a face-will your child imitate it?)	Yes No
14.	Does your child respond to his/her name when you call?	Yes No
15.	If you point at a toy across the room, does your child look at it?	Yes No
16.	Does your child walk?	Yes No
17.	Does your child look at things you are looking at?	Yes No
18.	Does your child make unusual finger movements near his/her face?	Yes No
19.	Does your child try to attract your attention to his/her own activity?	Yes No
20.	Have you ever wondered if your child is deaf?	Yes No
21.	Does your child understand what people say?	Yes No
22.	Does your child sometimes stare at nothing or wander with no purpose?	Yes No
23.	Does your child look at your face to check your reaction when faced with something unfamiliar?	Yes No

Have you ever filled out this form for this child before? Yes No

Scoring the M-CHAT: Either a) Any 3 items answered "no" or b) 2 out of 6 of the following items answered "no": 2 (interest in other children), 7 (proto-declarative pointing), 9 (bringing objects to show the parent), 13 (imitating), 14 (responding to name), and 15 (following a point) (Dumont-Mathieu & Fein, 2005).

M-CHAT requires about 5 – 10 minutes to administer.

M-CHAT is a Public Domain instrument and is available on the web at:
http://www.firstsigns.org/downloads/m-chat.PDF

Figure 2 Modified Checklist for Autism in Toddlers.

The Modified Checklist for Autism in Toddlers (M-CHAT) is a commonly used scale used to measure for a possible diagnosis of autism. This measure can be found in Figure 2 (Nadel and Poss, 2007). The checklist is a twenty-three question yes/no parent report checklist, which was designed to screen for autism in 16 to 30 month old children (Green, Pandey, Ventola, 2006). The initial failure of this screener is defined as any three items failed, or any two of the critical items failed (Green, 2006). Critical items are identified by discriminant functional analysis of children with and without a disorder on the autistic spectrum, including items such as joint attention, responding to name interest in other children and imitation (Green, 2006).

The Autism Diagnostic Observation Schedule (ADOS) is also an instrument used to assess children who possibly have autism. This is a standardized and semi-structured observational instrument, which is used to assess symptoms of autism in the areas of socialization, overall communication, toy play, stereotyped behaviors and restricted interests (Loveland, Shaw, Tomanik, 2006). These observations are made through a series of ten activities, which are designated to elicit certain behaviors (Loveland et. al., 2006). With this measure a child receives a score in the social domain, the communication domain, and the combined social and communication domains (Allen, Barton, Fein, Green, Kleinman, Pandey, Robins, Ventola, 2006). Classification for diagnosis is made by exceeding cutoff scores (2006). Depending on the scores that are exceeded a child may be classified as having Autistic Disorder, Autism-Spectrum Disorder or as not having autism (2006).

The Autism Diagnostic Interview which has both a revised and toddler form (ADI-R, ADI-Toddler Form) is also used as a measure to assess children who could possibly have autism. These measures are described as being semi-structured clinician-based parent report interviews that evaluate communication, play, social development and restricted, repetitive and stereotyped behavior (Allen et. al., 2006). The ADI-R is made up of 111 questions while the ADI-Toddler form consists of 123 questions. For both of the measures, the interviewer scores each question

with a zero to three based on how severe a behavior is, with zero being no atypical behavior of this type and three being very impaired or atypical behavior (2006). Both of the forms of this measure have the same scoring algorithm that is based on the DSM-IV and International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) criteria for autism though the ADI-Toddler Form have non algorithm items specifically designed for very young children (2006). The interviews for both editions yield separate scores for each of the three diagnostic domains (social interactions, communication and repetitive and stereotyped behaviors) (2006). In order to meet the diagnostic criteria for autism, the child must meet the scoring criteria in each of the three domains separately (2006). The ADI algorithm for both forms gives a classification of autism or no autism (2006).

The Childhood Autism Rating Scale (CARS) is made up of fifteen subscales (Allen et. al., 2006). For the purpose of this measure, the child is rated on each of the subscales based on the clinician's observation of the child's behavior though the duration of the testing and behavioral observation and the parent report may also be considered (2006). The CARS incorporates items measuring socialization, communication, emotional responses, and sensory sensitivities (2006). The clinician scores each of the fifteen items on a scale from zero to four, with zero meaning no impairment and four meaning severe impairment (2006). Based on the child's score on the fifteen items he or she could be classified with mild, moderate or severe autism, or no autism (2006).

The Repetitive Behavior Scale Revised (RBS-R) is primarily used to measure the variety of Restrictive Repetitive Behaviors (RRBs) observed in children with Autism Spectrum Disorders (Aman, Lam, 2006). The RBS-R has several subscales including stereotypic behavior, self-injurious behavior, compulsive behavior, ritualistic behavior, sameness behavior and restricted behavior (2006). This scale is composed of 43 items rated on a four point Likert Scale ranging from zero, behavior does not occurs, to four, behavior occurs and is a serious problem (2006).

Raters who complete the scale are asked to refer to the previous month when completing the scale (2006).

The Early Screening for Autistic Traits (ESAT) used to screen young children who usually fall between the ages of fourteen to fifteen months (Buitelaar, Groen, Jan van der Gaag, Swinkels, 2007). This measure is a fourteen-item questionnaire (Buitlaar, Daalen, Engeland, Swinkels, 2006). Guardians of the children are to complete the questionnaire (2006). The items on the questionnaire assess many important skills and behaviors of the child including pretend play, joint attention, interest in others, eye contact, verbal and nonverbal communication, stereotypes, preoccupation, sensory stimuli, emotional reaction, and social interaction (Buitelaar, 2007).

The Social Communication Questionnaire (SCQ), is a measure which is based on the ADI-R (Eaves, Ho & Wingert, 2006). The SCQ is a written questionnaire for the parents or caregivers of people of any age but has specific reference to behaviors which are displayed at age four to five (2006). According to the questionnaire, children who are under the age of four, their mental age should exceed two years (2006). Areas such as social smiling, interest in other children, offering comfort, gestures, conversation, stereotyped utterances, circumscribed interests and preoccupations (Buitelaar et. al., 2007). The questionnaire is made up of forty items, which correspond to the diagnosis of autism found in the Diagnostic and Statistical Manual (2006).

There are many measures and questionnaires that help care-givers and clinicians document observations and record behaviors that may help determine whether or not a child is truly autistic. According to Allen et. al. (2006), clinical judgment may be the most important factor for determining if a child may have autism. Infact, clinical judgment is the "gold standard" for autism diagnosis (Allen et. al., pg. 841).

Sensitivity and Specificity of Early Detectors of Autism

As mentioned before clinicians use and administer several measures that are used to help determine whether or not a child could possibly have autism. Though there is a wide array of these measures some are described as better than others with more sensitivity and specificity. This could possibly help indicate which measures are better to use.

The CHAT is an instrument which aids in possible early detection of autism in children at eighteen months (Buitelaar et. al., 2007). According to Buitelaar et. al. (2007), this instrument yields a yields a positive likelihood ratio of sixteen and any likelihood ratio over ten is considered to substantially improve the likelihood that a disorder is present. The CHAT yields a sensitivity score of 35% and a specificity score of 98%. It appears that though the test is more specific, it lacks sensitivity, which makes it less likely to help make a positive diagnosis of autism.

The M-CHAT is commonly used to help aid in the early detection in children from eighteen to thirty months (Eaves et. al., 2006). This measure was developed by using items from the CHAT and was expanded to a twenty three-item yes or no questionnaire, which is given to parents. To test the sensitivity of this measure, 1122 children and 171 children who had been referred for early intervention services between the ages of eighteen and twenty-four months were given the M-CHAT (Barton, Green, Fein, & Robins, 2001). If a child failed once, the questionnaire was re-administered and if it was failed again the child was fully assessed (Barton et. al., 2001). It was reported that of the fifty eight children who failed, thirty nine received the diagnosis of autism while the remaining nineteen were found to have developmental delay (2001). The M-CHAT has yielded the sensitivity and specificity of 0.97 and 0.95 for identifying autism within children based on three autism responses endorsed (Eaves et. al., 2006). This shows that the test may be excellent for aiding in possible detection of autism. However, it was also found that when the subjects were limited to only children ages four to six, the sensitivity and specificity were reported to be 0.92 and 0.27 on the second administration of the measure.

The ESTAT is regularly used to assist in the early detection of autism for children ages fourteen to fifteen months (Buitelaar et. al., 2007). According to Buitelaar et. al., (2007), this instrument yields a positive likelihood ratio of sixty seven and as stated before a likelihood ration of over ten is considered to substantially improve the likelihood that the disorder is present. The ESTAT yields a sensitivity of 23% and a specificity score of 99.7% (Buitelaar et. al., 2007). This measure has a better specificity score. Though it is highly specific, Buitelaar et. al., (2007), states that this measure has a high likelihood ratio which has a higher probability for detecting general developmental problems, instead of autism.

The SCQ is also used quite frequently to assist in the early detection of autism of young children. As mentioned before, though the instrument can be used for individuals of any age, it is specifically geared toward referencing behaviors at ages four to five (Eaves et. al., 2006). In an experiment conducted by Eaves et. al., (2006), the parents of 178 children, eighty four were two to three years old and ninety four were four to six years old, were given the SCQ. The sensitivity and specificity reported for this measure was 0.74 and 0.54 (Eaves et. al., 2006).

These measures, which are used the most, help clinicians make final diagnoses for autism. There are still some researchers that are skeptical of these measures. Pope (2007) states that current tools that assist in diagnosis lack sensitivity to correctly differentiate various types of autism. It is important that the most reliable measures are used to help arrive at the correct diagnosis or even a positive detection of a possible problem. Since most of the literature agrees that early detection is most desirable, it is important that these measures are utilized to ensure diagnoses are made correctly.

Early Detection of Autism: How Early is too Early?

Early detection of children who may have autism seems quite important. It may help the parents and clinicians better assist and understand the child, and furthermore, the child may

receive the help they may need to cope with the disorder and perhaps function as normal as possible as they grow and develop. Many researchers have argued that it is best to detect and treat autism earlier rather than later to not only ensure a child receives the help that they need early in their lives, but early detection could help educated the parents and care providers and equip them with the tools and knowledge of the disorder to be prepared to better assist their child. According to Coonrod, Pozdol, Stone & Turner (2004), early identification of children with autism has come to be recognized as a critical part of a child's medical treatment and management. It appears the earlier the child is diagnosed the more work can be done to assist the child in making critical life gains and may even allow clinicians the chance to individualize treatments for autistic children while finding and adjusting treatments to assist other autistic children who may share similar problems.

According to Arehart-Treichel (2007), there are two types of autism. One is the early onset type and a later onset regressive type (Arehart-Triechel, 2007). When infants display a limited level of complex babbling, word production, and declarative or definite pointing at rates much lower than those produced by normal developing children at one year of age, early onset of autism could be occurring or developing (Arehart-Triechel, 2007). When children display the latter type they behave normally in the first year of life, however by age two, they use fewer words, are less likely to respond to their own names and look at children less often than normal children (Arehart-Triechel, 2007).

Researchers have found it hard to agree on an exact age in which an autism diagnosis should be made. It seems that different questionable behavior rise in children in a range of ages. The American Academy of Pediatrics (AAP), implemented a policy and recommends that the surveillance for developmental disorders at all-well preventive care visits and a routine screening with a routine screening tool at the nine, eighteen and thirty-month visit, and screening with an autism specific screening tool should also be done at the eighteen month mark (Bryant et. al.,

2007). Bryant et. al. (2007), asserts that the screening using an autism specific screening tool should also be repeated at twenty four months just to ensure that the child is closely monitored. Screening past the twenty-four month point or waiting until a child can be screened in the educational setting can delay valuable treatments and interventions (2007). Bryant et. al. (2007), believe that although a screening early in a child's life may create a false sense of security for parents and clinicians, a follow up autism specific screening will help detect symptoms that were not apparent when the child was eighteen months or younger (2007). Several screenings at different point in the child's development could possibly lead to early autism detection and treatment implementation. Nadel and Poss (2007) report that a diagnosis of autism is normally not made until the child reaches ages three or four, even though 50% of parents suspect that there are problems rising in their child by the age of one and between 12% and 76 % of parents report that their children had symptoms of autism in their first year of life.

Though it is most desirable to detect and treat autistic children at the earliest possible age, it is not easy to be 100 % secure in an early diagnosis. Nadel and Poss (2007), emphasize that since there is no pathognomonic sign or laboratory test to detect autism, diagnosis during a routine primary care visit may be quite challenging. Researchers found that early detection of autism is definitely more difficult because symptoms during infancy may be harder to detect and may present themselves differently from manifestations of the disorder which are present in later stages of an autistic child's life (Nadel,Poss, 2007). According to Anderson, Gardenier, Geckeler, Green, Halcomb, MacDonald, Mansfiel and Sanchez (2007), the way in which data is collected to diagnose a child with autism must be analyzed in depth:

> We suggest that brief samples of stereotypic behavior obtained through continuous direct observational measurement are better than indirect, subjective measures such as caregiver reports, estimates derived from discontinuous measurement methods, or no measures at all (pg. 274).

According to Kraft (2007), it is no wonder why determining whether a young child us autistic is filled with uncertainty. Kraft (2007) goes on to say that the diagnosing process usually involves rating the child's behavior against a set of standards and it is quite hard to make this exercise conclusive until the child reaches their second birthday. Overall it appears that early diagnosis of children who could possibly have autism is the key to ensure that the child receives the early help and support that they need and to possibly help the children lead more normal and healthier lives in their futures.

Early identification of and good intervention for children who may have developmental problems is important and could help relieve stress for parents, care providers and teachers. This seems to be true for children who have autism because they gain better developmental results if interventions are implemented early. Pivalizza (2007) also supports this point of view and believes that it is most important that a diagnosis of autism is made early in a child's life, but it is also important that at the time of diagnosis autism specific intervention and programs need to be available and provided at the very young age level. Pivalizza (2007), goes on to say "lack of specific appropriate interventions would weaken efficacy of any screening program and specifically, efficacy early intervention for autism affected children" (pg. 1253). Nadel and Poss (2007) state, "early detection can empower families by reinforcing their stressful uncertainty about what is wrong with their children toward the active condition of finding out how to best care for their children" (pg. 409). The age for diagnosis of autism has decreased, however many children do not receive a definite diagnosis of autism until the age of three to four years or later (Bryant, Byers, Gupta, Hyman, Johnson, Kallen, Levy, Myers, Rosenblatt, Yeargin-Allsopp, 2007). This point is also supported by Nadig, Ozonoff, Young, Rozga, Sigman and Rogers 2007) who believe that though early diagnosis of autism is made at very young ages a true diagnosis of autism should not be made until the third or fourth year of life. According to Kraft (2007), the inability to detect Autism until a child reaches two or three years old is a disadvantage and

eliminates a valuable window of treatment opportunity when the brain is undergoing significant developments (2007).

Even though much of the research supports and prefers early diagnosis Ozonoff and Yirmiya (2007), believe that by identifying and labeling these children quite early, or before the age of two or three, clinicians are actually making decisions too before it is known whether the criteria is stable and meaningful. Retrospective reports made by parents may help alert clinicians that a child could possibly have autism but this data could be miscalculated and some of the early behaviors may not indicate an early onset of autism (Baranek, Bryson, Iverson, Kau, Klin, Landa, Lord, Rogers, Sigman, Stone, Thurm & Zwaigenbaum, (2007). When determining whether or not a child could be at high risk for having autism, Baranek et. al., makes suggestions so faulty diagnoses are avoided:

> General recommendations for the field with respect to high-risk research include the need to pay critical attention to methodological rigor as well as human subjects concerns and practicalities in engaging families in research, retaining their research participation, and ethically considering appropriate parental involvement and feedback (pg. 476).

It is important that the child is diagnosed correctly, so clinicians must ensure that they take into account all information and analyze it correctly. This seems to be especially true for clinicians who attempt to make a diagnosis of autism in the very early stages of a child's life. Researchers also believe that there are several ways to improve the chances of clinicians making informed and correct diagnosis for children who are believed to have autism. Baranek et. al. (2007) believes that clinicians should consider input from parents, make collaborations across research groups across research groups to gain an adequate sample for successful data analysis and include researchers form disciplines such as genetics, neurobiology, developmental psychology, and also

ethicists which could enhance the probability of researchers analyzing correct behaviors by way of observation and allow for a better understanding of the scientific background of the disorder.

Treatments for Autism (Overview of Different Treatments)

Since autism is such a complex disorder, it is important that the treatments are intricate enough to ensure that all symptoms and difficulties are addressed and all areas of the disorder are properly handled. For this reason, researchers have cited several different treatments that may work. It is possible that diverse application of treatments is used and since no autistic people are the same, it is possible that the treatments applied to one person may appear to be very different. According to Autism Speaks, Incorporated (2007, Treatments page), there are several top treatments for autism including Applied Behavior Analysis (ABA), Floortime Therapy, Gluten Free, Casein Free Diet (GFCF). Speech Therapy, Occupational Therapy, PECS, SCERTS, Sensory Integration Therapy, Relationship Development Intervention, Verbal Behavior Intervention, and the school-based TEAACH method.

Applied Behavioral Analysis (ABA) is a natural science of behavior which was first described by B.F. Skinner in the 1930's (Autism Speaks, Incorporated, 2007, para 1). Principles and methods used in ABA have been successfully applied in many areas (2007). ABA is a very intensive system of reward-based training that focuses on teaching particular skills and is the most effective treatment for autism to date (2007). ABA techniques are usually instructed by adults in a very structured manner while others may make use of the learner's natural interests and follow their initiations (2007). All steps to a particular skill are broken down into small steps and the learner is given several chances to learn a skill with positive reinforcement to follow properly executed skill (2007). No matter what the age of a learner with autism, ABA is used to help an autistic person function autonomously and effectively as possible in different environment (2007). These notions are further supported by a study conducted by Graupner and

Sallows (2005) where it was found that after two year of quite intensive behavioral treatment (two years at thirty eight hours per week), 48% of all children with autism in the study showed dramatic increases in cognitive and social skills and were able to succeed in regular education classes (2005). Ben-Itzchak and Zachor (2007), conducted a study, which focused on the impact of specific cognitive, social and communication characteristics of children with autism at diagnosis on their developmental outcome, while other variable such as age at start of therapy, type of intervention, and the intensity of the behavioral treatment were controlled. The behavioral domains and cognitive abilities of the children were measured before and after a year of intense behavioral treatment (2007). The findings showed that after intervention, the children made remarkable progress in cognitive growth and several of the developmental domains (2007). In their study, Eldevik, Eikseth, Jahr, and Smith (2007) also found that children who began intensive behavioral treatments at four years by the age of seven years had made significant cognitive and behavioral gains. These researchers concluded that ABA interventions can begin at most any age and still prove to be quite effective for people with autism (Eldevik et. al., 2007).

The treatment Floortime Therapy is also a very popular treatment for autism (Autism Speaks, Incorporated, 2007). The main purpose of this treatment is to move the child through the six basic developmental milestones that are o be mastered for both emotional and intellectual growth:

> Greenspan describes the six rungs on the developmental ladder as: self regulation and interest in the world; intimacy or a special love for the world of human relations; toe-way communication; complex communication; emotional ideas; and emotional thinking (Autism Speaks, Incorporated, 2007, para. 4).

A child with autism finds it quite difficult to naturally achieve these milestones as a result of processing difficulties, sensory over or under reactions, and poor control of their physical

responses (2007). During this treatment the parent is to involve the child at a level the child enjoys and enters the child's activity all while following their lead (2007). This process is believed to help lead the child to an increasing amount of complex interactions (2007). This treatment does not focus on speech, motor, or cognitive skills but places emphasis on emotional development (2007).

The next most popular treatment for autism is a Gluten Free, Casein Free Diet (GFCF) (Autism Speaks, Incorporated, 2007, para. 6). Many of those who care have taken great interests in the nutritional changes and interventions that could possibly help some children's symptoms (2007). The effectiveness of the GFCF diet has yet to be proven by any scientific studies though studies are currently being conducted (2007). Though the benefits of this diet have not been proven, many families testify that this dietary change helps regulate bowel habits, sleep, overall activity, habitual behavior and the complete progress of their child (2007). This diet is quite strict to follow and it is recommended that a dietician is consulted to ensure the diet is balanced (2007).

Occupational Therapy is one of the most widely used treatments for children with autism (Autism Speaks, Incorporated, 2007, para. 8). This type of therapy can benefit people with autism by attempting to improve the overall quality of life of the individual (2007). The ultimate goal of this therapy is to assist in maintaining, improving and introducing the daily living skills (2007). These basic skills include coping skills, fine motor skills, play skills, self help skills and socialization skills (2007). Occupational therapy methods help assist a person with autism in home and school settings by teaching activities such as dressing, toilet training, social skills, feeding as well as better develop of fine motor, gross motor and visual perceptual skills (2007). Occupational therapy is a collaborative effort made by medical and educational professionals, parents and family (2007). With this effort a child with autism may begin to gain skills in appropriate social, play and learning skills which are needed for successful functioning in daily life (2007).

Social Skills Therapy (SST) is a widely used treatment for autism. According to Matson, Matson and Rivet (2007), SST is defined as interpersonal responses with specific operational definitions that allow the child to adapt to their environment through both verbal and non-verbal communication (Matson et. al., 2007). This treatment has been implemented because most autistic children need help building skills they need to hold a conversation and connect with people (2007). Practitioners may implement treatments such as peer-based social interactions, which include targeting skills such as eye contact, appropriate content of speech, words spoken, appropriate facial affect, appropriate motor movements, verbal disruptions, unpleasant demeanor, conversational speech, and overall rating of social skills proficiency (2007).

Picture Exchange Communication (PECS) is a visually based therapy which is an alternative communication technique where people with little or no verbal capabilities learn to communicate using picture cards (Autism Speaks, Incorporated, 2007, para. 11). Using pictures from a specialized book, newspaper or magazine, children with autism can utilize pictures to assist in vocalizing what they want (2007). It is believed that since many people with autism learn visually, this type of communication technique has been shown to be effective in improving independent communication skills, which in some cases has lead to spoken language (2007).

Relationship Development Intervention (RDI) is a developmental therapy which focuses on improving the long term quality of life for individuals with autism (Autism Speaks, Incorporated, 2007, para. 14). RDI therapy is parent-based and the main focus is on gaining friendships, expressing love, feeling empathy, while gaining the ability to share experiences with others (2007). This therapy is based on enhancing what researchers refer to as the six abilities of dynamic intelligence (2007). These abilities include emotional referencing, social coordination, declarative language, flexible thinking, relational information processing and foresight and hindsight (2007). It is believed that with the improvement of these six abilities, a child with autism can begin to live a more normal life (2007).

The SCERTS model or Social Communication and Emotional Regulation and implementing Transactional Supports was developed for both children and older individuals with autism and their families (Autism Speaks, Incorporated, 2007, para. 16). This treatment is considered multidisciplinary, comprehensive and team based (2007). The main goal of this treatment is to help those with autism achieve progress and learn and apply functional skills in a variety of settings (2007). This model paces a great emphasis on child initiation in both semi-structured and natural activities (2007). Those who have developed this treatment make the claim that it goes above and beyond the goals of Applied Behavioral Analysis, and it is based on better developing those skills that people with autism have difficulty in a manner similar to RDI and Floortime (2007).

Sensory Integration Therapy (SIT) is a treatment which is used to facilitate the development of the nervous system's ability to process sensory input in a more normal way (Autism Speaks, Incorporated, 2007, para. 19). This is because children with autism often display difficulty with sensory integration (Sensory Integration Dysfunction), which is the process through which the brain organizes and interprets external stimuli which includes movement, smell, touch, sight and sound (2007). This therapy is taught by occupational and physical therapists and it is believed that it does not teach higher levels of skills, but does improve the sensory processing abilities which allow the child to obtain these skills (2007).

Another popular treatment of autism is speech therapy. This therapy is quite important because most people with autism have problems with speech and language acquisition (Autism Speaks, Incorporated, 2007, para. 23). Some people with autism can speak well and others are non-verbal or have very poor speech (2007). The therapy is not just centered on articulation issues or grammar but to speech pragmatics, which is the use of speech to build social relationships (2007). This treatment is one of the best and works well when teachers, practitioners and parents work together to ensure the child works towards specific goals in

regards to their speech (2007). This treatment may also prove useful to help allow children with autism express what they need and how they feel. This method may also prove successful in helping the child release their frustrations. According to Thorne (2007), since autistic children can't speak to express themselves, tantrums may be their alternative measure because it may be the only way they feel they can communicate their desires or unhappiness (Thorne, 2007).

The last of the most popular treatments of autism is Pharmacotherapy. According to Handen and Lubetsky (2005), the use of psychotropic medication as a primary treatment intervention or even as a supplement for non-pharmacological treatment has been widely used among children with autism. Even though none of the medications prescribed for people who are autistic address the core features of the disorder, psychotropic medications are used to treat specific behavioral and/or psychiatric symptoms (Handen & Lubetsky, 2005). There is still a large gap in the literature describing the efficacy and safety of the use of medications on young children with autism (2005). As a result, the current prescribing practices are based on the literature that describes the success of the use of medication on individuals with mental retardation and general studies on uses of medication on children and adolescents (2005). Medications used for children with autism include psycho-stimulants, antidepressants, antipsychotics, and mood stabilizers among others (2005).

There are several treatment options for children with autism. It appears that the type of therapy chosen coincides with the activity level, attitude and behavior of the child. Other treatments include facilitated communication treatments, TEACCH (Training and Education of Autistic and Related Communication Handicapped Children), verbal behavior intervention, holding therapy and auditory integration therapy (Autism Speaks, Incorporated, 2007). Upon analysis of the literature, Applied Behavioral Analysis is the most successful at offering autistic children strict schedules of reinforcements while working towards a way to control unwanted behaviors and increasing the likelihood of more desirable behaviors (Autism Speaks,

Incorporated, 2007). These methods rather combined or alone could lead to a better life for children who have autism.

Highly Used Treatment (Sensory Integrative Therapy)

As described in the previous section of treatments, practitioners use Sensory Integrative Therapy (SIT) quite often when treating children with autism. SIT was a treatment that was originally intended to be used as a treatment for children with cerebral palsy, however, its use has spread to different populations (Clark and Shuer, 1978). According to Clark and Shuer (1978), Sensory Integration was originally considered the organization and interpretation of sensory stimuli for and adaptive response. Clark and Shuer (1978) asserted that the first part of this definition refers to the translation of stimuli into meaningful perceptions including sensory judgments, while the later part of it refers links perception to adaptation. In the past it was believed that the concept of Sensory Integrative Theory and Sensory Integrative Therapy must be viewed as separate entities (Clark and Shuer, 1978). When separating the definition of Sensory Integration Theory and Sensory Integrative Therapy, Clark and Shuer (1978) find:

> The term sensory integrative "theory" must be distinguished from the term, sensory integrative "therapy." While the former refers to selected functioning, the later refers to selected concepts and principles of central nervous system functioning. Sensory integrative theory constitutes more of a pure than an applied science, whereas the opposite hold for sensory integrative therapy (p. 227).

It seems most important that one is able to separate the two to gain the true understanding of the goals and aims of Sensory Integrative Therapy (SIT).

According to the Association for Science in Autism Treatment (2008), SIT can be most thoroughly described as an intervention where the participants receive sensory stimulation with an overall goal of improving attention and cognitive functioning, while decreasing any disruptive

or repetitive behaviors. Association for Science in Autism Treatment (2008) goes into great depth describing the different types of this treatment:

> Examples include brushing the body, compressing the elbows and knees, swinging from a hammock suspended from a ceiling, and spinning around and around on a scooter board. Examples of sensory diet interventions include wearing a weighted vest or wristbands, putting a body sock on the participant, or massaging the child's mouth or other body parts. Sensory Integrative Therapy is often supervised by an occupational therapist (para. 1).

SIT appears to be a multifaceted approach to treating children who have autism. In their definition, practitioners and specialists Laurel, Trott and Windek (1993), describe Sensory Integration as a process in which humans develop a preference for particular things because specific kinds of sensory input, including activities, sounds, textures, and even foods have helped us respond appropriately in a given situation. According to Coster and Cross (1997), when looking at the goals of Sensory Integrative Treatment it proposes to counter this sensory processing difficulty and also improve sensory integration by providing some controlled sensory experiences within the context of a meaningful activity that will assist in eliciting adaptive behaviors.

Researchers Heflin and Simpson (1998), simply described SIT as the organization and processing of sensory information for specific functional use. Through their scope of research, SIT offers practitioners a unique strategy for looking at and intervening with children and youth with autism (Heflin and Simpson, 1998). Furthermore, the foundations of SIT assert that the aberrant behavior of those with autism is an attempt to gain an internal state of equilibrium (1998). Therefore many practitioners such as occupational therapists who work with children who have autism will proclaim that their behaviors are an attempt to seek preferred stimuli and

also to seek other types of sensation, which will help create nervous system homeostasis (1998). Therefore according to Heflin and Simpson (1998), professionals in accordance with this theoretical framework who base their interventions on this theory, perceive atypical responses as having a specific sensory function.

Though SIT has been viewed by many practitioners as effective and useful for treating individuals with autism, the effectiveness of this treatment is still unknown. According to the Association for Science in Autism Treatment (2008), even though SIT has been a quite popular intervention for individuals with autism since the 1970's, there exist so few studies that conclusions cannot be drawn. Since there is a gap in the literature, more evidence supporting the treatment effectiveness of SIT must be collected. Comparisons of SIT and other popular and highly used forms of treatment should be compared. In a single case design researchers Dura, Hammer and Mulick (1988), who sought to find if self injurious behaviors could be reduced by SIT in a 15-year old boy, it was found that the results were inconclusive and that the treatment was not effective in relieving all of the behaviors. Dura et. al. (1998), concluded that SIT should be demonstrated as being effective with a specific individual before it is implemented to reduce any specific behaviors.

Weighted Vests

There are different ways in which practitioners may implement the use of SIT. One such method is the use of weighted vests. According to Morrison (2007) an occupational therapist, the use of the weighted vest is based on the sensory integrative framework of reference. Morrison (2007) states the believed benefits of the use of weighted vests for children who have autism, "It is argued that the weight in the vest provides proprioception (deep pressure), which provides calming input to the central nervous system by promoting the production neurotransmitters such as serotonin and dopamine" (p. 323). Morrison (2007), reported that over 82% of school-based

occupational therapists report using weighted vests with students. These same therapists also reported seeing benefits in the areas of calming, increased attention to task, and a decrease in self-stimulatory behaviors (2007). Morrison (2007) also reported that most occupational therapists report using the sensory integrative framework and specifically the proprioceptive input as a part of the intervention. Occupational therapists have been found to utilize the weighted vests the most with children who have specific developmental disorders. These vests can be used for different purposes and can be specifically used, "To support the everyday classroom functioning of children and adolescents with a range of developmental disorders" (Moulton and Olson, 2004, p. 53). Moulton and Olson (2004) provide a thorough definition of the weighted vest: "A weighted vest is a vest that typically has up to 10% of a person's body weight evenly distributed around the vest" (p. 53). Moulton and Olson (2004) site several reasons why weighted vests may be utilized and for what specific situations:

> Within the guidelines of the Sensory Integrative Frame of Reference, children's over-sensitivity to everyday sensory input may result in behavioral difficulties such as inattention to task, hyperactivity, agitation, or stereotypic behavior such as rocking or flapping. Other children may exhibit under-responsiveness to sensory input and therefore be less aware of their body in space and may exhibit clumsy or awkward movement (p. 53).

It appears that the use of weighted vests is expected to reduce many of the unwanted stereotyped behaviors that may be exhibited by children who have autism. Dearborn, Kane, Luiselli and Young (2005), reported on studies that found that children who received deep pressure from an apparatus such as a "hug machine" reduced tension and anxiety when compared with a control group.

Results Reported on the Use of the Weighted Vest

There is not a strong literature base to support the use and effectiveness of weighted vests, a specific type of SIT. Therefore many of the studies found include data that does not specifically support their usefulness. Many of the results reported are inconclusive or the treatment only seemed worked for very few participants in each study. Furthermore, many of the studies were based on surveys in which occupational therapists would report whether they felt weighted vests worked to suppress certain behaviors or whether or not they felt completely competent in the area of utilizing weighted vests for clients.

As stated before, there have been several different results reported in studies that have used weighted vests to reduce stereotyped behaviors in subjects. In the study entitled *Use of Weighted Vests in Pediatric Occupational Therapy Practice,* researchers Moulton and Olson (2004) used a Total Design Method and mailed out questionnaires to 514 randomly chosen occupational therapists with different years of experience to report how well they felt that weighted vests increased positive behaviors such as staying on task, eye contact, language, staying in seat, attention span and following direction or whether it relieved negative stereotyped behaviors such as rocking, activity level, hitting and flapping. The results of the surveys was that there was an agreement in this nationwide sample of pediatric occupational therapists that certain positive behaviors, specifically staying on task, staying in seat and a greater attention span all increased when the weighted vests were utilized (Moulton and Olson, 2004). Moulton and Olson (2004) also reported that some negative behaviors such as rocking and high activity levels decreased when weighted vests were on. However, the researchers reported that more research must be done to directly determine if the treatment will work while controlling intervening variables as well as discovering error (Moulton and Olson, 2004). Furthermore, the researchers reported that in the use of weighted vests there is not a widely accepted, standardized protocol for the duration of wearing a weighted vest or for the amount of weight that should be included (Moulton and Olson, 2004). In the follow-up study to the previous study conducted by the same

researchers, Moulton and Olson (2004), a convenience sample of 51 occupational therapists were given a 21-question survey which asked about the use of weighted vests on children diagnosed with a developmental disorder. In this particular study, the occupational therapists reported that weighted vests are quite useful for children on the autistic spectrum, and the vests were recommended for calming children and also to increase their ability to attend to activities (Moulton and Olson, 2004). In another similar study conducted by Morrison (2007), *A Review of Research on the Used of Weighted Vests with Children on the Autism Spectrum,* Morrison reported on the findings of several studies that surveyed occupational therapists to find out how effective they felt they were. Once again, it was a general consensus of the 5 studies reviewed by Morrison (2007) that occupational therapists reported regular use of weighted vests and found them quite beneficial. Morrison (2007) cautioned against practitioners taking this information for full face value and more clinical studies need to be conducted to provide solid proof of the effectiveness of the use of weighted vests.

There have also been other studies with the focus of proving or disproving the effectiveness of weighted vest for the reduction of stereotyped behaviors in children who have autism. In a single case study conducted by Dearborn, Kane, Luiselli and Young (2005) on 4 children ages 8-11 weighted vests were used to compare the amount of stereotypic behaviors in 3 conditions including baseline, weighted vest and no weighted vest (alternating treatments). The behaviors were stereotypic and were defined as: Repetitive, invariant, and perseverative motor responses, which interfered with instruction and were targeted for behavior reduction in their individualized education programs (Dearborn, Kane, Luiselli and Young, 2005). All participants' behaviors were measured during 10-minute sessions with the implementation of each condition (Dearborn, Kane, Luiselli and Young, 2005). The results of the study did not support the wearing of weighted vests as an effective intervention to reduce stereotypy and increase attention to task of children with autism (2005). Dearborn et. al. (2005) concluded:

> At this stage of intervention research dissemination, it appears that proponents of SIT have the burden of providing convincing efficacy data, supporting both the theory of neurodevelopmental functioning and in the case of wearing a weighted vests specific therapeutic techniques (p.24).

In a study conducted by Deris, DiCarlo, Hagelman and Schilling (2006), they wanted to assess the effects of a weighted vest compared to a pressure vest on increasing attention and decreasing self-stimulatory behaviors. Deris et. al. (2006) utilized a single case design, specifically alternating treatment of different vests (weighted or pressure vest). The child selected for the study was to wear the vests for 15 minutes at a time (Deris et. al., 2006). In the case of this child the researchers concluded that neither the use of the weighted nor pressure vests helped to increase attention to task or to reduce self-stimulatory behaviors (Deris et. al., 2006).

Though it seems that many professionals report that Sensory Integrative Therapy is a valuable tool in treating children with autism, many of the studies behind it are inconclusive and do not prove its effectiveness in reduction of stereotypic and self-stimulatory behaviors. This means that professionals should review the treatment and ensure that it fits within the scope of best practice when treating children from this population. Any treatment that does not have strong research behind it to support its use should be used with caution. According to the Association of Science in Autism Treatment (2008):

> An important area for future research is to evaluate Sensory Integration in studies with strong experimental designs. Professionals should present Sensory Integration as untested and encourage families who are considering this intervention to evaluate it carefully (para 3).

Experimental designs should be utilized to determine the effectiveness of this treatment so that its use can be supported.

Highly Used Treatment (Applied Behavioral Analysis)

As mentioned earlier in the literature Applied Behavioral Analysis (ABA) has been deemed the most successful at offering autistic children strict schedules of reinforcements while working towards a way to control unwanted behaviors and increasing the likelihood of more desirable behaviors (Autism Speaks, Incorporated, 2007). According to Cooper, Heward and Heron (2007) ABA is many tactics which are derived from the principles of behavior and are applied to improve socially significant behaviors and with this method experimentation is used to identify the variables that are responsible for an improvement in behavior. With this definition, it may be asserted that ABA is quite a structured treatment. Simpson and Heflin (1999), report that ABA grew out of earlier work for behavior modification. Schoen (2003) thoroughly outlined the process of ABA when used as a treatment:

> The process of applied behavioral analysis is very systematic. Children are first individually analyzed to assess the behavior that needs to be altered. Once the behavior is identified, intervention strategies are determined to suit the situation and them used to modify the behavior. During this time, the instructor provides reinforcement to elicit and maintain the desired behavior. Evaluations are made throughout the modification process to assess the effectiveness of the intervention. When an intervention is found to be ineffective, another strategy is substituted (p. 127).

This type of treatment appears versatile and quite helpful for the population of children with autism.

ABA has in many cases been utilized to inform treatment and determine a route for instruction. Heflin and Simpson (1999) assert that after a child is analyzed to determine any skills they are lacking and the function of their behaviors, systematic teaching and intervention methods are used to train students to independently display desired responses. This notion is

supported by Cooper, Heron and Heward (2007) who found that the *applied* in ABA signals the overall goal of ABA is to affect improvements in behaviors that enhance and improve people's lives. The *behavioral* in ABA signifies that those who analyze the key behaviors that may need change focus on studies of the behavior and not studies merely about the behavior (Cooper et. al., 2007). The *analysis* or analytic goal of ABA is that the experimenter, or the person treating the child must be able to control the occurrence of and nonoccurrence of the behavior (Cooper et. al., 2007). A practitioner must choose the behaviors to change that are socially significant for participants which include social, language, academic, daily living, self-care, vocalization, and recreation and any leisure behaviors that improve the day-to-day life experience of the participants and affect their significant others (parents, teachers etc.), in a way that they begin to believe more positively with and towards that participant (Cooper et. al., 2007). ABA appears to be a very effective way to lower socially unacceptable behaviors, which could include some of the stereotyped, repetitive and self-stimulatory behaviors displayed by children who have autism.

Specific ABA Treatments for Children with Autism

There are many ways in which pratitioners of ABA seek to improve the behaviors of children who have autism. According to the Association for Science in Autism Treatment (2008), analysts use techniques of ABA to improve socially important behavior by way of interventions that are based on principles of learning theories that have been evaluated in experiments, which used only reliable and objective measurement. The Association for Science in Autism Treatment (2008) lists several ways in which ABA methods are used and specifically intended to support persons with autism spectrum disorders in many ways:

> To increase behaviors (e.g. to increase on-task behavior, or social interactions), and to teach new skills (e.g., life skills, communication skills, or social skills). To maintain behaviors (e.g., self control and self monitoring procedures to maintain and generalize

> job-related social skills). To generalize or to transfer behavior from one situation or response to another (e.g., from completing assignments in the resource room to performing as well in the mainstream classroom). To restrict or narrow conditions under which interfering behaviors occur (e.g., modifying the learning environment), and to reduce interfering behaviors (e.g., self injury or stereotypy) (Association for Science in Autism Treatment Applied Behavioral Analysis Page, para 2).

These are all important factors to consider when reducing unwanted behaviors in a child who has autism, more specifically stereotyped behaviors.

Treatments utilizing ABA and behavioral reduction procedures employ several techniques for different situations and specific behaviors. One such methods or technique is the use of differential reinforcement. According to Cooper, Heron and Heward (2007), differential reinforcement is simply a procedure which entails the reinforcing one response class of behaviors and withholding reinforcement for another response class. When a practitioner seeks to utilize such a procedure differential reinforcement consists of two main components: (a) providing reinforcement contingent on either the occurrence of a behavior other than the problem behavior or the problem behavior occurring at a reduced rate, and (b) withholding reinforcement as much as possible for the problem behavior (Cooper et. al., 2007). This procedure is widely used to reduce problem behaviors. The most researched variations of this technique for decreasing inappropriate behaviors are differential reinforcement of incompatible behaviors (DRI), differential reinforcement of alternative behaviors (DRA), differential reinforcement of other behaviors (DRO) and differential reinforcement of low rates (DRL) (Cooper et. al., 2007).

The techniques differential reinforcement of incompatible behaviors (DRI) and differential reinforcement of alternative behaviors (DRA) both have the dual effects of weakening the problem behavior while simultaneously strengthening those acceptable behaviors that are

incompatible with or must be alternative to the targeted problem behaviors (Cooper, Heron and Heward, 2007). DRI and DRA, when used to reduce problem behaviors, can be conceptualized as a schedule of reinforcement where two concurrent operants, the inappropriate behavior targeted for reduction and the appropriate behavior selected, receive reinforcements at different rates (Cooper et. al., 2007). If the proper behaviors are selected these two interventions may promote educational, social, and personal skill deficits (Cooper et. al., 2007). With these techniques the practitioner is able to control the development of appropriate behaviors while concurrently measuring both the problem behavior as well as the desired replacement behavior (Cooper et. al., 2007). These have been described as the easiest of the four differential reinforcement procedures to apply (Cooper et. al, 2007).

A practitioner who decides to apply the differential reinforcement of incompatible behavior (DRI) would reinforce a behavior that cannot occur at the same time with the problem behavior and withholds reinforcement following an occurrence of an unwanted behavior (Cooper et. al, 2007). The behavior that gets reinforcement and the problem behavior that is placed on extinction are responses that are topographically impossible to perform at the same time (Cooper et. al, 2007). DRI seems to help a practitioner completely eliminate and replace an unwanted behavior.

In the use of differential reinforcement of alternative behaviors (DRA) a practitioner reinforces occurrences of a behavior that provides a desirable alternative to the problem behavior but is not necessarily incompatible with it (Cooper et. al, 2007). A behavior analyst could utilize an alternative behavior to occupy the time that the behavior might ordinarily occur however the behaviors are not topographically incompatible (Cooper et. al, 2007). A practitioner would hope to reduce an unwanted behavior and decrease its occurrence by replacing it with another behavior to occur at that time.

The technique differential reinforcement of other behaviors (DRO) is used by delivering a reinforcer whenever a problem behavior has not occurred during or at specific times (Cooper et. al, 2007). Reinforcement in this case is contingent upon the absence or the complete removal of a target behavior and is sometimes referred to differential reinforcement or omission training (Cooper et. al, 2007). A practitioner would determine how the reinforcement will be delivered by a DRO by the combination of how exactly the omission requirement is implemented and scheduled (Cooper et. al, 2007). This requirement can make reinforcement contingent upon the problem behavior not occurring either throughout an entire interval of time (interval DRO) or at a specific moment in time (momentary DRO) (Cooper et. al, 2007). With an interval DRO reinforcement is only delivered if no occurrences of problem behavior was observed during the entire interval (Cooper et. al, 2007). If the behavior occurs the entire interval is reset, which postpones the reinforcement (Cooper et. al, 2007). It can be determined if an omission requirement (at the ends of the intervals or at specific moments) has been met through a fixed or variable schedule (Cooper et. al, 2007). In the case of a momentary DRO procedure, reinforcement is contingent upon the absence of a problem behavior at very specific points in time (Cooper et. al, 2007). Practitioners often utilize the interval DRO more than the momentary DRO because interval DRO seems to be more effective at helping to suppress or eliminate some pressing problem behaviors.

Finally, a practitioner may also employ the use of the technique differential reinforcement of low rates of responding (DRL) (Cooper et. al, 2007). DRL is a procedure in which reinforcement is applied as an intervention to reduce the occurrences of a target behavior (Cooper et. al, 2007). A practitioner would specifically use this technique to decrease the overall rate of a behavior that occurs too frequently but not to completely eliminate the behavior (Cooper et. al, 2007). There is full session DRL, interval DRL and spaced responding DRL. In the use of the full session DRL schedule of reinforcement is delivered at the end of an instructional of

treatment session if during that entire session the behavior occurred at or below the predetermined number for criterion (Cooper et. al, 2007). However if the responses exceed the criteria the reinforcement is withheld (Cooper et. al, 2007). In the use of the interval DRL a practitioner would divide a total session into a series of equal intervals of time and would give reinforcement at the end of each interval where the number of occurrences of the behavior during the specific interval is either at or below a criterion limit (Cooper et. al, 2007). If the learner exceeds the criterion number of responses during that time interval the practitioner will remove the chance to gain reinforcement and starts a new interval (Cooper et. al, 2007). The last of the DRL schedules is the spaced responding DRL. With this procedure the practitioner delivers a reinforcer following the occurrence of a response that is separated by at least a minimum amount of time from the previous response. All of these techniques are ways to lower the amount of an unwanted behavior.

Results Reported on the Use of Applied Behavioral Analysis (Differential Reinforcement)

There have been several studies that have utilized Applied Behavioral Analysis to treat children who have autism. Many of these treatments are highly structured and appear to assist the child in reducing stereotyped behaviors as well as increasing more wanted behaviors. This treatment continues to grow and seems to offer practitioners many ways to effectively treat children who have autism.

There have been many studies that have sought to reduce the frequency and intensity of stereotyped and other unwanted behaviors in children who have autism with the use of Applied Behavioral Analysis, specifically differential reinforcement schedules. According to Beretvas, Lancioni, Machalicek, O'Reilly and Sigafoos (2006), differential reinforcement schedules had been most often utilized to treat stereotyped behaviors in children with autism. In a study conducted by Andelman, Barreto, Reed, Ringdahl and Wacker (2005), the researchers found that

a differential negative reinforcement of alternative behaviors proved to work well in lowering aggressive and destructive behaviors in two young boys with autism. More specifically, the researchers found that when a fixed time escape reinforcement schedule is paired with a differential reinforcement of alternative behaviors schedule of negative reinforcement, they produce similar positive effects on maintaining behaviors just as positive reinforcement (Andelman, Barreto, Reed, Ringdahl and Wacker, 2005). Researchers Falcomata, Fisher, Pabico, Roanne and Sgro (2004), utilized a differential reinforcement of alternative behaviors schedule in order to reduce aggressive behaviors in two young boys diagnosed with autism. The behaviors that the particular schedule helped to reduce were described as aggressive and specifically hitting, slapping, sitting on a therapist for boy one and pinching, biting and grabbing the therapist (Falcomata, Fisher, Pabico, Roanne and Sgro, 2004).

Some researchers have sought to reduce the frequency of aggressive behaviors in children who have autism with the use of differential reinforcemnt schedules. In a study conducted by Boisjoli, Gonzalez, LoVullo, and Matso (2008), the researchers developed and implemented a behavioral treatment for an 11-year old girl with autism and aggressive behaviors. Boisioli et. al. (2008) utilized a differential reinforcement of other behaviors (DRO) schedule while also using compliance training extinction, and functional communication as primary intervention strategies. The specific behaviors that the researchers wanted to lower the frequency of were pinching, screaming, head butting, hitting, slapping, kicking, and biting (Boisioli et. al., 2008). After treatment had been implemented for seven weeks, the researchers found that the behaviors that the young girl exhibited reduced significantly (Boisioli et. al., 2008). In fact, according to those who implement the DRO schedule consistently, the young girl earned reinforcement for 90% of the intervals per day (Boisioli et. al., 2008).

Researchers Buckley and Nechok (2005) utilized methods of differential reinforcement in order to reduce unwanted and abnormal eating behaviors in a 9-year old girl with autism. The

child presented problems in eating different foods and would pack, or store foods in her mouth that she didn't prefer to eat (Buckley and Nechok, 2005). The goal of the researchers was to increase the different types of food that the child ate and to help ensure that she would not pack the food in her mouth, but completely eat it as she was supposed to. In order to reduce the amount of packing the researcher utilized a differential reinforcement schedule and response cost along with simultaneous presentation or following the unwanted food with a desired food (Buckley and Nechok, 2005). According to the researchers results, the use of the differential reinforcement with response cost and simultaneous presentation lowered the amount packing behavior from baseline (Buckley and Nechok, 2005).

Children with autism also present difficulty with communication and vocal stereotypy. Some researchers have utilized differential reinforcement schedules in order to treat abnormal vocal outbursts. Researchers Hoch, Taylor and Weissman (2005), compared 2 types of differential reinforcement for the purpose of lowering occurrences of vocal stereotypy, fixed time schedule of reinforcement (FT) and differential reinforcement of the non-occurrence of a behavior (DRO) (Hoch, Taylor and Weissman, 2005). The researchers found that the FT schedule yielded no effect while the DRO schedule led to a reduction in the target behavior during treatment sessions and even across the child's school day. Researchers Jawor, McComas and Lee (2002), utilized a differential reinforcement schedule of alternative behaviors (DRA), paired with a differential lag reinforcement schedule (LAG) in order to increase the amount of vocal responding for 3 young males with autism (Jawor, McComas and Lee, 2005). The results revealed that when LAG was added to the DRA during intervention that appropriate verbal responding increased for 2 of the 3 participants in the study (Jawor, McComas and Lee, 2005).

Applied Behavioral Analysis appears to be a highly utilized and sought treatment. Such a treatment has an effect on many different types of behaviors displayed by children who have autism. These treatments may be used to increase wanted behaviors and decrease unwanted

behaviors through the use of such schedules as differential reinforcement. Since this treatment has yielded favorable results in many studies, it is important that more studies are conducted to ensure the treatment is effective in even more variable settings and situations. Although this treatment has been successful, according to Schoen (2003), it is important to remember that there is no treatment that completely addresses all the needs of a person who has autism.

Evaluation Process for Autism (Study Designs)

There are several different methods and designs that researchers have used to study the effects of the treatments of children who have autism. More specifically there have been different methods reported for the comparison of SIT and ABA in behavioral reduction procedures for these children. It is important that the right design is chosen to accurately measure the effects of a given treatment.

If one is to accurately determine the effectiveness of such treatments as Sensory Integrative Therapy (specifically the use of weighted vests) in comparison to Applied Behavioral Analysis (differential reinforcement schedule), it is important that an evaluative measure that is adequate in measuring both of the treatments is utilized. According to researchers Olson and Moulton (2004):

> Continued study of the effectiveness of weighted vest use for children with disabilities is imperative. Single subject designs may be the most feasible designs for implementation in clinical practice and may also facilitate researchers discovering errors, but attempts must be made to better control intervening variables (p. 58).

Furthermore in the review of the literature (described above), the studies appear to utilize different variations of the single subject designs when applying particular treatments.

Specific Single Subject Designs

Single subject designs (also referred to as single case, with-in subject and intra- subject design) can be described as a wide variety of research designs that use a form of experimental reasoning described as baseline logic to help in demonstrating the effects of the independent variable on the behavior of the individual subjects (Cooper, Heron and Heward, 2007). This type of design may include the reversal design, changing criterion design, multiple baseline design and the alternating treatments design (Cooper et. al., 2007). All of these designs are excellent but some of more useful than others in specific types of studies.

The first type of single subject design is the reversal design. This designs entails repeated measures of behavior in a given setting (Cooper, Heron and Heward, 2007). There must be at least three consecutive phases in order for there to be a reversal design; (a) a initial baseline phase before the independent variable is applied, (b) the intervention phase where the during which the independent variable is introduced and remains in contact with the behavior, and finally (c) a return to the baseline conditions accomplished by a withdrawal of the independent variable (Cooper et. al, 2007). Usually the baseline data, *A* (first condition), is collected until a steady state of responding is achieved (Cooper et. al, 2007). After that has occurred, an intervention or *B* condition is applied that represents the application of treatment or the independent variable (Cooper et. al, 2007). An experiment which entails one reversal is the A-B-A design, however an A-B-A-B design in preferred because reintroducing a B condition helps to enable thee replication of treatment effects which strengthens the demonstration of an experimental control (Cooper et. al, 2007).

The second type of single subject design is the changing criterion design. This design requires an initial baseline observation on a single targeted behavior (Cooper, Heron and Heward, 2007). The baseline phase is then followed by an implementation of a treatment program on each of the series of treatment phases (Cooper et. al, 2007). Each of the treatments is associated with a step-wise change in criterion rate for the target behavior (Cooper et. al, 2007). Each phase of the

design provides a baseline for the phase that follows (Cooper et. al, 2007). When the rate of the target behavior changes with the stepwise change in the criteria, the therapeutic change is replicated and experimental control is demonstrated (Cooper et. al, 2007).

The third type of design is the multiple baseline design. This design type is to be used as an alternative to the reversal design in the situation that a target behavior is likely to be irreversible or when it is impractical, undesirable, or unethical to reverse a condition (Cooper, Heron and Heward, 2007). With this design, many of the responses are identified and measured over time to provide baselines against which change can be evaluated (Cooper et. al, 2007). When these baselines are in place the experimenter applies an experimental variable to one of those behaviors, produces a change in it and may no little to no change in the other baselines (Cooper et. al, 2007). If it does then rather than reversing the change that was just produced, he applies the experimental variable to one of the other, as yet unchanged responses. If a change is produced at that point, evidence is building that the experimental is effective and helps to solidify that the prior change was not only a coincidence (Cooper et. al, 2007). The variable can then be applied to another response and continue on (Cooper et. al, 2007). Types of multiple baseline designs include multiple baseline across behaviors design, multiple baseline across settings design and the multiple baseline across subjects design.

The final type of single subject design is the alternating treatments design. This design is one that provides an experimentally sound and efficient method for comparing the effects of two or more treatments (Cooper, Heron and Heward, 2007). This type of design is characterized by a rapid alternation of two or more distinct treatments or independent variables while their effects on the targeted behavior or the dependent variable are measured (Cooper et. al, 2007). This design is different from the previously mentioned reversal design where experimental manipulations are made after a steady state of responding is achieved in a particular phase of an experiment, the interventions in the alternating treatments design are manipulated independent of the subject's

level of response (Cooper et. al, 2007). The design is based on the principle of stimulus discrimination (Cooper et. al, 2007). In order to aid the subject's discrimination of which treatment condition is in effect during a given session, a distinct stimulus is often associated with each treatment (Cooper et. al, 2007). This design is also referred to as multi-element design, multiple schedule design, concurrent schedule design and simultaneous treatment design (Cooper et. al, 2007). This type of design is regarded quite highly as it is an experimental design that will help to quickly reveal the most effective treatment among several possible approaches (Cooper et. al, 2007).

The Importance of a Solid Treatments and Evaluative Methods

There are many different treatments and evaluative methods used for children who have autism. Often it seems that even though some treatments are not proven to work, they continue to be utilized to treat this population. Furthermore it is quite important that progress and evaluation are measured fairly and efficiently to ensure that methods that are being implemented are utilized. Treatments which are highly utilized such as SIT and ABA should be compared to one another rather than the absence of treatment to determine what gains can be made during treatment and which of the treatments is best practice.

Best practices are important and denying the option of better treatment to a child with autism is detrimental to the child. According to Heflin, Hess, Ivey and Morrier (2008) too many unsupported treatments are used for children with autism:

> Controversial and unsupported treatments plague the field of autism, resulting in wanted time, energy and funds. These strategies offer inadequate treatment for individuals with ASD and their families. Overall, one third of the treatments reported to be in use by responding teachers have limited support, suggesting a serious disconnect between the

> broadly accepted best practice guidelines and current reported classroom practice…. Many of the strategies used with children with ASD are not evidence based (p. 967).

Since this has been a recognized problem and the review of the literature has revealed that many treatments such as SIT, and more specifically the use of the weighted vests has not been proven to work, why do such treatments continue to be utilized so much? It is a richer literature base is built in order to support claims of treatments that work so that practitioners may engage in the use of best practices at all times with this population. Heflin and Simpson (1998), strongly suggest that there should be more development and evaluation of novel methods, and that they be identified as such and subjected to more thorough and ongoing evaluation.

Many practitioners should begin to consider their methods for evaluation of treatments and should become more aware of their own reasons for choosing certain treatments over others. Furthermore it seems most important that all practitioners who treat children with ASDs understand the treatment background, discover ways to effectively combine it with other treatments and become educated on the proper uses of the treatment. Cicchetti, Reichow and Volkmar (2008), identifying educational practices based on scientific evidence for children with ASD is admirable and utilizing scientific evidence to inform practice should increase the likelihood of a practitioner providing effective treatments. These reasons further solidify the reason why practitioners should choose best practices and utilize the best evaluative measures when treating children who have autism.

The present study will seek to determine best practices when comparing two highly used treatments for treating children who have autism. For many years several different treatments have been used and all have not been proven through research. Applied Behavioral Analysis has been a treatment shown to improve some of the problematic behaviors displayed by children with autism. This is the reason why it is used so widely. On the other hand Sensory Integrative

Therapy specifically the use of weighted vests to eliminate stereotyped behaviors is also a treatment, which is used for this very population, however there is not enough research behind it to assert that it truly works. This study will test the efficacy of such treatments and determine how effective they are in treating children who have autism.

It is also important that when children with autism undergo various treatments, they are still on task during their various daily activities. A treatment may also be deemed as more effective when the child is able to stay on task. Therefore, this study will also test which treatment produces the most on-task behaviors in the children during their various activities.

CHAPTER III

METHODOLOGY

Research Design

For the purpose of this study a single subject, alternating treatments design was used. This design is one that provides an experimentally sound and efficient method for comparing the effects of two or more treatments (Cooper, Heron and Heward, 2007). This type of design is characterized by a rapid alternation of two or more distinct treatments or independent variables while their effects on the targeted behavior or the dependent variable are measured (Cooper et. al, 2007). SIT and ABA were the treatments that were consistently alternated for the participants.

All occurrences of the behavior were recorded on a graph. This allowed the effectiveness of each treatment to be visually monitored while a note of which treatment produced the most favorable effects was immediately recorded.

Once all video data had been collected, random videos of each subject were viewed to measure which of the treatments helped produce the most on task behaviors. Systematic behavioral observations simply measuring on task and off task behaviors were utilized to generate an overall percentage of on-task behavior for each subject with each treatment.

Participants and Setting

Participants included 4-6 elementary school students who were diagnosed with autism and displayed a class of stereotyped behaviors consistent with the diagnosis. These behaviors included body-rocking, hand or limb flapping, head-banging and spinning, biting, kicking, screaming, repeated actions and self injurious behaviors.

The sessions took place in the elementary schools in which the chosen participants attended. Sessions took place in a designated area in the school in which treatment were the most appropriate.

Instrumentation/Material

Trained Researchers. For the purpose of this study, trained researchers administered the treatments. These researchers were responsible for recording all occurrences of stereotyped behaviors during the time that treatment was implemented. They pin-pointed the specified class of behaviors during the implementation of Sensory Integrative Therapy (specifically weighted vests) and Applied Behavioral Analysis (specifically a differential reinforcement schedule).

Recording Sheets/Interval Time Recording Sheets. An Interval Time Recording Sheet with the specified class of stereotyped behaviors displayed by the sample of children who have autism was provided for the researchers. The behaviors were operationally defined using reports from parents and direct care-takers. These behaviors were measured by using interval time recording procedures and the results served as the dependent variable for this current study. The researchers used the recording sheet to record the behaviors that they observed during a specified time period during the use of SIT and ABA. The frequency, or amount of times a behavior occurred during a specific interval was recorded on the sheet. The duration, or the amount of time the behavior lasted was also noted on the recording form. Such an interval time recording

sheet ensured that all observed behaviors were recorded. Furthermore a notes section was provided for the researchers to make note of any other valuable observations they find.

Video Camera. The camera was used to record all sessions of treatment with each child. This made it easy for the professionals to review the tape while ensuring that all behaviors were correctly recorded. Furthermore the tape helped to serve as evidence that treatment was correctly implemented across participants.

Weighted vests. For the purpose of this study weighted vests were used during the implementation of SIT. The vests were placed on the participants during a specified period of time and all specified stereotyped behaviors were recorded during the specific period in order to determine the rate and frequency of their occurrence.

Differential Reinforcement Schedule/Behavior Reduction Procedure. A schedule of reinforcement was used to reward participants during periods in which the treatment ABA was implemented. The participants were rewarded for the reduction of stereotyped behaviors during this treatment. The final schedule of reinforcement (DRA, DRO, DRI etc.) was chosen based on the data collected on the individual participants during initial assessment of stereotyped behaviors and frequency and occurrence of behaviors.

Rewards for Differential Reinforcement Schedule. Rewards for the schedule and absence of stereotyped behaviors during the implementation of ABA were determined after initial assessment of the child. It was determined, by input of parents and observations of the participants, exactly what objects or activities were reinforcing to the child.

Independent Variables

For the purpose of this study the Use of Applied Behavioral Analysis (a differential reinforcement schedule) and Sensory Integrative Therapy (specifically weighted vests) were employed. These specific treatments served as the independent variables for the current study.

Treatments utilizing ABA and behavioral reduction procedures employ several techniques for different situations and specific behaviors. One such methods or technique is the use of differential reinforcement. According to Cooper, Heron and Heward (2007), differential reinforcement is simply a procedure which entails the reinforcing one response class of behaviors and withholding reinforcement for another response class. When a practitioner seeks to utilize such a procedure differential reinforcement consists of two main components: (a) providing reinforcement contingent on either the occurrence of a behavior other than the problem behavior or the problem behavior occurring at a reduced rate, and (b) withholding reinforcement as much as possible for the problem behavior. This procedure is widely used to reduce problem behaviors. For the present study, a Differential Reinforcement of Other Behaviors (DRO) schedule was utilized. The technique, differential reinforcement of other behaviors (DRO) is used by delivering a reinforcer whenever a problem behavior has not occurred during or at specific times. Reinforcement in this case is contingent upon the absence or the complete removal of a target behavior and is sometimes referred to differential reinforcement or omission training (Cooper et. al, 2007). A practitioner determined how the reinforcement would be delivered by a DRO by the combination of how exactly the omission requirement is implemented and scheduled. This requirement can make reinforcement contingent upon the problem behavior not occurring either throughout an entire interval of time (interval DRO) or at a specific moment in time (momentary DRO). For the purpose of this study an interval DRO was used because interval DRO seems to be more effective at helping to suppress or eliminate some pressing problem behaviors (Cooper et. al, 2007). This method was used for those subjects who have a low base rate of stereotyped behavior (10 or fewer occurrences in a 1 minute interval) during initial assessment, as it may be

feasible for their behaviors to reach a zero-level. This also employed the use of the technique differential reinforcement of low rates of responding (DRL) (Cooper et. al, 2007). DRL is a procedure in which reinforcement is applied as an intervention to reduce the occurrences of a target behavior. A practitioner would specifically use this technique to decrease the overall rate of a behavior that occurs too frequently but not to completely eliminate the behavior (Cooper et. al, 2007). There is full session DRL, interval DRL and spaced responding DRL. For the present study, the interval DRL was used. In the use of the interval DRL a practitioner divided a total session into a series of equal intervals of time and gave reinforcement at the end of each interval where the number of occurrences of the behavior during the specific interval was either at or below a criterion limit. If the learner exceeded the criterion number of responses during that time interval the practitioner removed the chance to gain reinforcement and starts a new interval (Cooper et. al, 2007). This was used for those subjects whose base rate of stereotyped behavior was quite high (10 or more times in a 1 minute interval). It was most beneficial to lower their rates of behavior then to bring the behavior to a zero-level as with a DRO.

There are different ways in which practitioners may implement the use of Sensory Integrative Therapy. One such method is the use of weighted vests. Moulton and Olson (2004) site several reasons why weighted vests may be utilized and for what specific situations:

> Within the guidelines of the Sensory Integrative Frame of Reference, children's over-sensitivity to everyday sensory input may result in behavioral difficulties such as inattention to task, hyperactivity, agitation, or stereotypic behavior such as rocking or flapping. Other children may exhibit under-responsiveness to sensory input and therefore be less aware of their body in space and may exhibit clumsy or awkward movement (p. 53).

It appears that the use of weighted vests is expected to reduce many of the unwanted stereotyped behaviors that may be exhibited by children who have autism. It is important that the guidelines for the weight utilized in weighted vests are followed. Moulton and Olson (2004) provide a thorough definition of the weighted vest: "A weighted vest is a vest that typically has up to 10% of a person's body weight evenly distributed around the vest" (p. 53). Therefore, the vests used for the current student were 10% of each of the participants' weight.

Dependent Variable

For the purpose of the present study, the dependent variable was the frequency and duration of the stereotyped behaviors that were observed. The methods that were used to record these behaviors were noted under the Instrumentation and Materials section above.

Procedure

Each parent of the potential participants was asked to sign forms the grant their consent for their children to participate in the study. After consent was granted and the purpose and goal of the study was explained to the parents of the participants, each participant was initially assessed to determine the specific stereotyped behaviors they exhibited and at what frequency and intensity.

Initially a baseline (occurrence of behavior) of the participants' behaviors was recorded prior to treatment to determine the amount of observable occurrences of the stereotyped behaviors. After baseline was recorded and graphed, researchers were trained and briefed on how to correctly implement treatments with the participants. The treatments that were implemented are the SIT (weighted vests) and ABA (differential reinforcement schedule). They were also trained on how to correctly record the occurrences of the observed behaviors.

Participants alternated daily between the two treatments SIT and ABA. The treatment sessions lasted 15 minutes and was based on the base-rates of the behaviors. Once treatment was implemented all occurrences of stereotyped behavior for a session were calculated, recorded and graphed. Treatment spanned over the time of 5 weeks.

Target Behavior Identification

Children with Autism often display undesirable routines and repetitive behaviors often referred to as stereotyped behaviors. These children repeat words and specific actions several times and engage in non-purposeful behaviors such as clapping repeatedly, rocking, twirling, spinning flapping and flailing hands, tapping on objects, repetitively jumping up and down, inappropriate vocalizations or grabbing at items (American Psychological Association Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, 2000). For the purpose of the present study the participants were observed utilizing a partial interval sampling method in order to see what class of behaviors they displayed. Once those behaviors were pin-pointeded, the rate and frequency of the behaviors will also be recorded. If the behaviors occur at least ten times per minute, during recording, they were seen as problematic or stereotyped behaviors. These behaviors were the focus for recording for a specific participant after baseline was collected.

Baseline

The goal of the baseline data collection was used to determine the current frequency and duration of stereotyped behaviors that the participant exhibited. The participants were observed in their normal settings without the application of treatments in order to obtain a measure of the frequency and rate of the behaviors.

Implementation

As described above, an alternating treatments design was used for this study. This type of design is characterized by a rapid alternation of two or more distinct treatments or independent variables while their effects on the targeted behavior or the dependent variable are measured (Cooper et. al, 2007). SIT and ABA were the treatments that were consistently alternated for the participants. Subjects randomly received one of the two treatments daily. Subjects were separated into two groups and received treatments in the following manner:

Group 1: ABBA BAAB ABAB BABA

Group 2: BAAB ABBA BABA ABAB

The letter A represents the treatment of Sensory Integration, while the letter B represents the treatment of Applied Behavioral Analysis. Each letter also represents the treatment that was administered to the subjects for that day (1 treatment per day). The treatments were administered over a period of 5 weeks and until no differentiation of treatment could be observed.

Data Analysis

Data from the behavioral observations was graphed and analyzed. Visual analysis was utilized to evaluate differences in level slope and variability of the behaviors. This was done to determine the differences in the treatment effects on the target behaviors.

The videotaped treatments of each subject were also randomly chosen and analyzed. Observational was recorded, which was used to calculate the percentage of on-task behaviors for each subject during each treatment. This was used to determine which treatment produced the highest percentage of on-task behaviors for each of the subjects.

CHAPTER IV

RESULTS

Participants and Setting

Participants of this study were 4 children (4 boys) ages 7-11 years of age. All participants had marked developmental delays in various areas including communication, social, and cognitive skills. Each participant had a diagnosis of autistic disorder from clinical professionals. Participants are "Participant 1" (7 years old), "Participant 2" (10 years old), "Participant 3" (8 years old) and "Participant 4" (11 years old).

All of the participants presented with various stereotypic behaviors that may be described as repetitive and also perserverative motor responses. All of the behaviors have been described as problematic, interfering with instruction and have been targeted for behavioral reduction within the classroom and in some individualized education programs. Interviews with their immediate educators revealed that the students have been treated for their various sensory needs and do receive forms of sensory integrative therapy. Table 1 lists the stereotypic behaviors of each of the participants.

The study was conducted at 2 schools in classrooms for children with developmental disabilities. Each student attended school for full school days (7 hours and 15 minutes) on weekdays and were enrolled in classrooms with 5-8 other children. Each classroom had a primary teacher and teaching assistants. The focus of instruction in each classroom focused on acquisition of basic

learning skills, basic communication, socialization and personal and self care.

Measurement

Measurement was conducted during a daily 15-minute session with each participant. The observations took place in each of the participants classrooms, while they engaged in their daily one on one or small group work including discrete trials (with various basic learning tasks) and basic skill drills or familiar activities. Participant sat at tables or desks during all of the observations. An observer was positioned 2-4 feet from the session location. Table 1 only contains the stereotypic behaviors that occurred at the highest frequency and were described as the most problematic of each participant.

Table 1

Specific Stereotypic Behaviors of Each Participant

Participant	Targeted Stereotypic Behaviors
1	Tongue rolling and grabbing
2	Hand-flapping and clapping
3	Object twirling and placing hands and fingers in mouth
4	Rocking torso back and forth

Two behaviors were measured for the purpose of this study. The first measured behavior, stereotypy, included the behaviors that were listed in Table 1. The specific behaviors of each participant were defined operationally for all trained researchers and observers prior to implementation of treatments. The second behavior, attention to task, was defined as a participant engaging in purposeful engagement of the various activities they engaged in including discrete trials (with various basic learning tasks), basic skill drills or familiar activities. Stereotypy and attention to task were both measured using a partial interval recording procedure. Each observation was 15 minutes in length. The observer who was present recorded the

occurrence/nonoccurrence of each behavior on a form with 75 intervals at 12 seconds in length. The observer kept track of time using a handheld stopwatch to time the intervals. Any occurrence of the specified stereotypic behaviors were recorded on the form and totaled in the end. Inter-observer reliability was also measured at each session with a 3rd researcher. In order for observations to be valid, reliability had to reach 80% reliability.

After video data was collected, random sessions of each treatment were watched. Attention to task was measured using a partial interval recording procedure. Each observation was 15 minutes in length. Participants were scored as engaged/not engaged during their given tasks. They had to be actively engaged in the task in order to receive credit for a given interval. At the end of the observations, data were converted to a percent metric by dividing the number of intervals in which the stereotypic behavior were scored by the total intervals recorded (75) and then they were multiplied by 100.

Procedures

This study had 3 distinct evaluation phases. Including baseline (no SIT or ABA treatment), ABA and DRO. SIT and ABA are the treatments that were consistently alternated for the participants. Participants randomly received one of the two treatments daily. Subjects were separated into two groups and received treatments in the following manner:

Group 1 (Participant 1 & 3): ABBA BAAB ABAB BABA

Group 2 (Participant 2 & 4): BAAB ABBA BABA ABAB

The letter A represents the treatment of Sensory Integration, while the letter B represents the treatment of Applied Behavioral Analysis. Each letter also represents the treatment that was administered to the subjects for that day (1 treatment per day). The treatments were administered over a period of 5 weeks and until no differentiation of treatment was observed.

Treatments were administered by trained researchers. They were trained by both an occupational therapist and a highly qualified and trained professional in ABA. In order to be an observer, the researchers had to complete all trainings prior to the start of the study.

During treatment administration and observation, 3 researchers were present. One to administer treatments, and two to observe (and check reliability of observations).

Throughout all phases, each participant did their daily one on one or small group work with their instructor. These activities occurred during the duration of the 15 minute observation. These activities were identified by the chief experimenter in conjunction with the educational staff. The participants were quite familiar with all activities in which they engaged during the observations. Each participant was presented with the same activity during the duration of the study. The respective activities were math and vocabulary drills (Participant 1), discrete trials in matching, math, spelling, number identification and letter identification (Participant 2), trials in matching and picture identification (Participant 3) and reading and comprehension drills (Participant 4).

Baseline

Trained researchers accompanied the teachers and para-professionals who worked with the students during their work sessions. Participants were instructed to do their various activities as normal: Math and vocabulary drills (Participant 1), discrete trials in matching, math, spelling, number identification and letter identification (Participant 2), trials in matching and picture identification (Participant 3) and reading and comprehension drills (Participant 4). The researchers sat about 2-4 feet from the teachers and participants to observe and record their various levels of the specific stereotyped behaviors.

During the baseline condition, no weighted vest or applied behavioral analysis procedures were used. The researchers were to record the specific amount of occurrences of the targeted behaviors to be graphed and compared to the treatment phases for each participant.

Weighted Vest

During this condition, participants were fitted with a weighted vest during the duration of their specific activity. The researcher placed the weighted vest on the participant. The vest used was constructed specifically for participants in the study. It was made of blue jean fabric (taking on the look of an everyday vest), had fleece fabric lining the top near the shoulders for comfort, with Velcro lining the inside in order to attach the proper 2-8oz weights in the vest. When placed on the participant, the vest was secured with small metal buttons along the front seams. As determined before the study, the total weight of the vest with each participant was equal to 10% of their body weight. Throughout the study, a specific protocol was followed. The protocol was first read by the researcher to inform the child of what they would be doing during the intervention. After it was read, the treatment and activity began.

Applied Behavioral Analysis

During this condition, a small edible reinforcer identified for each participant prior to the study was used. Reinforcers included M&M's (Participants 1 and 3) or Skittles (Participants 2 and 4). Prior to the study, it was determined how many intervals a participant must go without engaging their targeted stereotyped behavior during the 15 minute observation, in order to receive reinforcement. Throughout the study, a specific protocol was followed. The protocol was first read by the researcher to inform the child of what they would be doing during the intervention. After it was read, the treatment and activity began.

Results

Figures 1 (a)- 4 (a) show the amount of intervals in which stereotypy occurred while figures 1 (b)- 4 (b) show the percent of attention to task each participant exhibited during their respective treatments.

For Participant 1, stereotypy was on average 61% during baseline. The weighted vest treatment yielded on average 26% stereotypy during treatment and applied behavioral analysis yielded on average 3% throughout the course of 10 treatments for each condition. The baseline for attention to task yielded an average of 40% for all intervals recorded. Attention to task during the weighted vest phase was very low (M=31%) and very high during the ABA phase (M=97%).

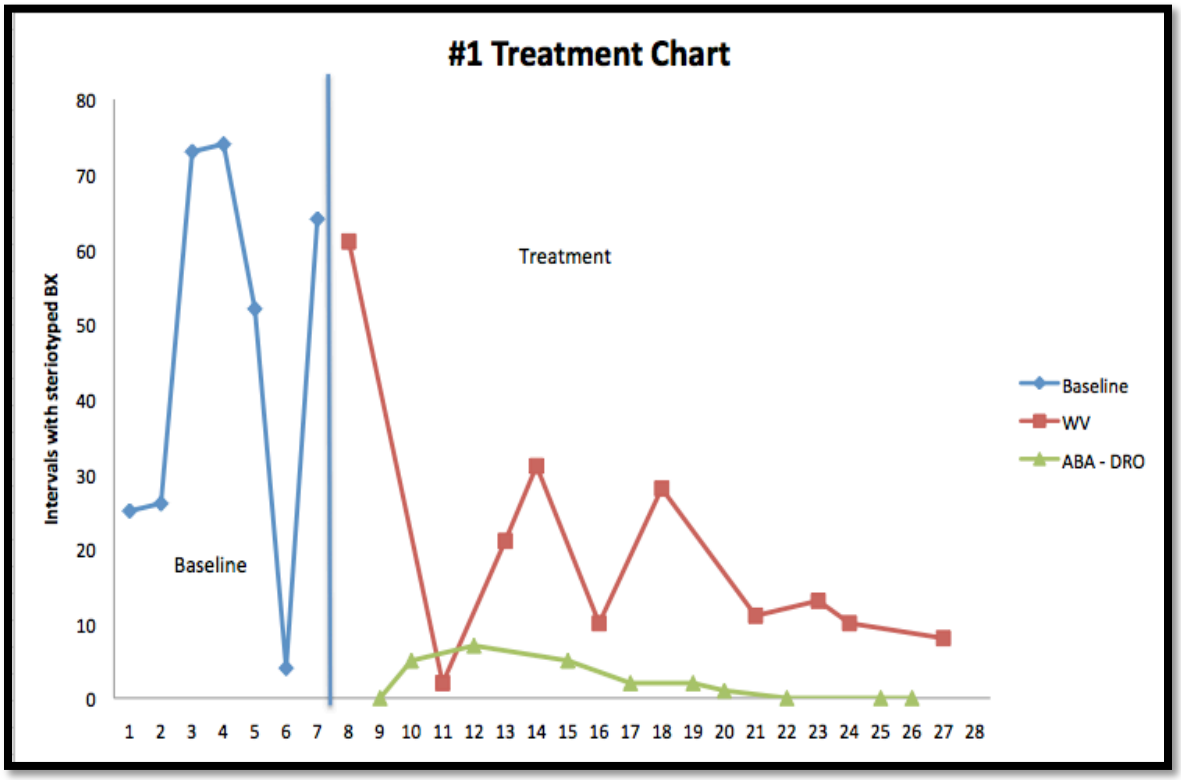


Figure 1 (a)

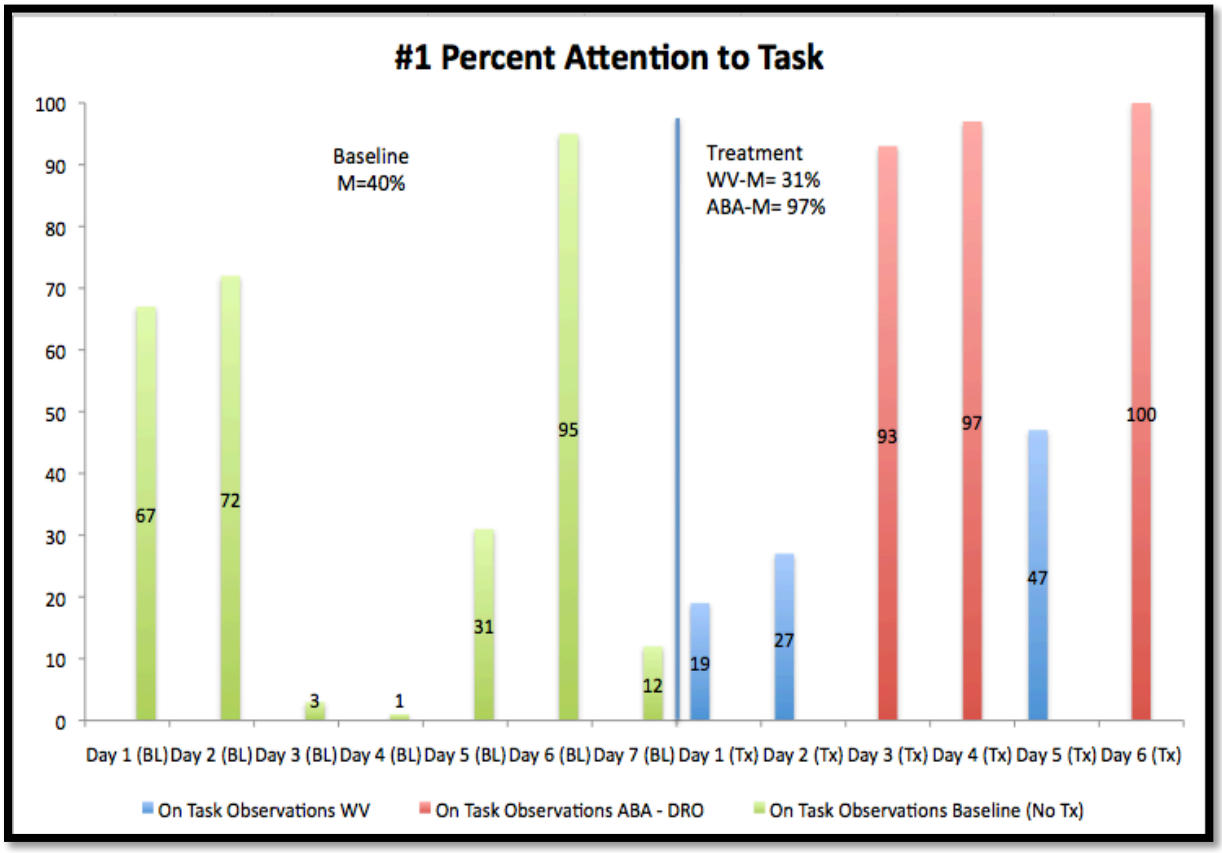


Figure 1 (b)

For Participant 2, stereotypy was on average 56% during baseline. The weighted vest treatment yielded on average 36% stereotypy during treatment and applied behavioral analysis yielded on average 24% throughout the course of 10 treatments for each condition. The baseline for attention to task yielded an average of 44% for all intervals recorded. Attention to task during the weighted vest phase was very low (M=32%) and high during the ABA phase (M=89%).

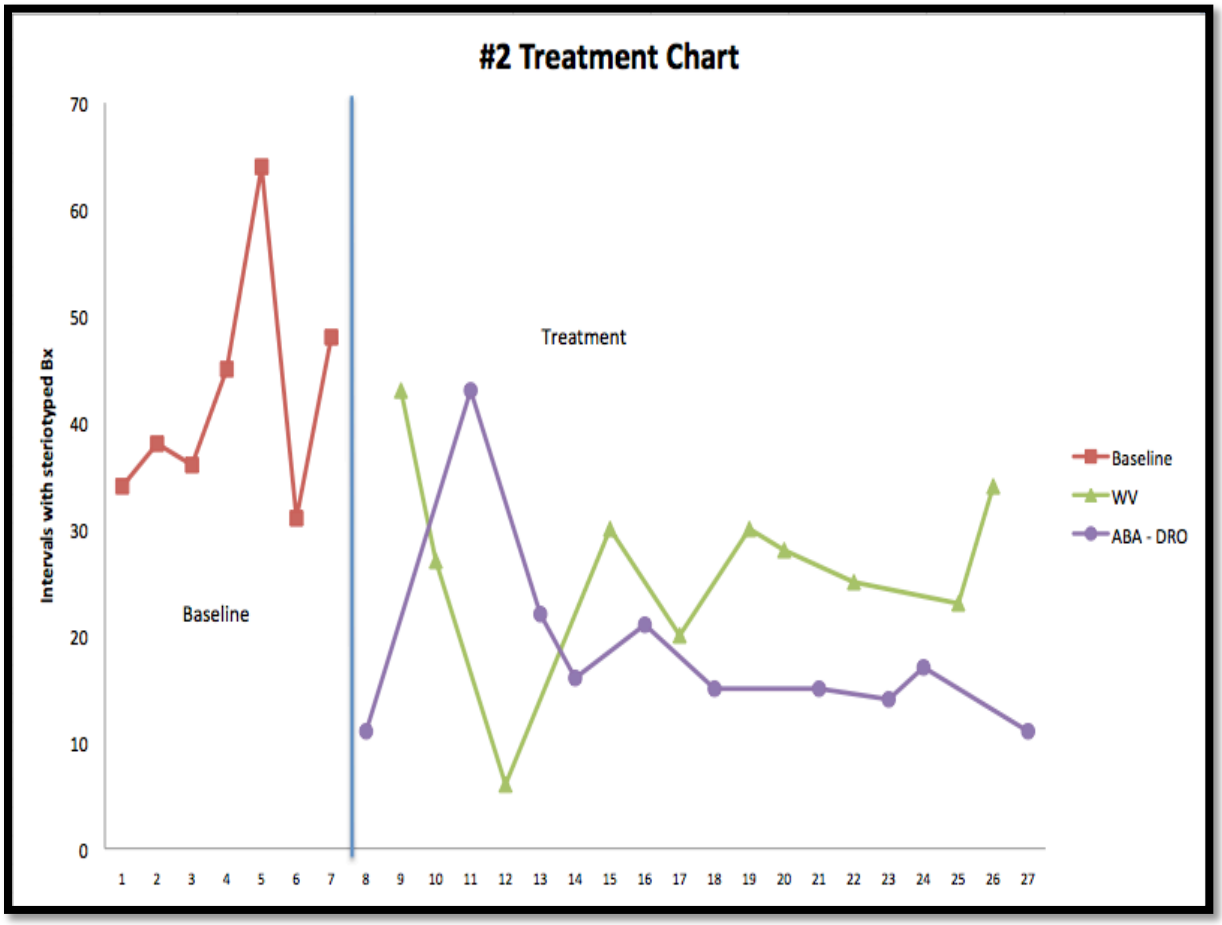

#2 Treatment Chart
Intervals with steriotyped Bx
70
60
50
40
30
20
10
0
Baseline
Treatment
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Baseline
WV
ABA - DRO

Figure 2 (a)

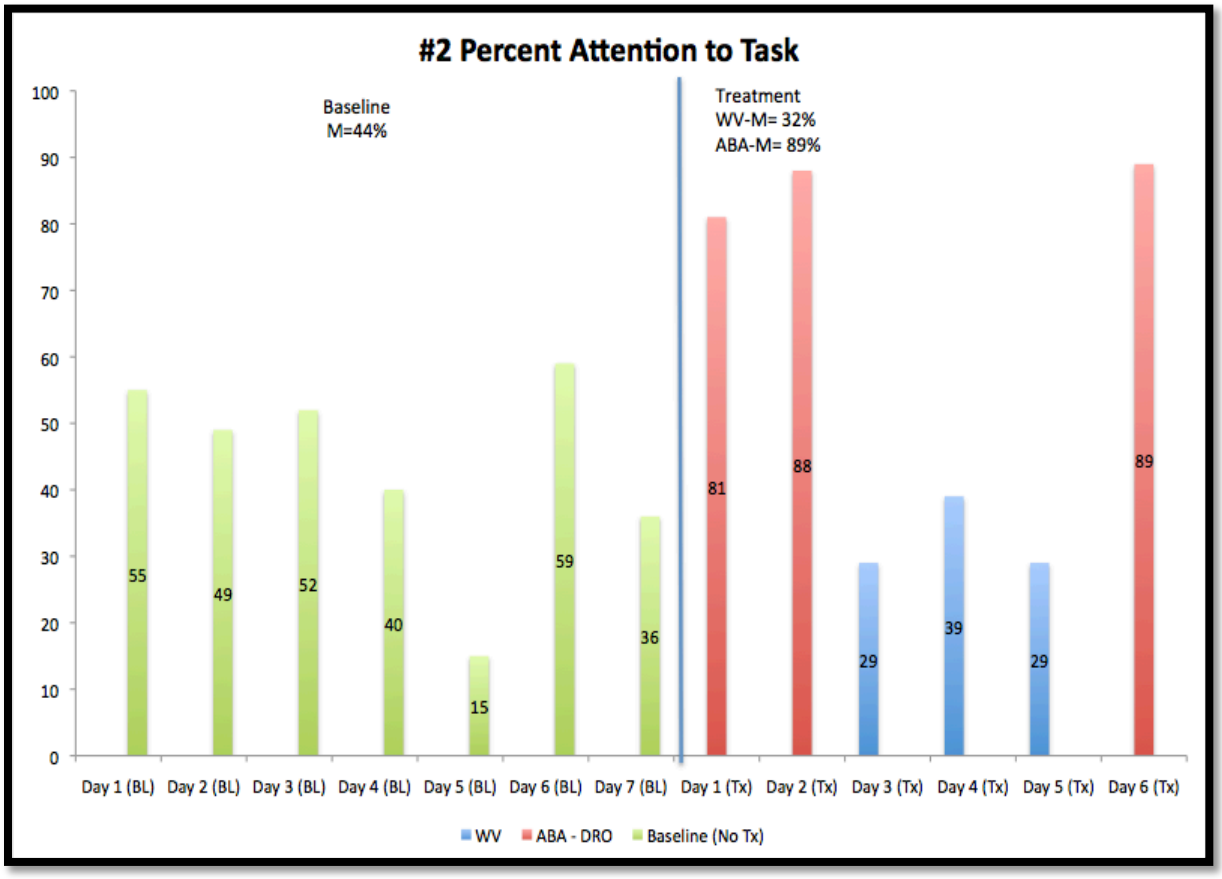


Figure 2 (b)

For Participant 3, stereotypy was on average 80% during baseline. The weighted vest treatment yielded on average 54% stereotypy during treatment and applied behavioral analysis yielded on average 23% throughout the course of 10 treatments for each condition. The baseline for attention to task yielded an average of 20% for all intervals recorded. Attention to task during the weighted vest phase was very low (M=28%) and a bit higher during the ABA phase (M=71%).

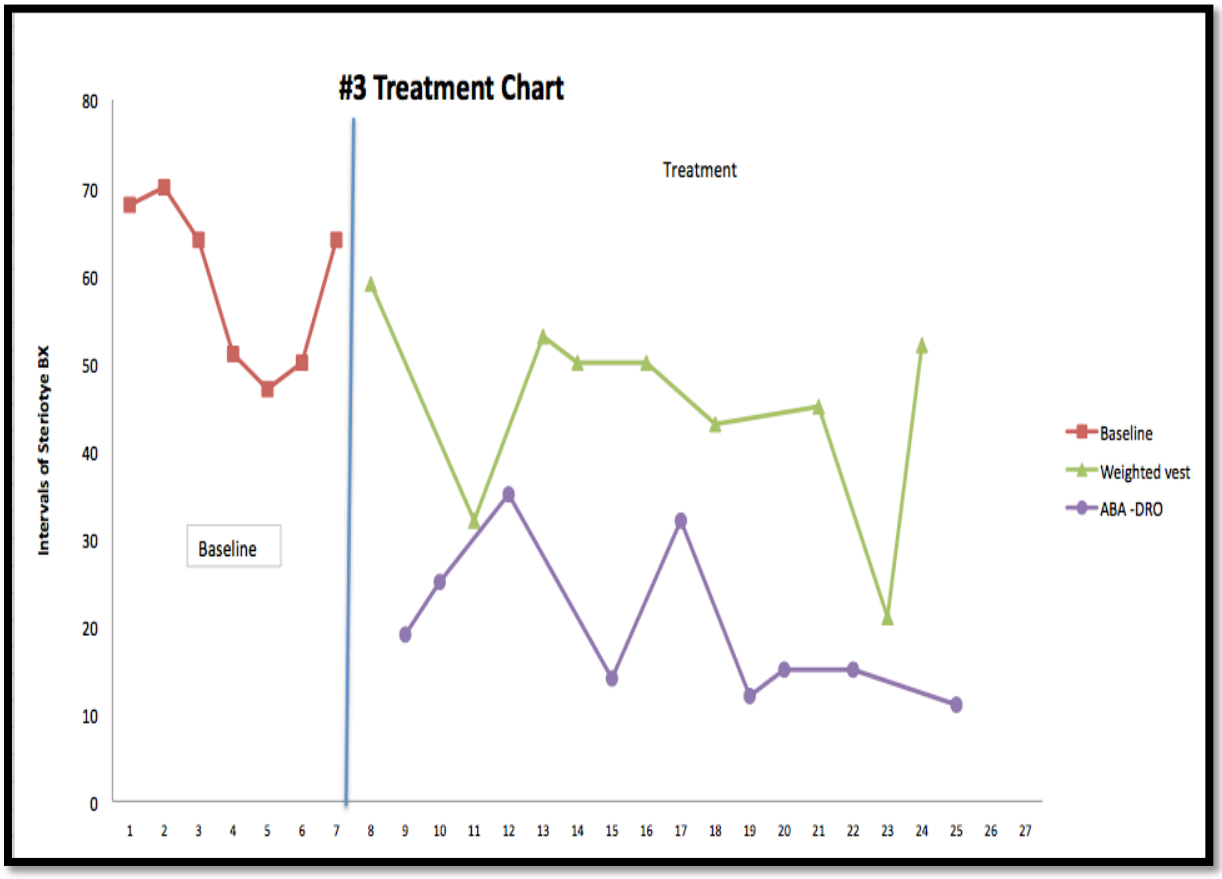

#3 Treatment Chart
Treatment
Intervals of Steriotye BX
Baseline
Baseline
Weighted vest
ABA -DRO
0
10
20
30
40
50
60
70
80
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Figure 3 (a)

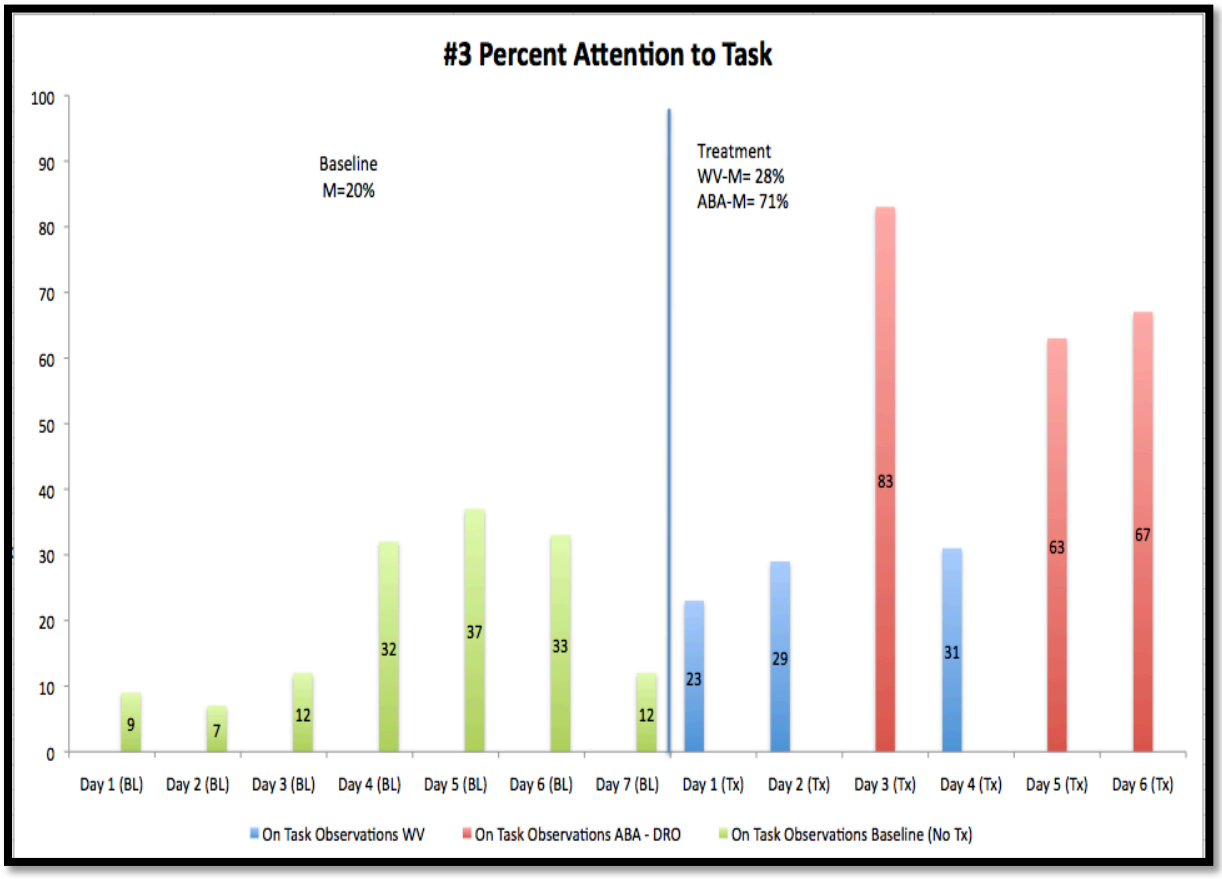


Figure 3 (b)

For Participant 4, stereotypy was on average 80% during baseline. The weighted vest treatment yielded on average 55% stereotypy during treatment and applied behavioral analysis yielded on average 33% throughout the course of 10 treatments for each condition. The baseline for attention to task yielded an average of 32% for all intervals recorded. Attention to task during the weighted vest phase was low (M=50%) and very high during the ABA phase (M=92%).

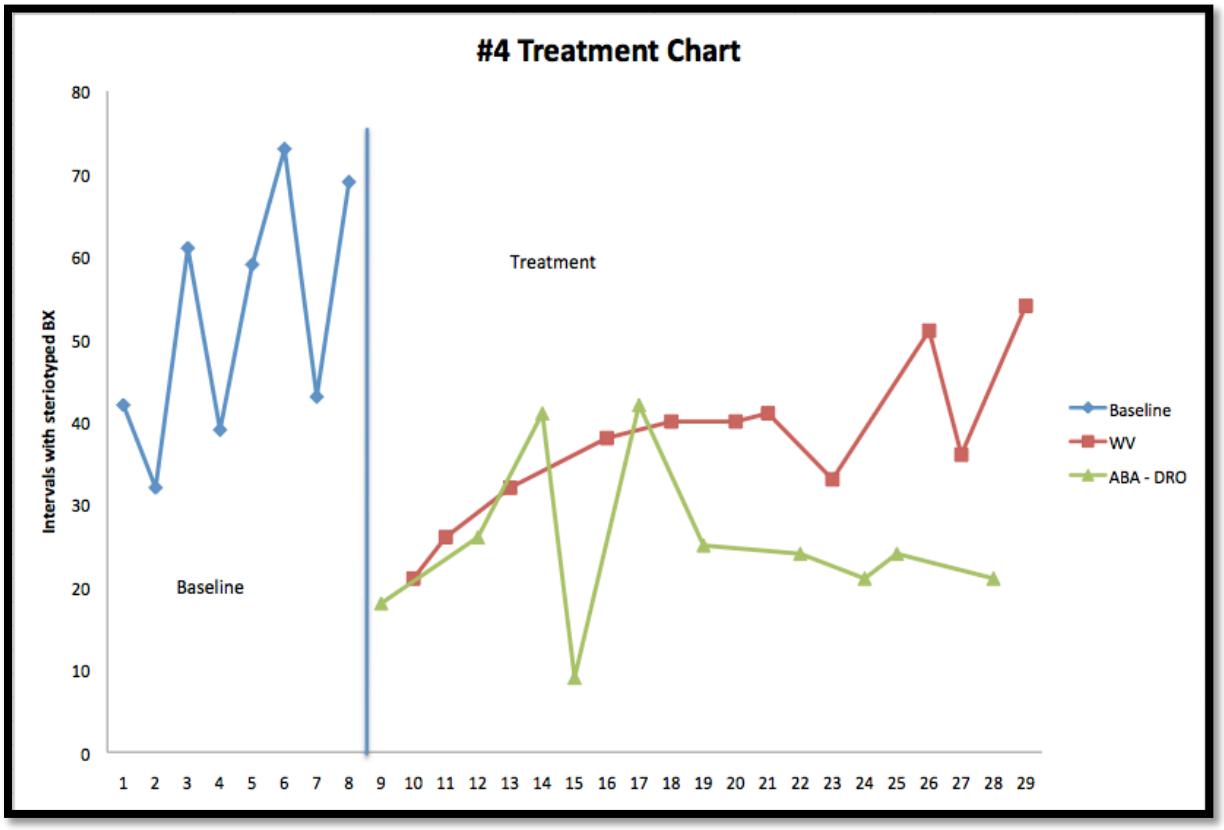

#4 Treatment Chart
Intervals with steriotyped BX
Treatment
Baseline
Baseline
WV
ABA - DRO
0
10
20
30
40
50
60
70
80
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

Figure 4 (a)

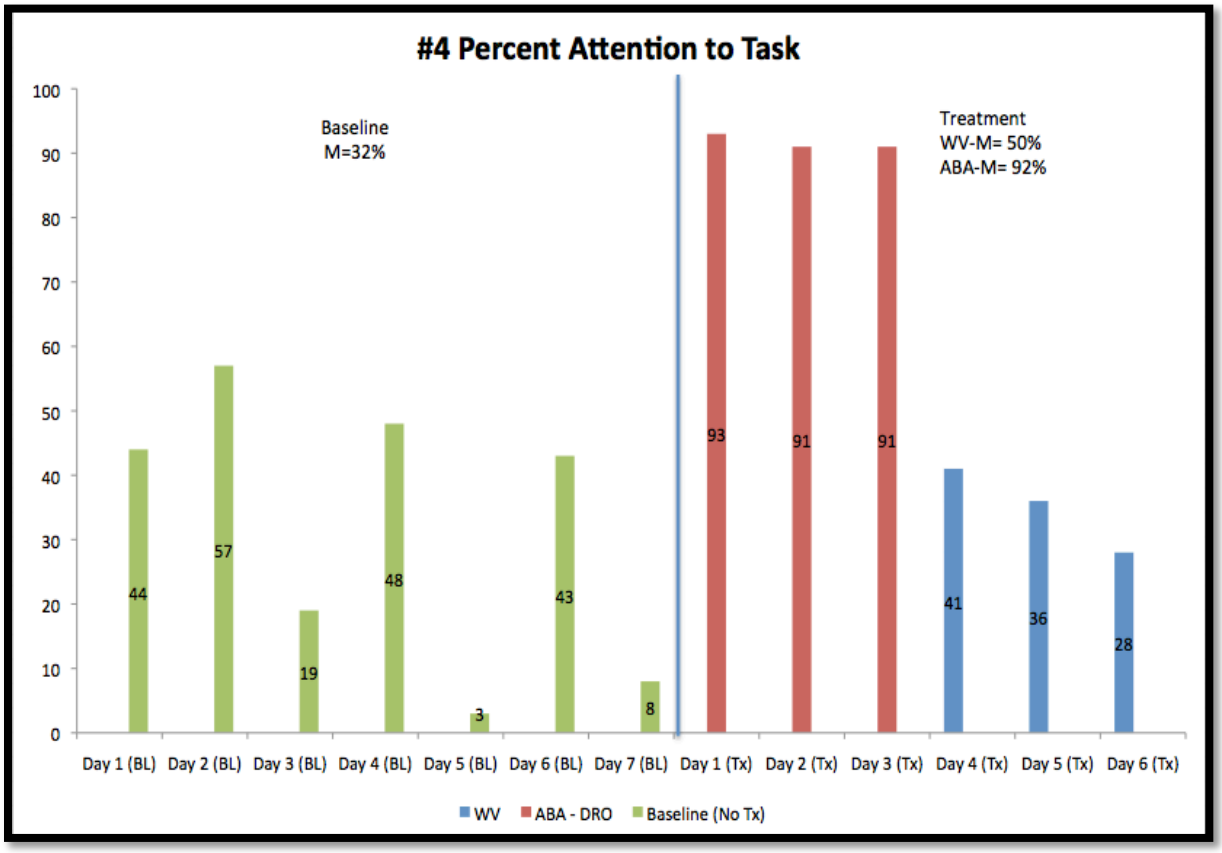

#4 Percent Attention to Task
Baseline
M=32%
Treatment
WV-M= 50%
ABA-M= 92%
100
90
80
70
60
50
40
30
20
10
0
44
57
19
48
3
43
8
93
91
91
41
36
28
Day 1 (BL)
Day 2 (BL)
Day 3 (BL)
Day 4 (BL)
Day 5 (BL)
Day 6 (BL)
Day 7 (BL)
Day 1 (Tx)
Day 2 (Tx)
Day 3 (Tx)
Day 4 (Tx)
Day 5 (Tx)
Day 6 (Tx)
WV
ABA - DRO
Baseline (No Tx)

Figure 4

(b)

CHAPTER V

DISCUSSION & CONCLUSION

The results of this study show that both of the treatments reduced the amount of stereotypy displayed by all of the subjects. However, results further yield that ABA decreased stereotypy more than SIT. Furthermore, results revealed that all subjects had more attention to task during the ABA condition in comparison to the SIT condition.

Two of the participants (Participant 3 and Participant 4) displayed stereotypy at 80% of recording intervals at baseline. For Participant 3 this percentage was lowered to 54% with the addition of weighted vests, but was reduced even lower (23%) with ABA. For Participant 4 this percentage was lowered to 55% with the addition of weighted vests, but was reduced even lower (33%) with ABA. Attention to task data revealed that during the addition of the weighted vest yielded 28% of on-task behaviors for Participant 3 and 50% for Participant 4. However data revealed that during ABA treatments Participant 3 was 71% on-task and Participant 4 was on-task 92% of the intervals observed.

Participant 1 and Participant 2 displayed lower levels of stereotypy at baseline. For Participant 1, the baseline rate of stereotypy was 61% and for Participant 2, 56%. For Participant 1, the percentage was lowered to 26% with the addition of the weighted vest, but was reduced even lower and was nearly reduced completely (3%) with ABA. For Participant 2 this percentage was lowered to 36% with the addition of weighted vests, but was reduced even lower (24%) with ABA. Attention to task data revealed that during the addition of the weighted vest yielded 31%

of on-task behaviors for Participant 1 and 36% for Participant 2. However data revealed that during ABA treatments Participant 1 was 97% on-task and Participant 2 was on-task 89% of the intervals observed.

Though results render behavioral reduction for both treatments, ABA was more effective across participants. It lowered the amount of stereotypy and during the intervals observed of the respective treatment, participants were more on-task than with the application of the weighted vest.

The data for all participants suggests that wearing the vest is not as effective as the ABA treatment. Not only was the weighted vest not as effective, it possibly had a negative influence. For example, percentage of on-task behaviors across participants was low, 31% (Participant 1), 32% (Participant 2), 28% (Participant 3) and 50% (Participant 4). All participants, more specifically Participant 2 and Participant 4 in many instances seemed to resist or find discomfort in wearing the vest, which required the trained researchers to reposition it on many occasions. Observations during data collection revealed that participants often touched, pulled on, tugged at and seemed distracted by the vest. This factor may have interfered with the participants' levels of attention and perhaps served as a provoking influence for more stereotypy. However, this could also be a reason why stereotypy appeared to be lowered with the vests, since participants engaged in moving, tugging and pulling at the vest, this may have lowered the frequency of stereotypy while they were worn. It could also be possible that the negative influence may have been lowered if participants wore the vests for more extended periods of evaluation.

Limitations

The proceeding discussion despite the interpretation of the data from this study may have benefited from further experimental manipulation. For example, with all participants, it may have been informative to have additional vest and ABA sessions so that there would be an even clearer distinction as to what treatment was most effective. Another manipulation such as return to baseline for all participants would have been beneficial, alternating between weighted vest and ABA conditions. A related consideration is that the evaluations and number of sessions was brief, totaling 10-12 sessions. Conducting more sessions was a possibility, however, as time progressed the stability of responding became more evident. The trend, level and variability became more stable over sessions. Carryover effects should also be considered a limitation in the present study. Participants alternated treatments between SIT and ABA randomly. It may have been beneficial to engage participants in each treatment separately followed by a resting phase before introducing a new treatment. Finally, all participants were male. It may be quite beneficial to utilize female participant with high levels of stereotypy for future studies.

Direction of Future Studies

The present study found that ABA not only reduced the amount of stereotyped behaviors of participants, but it also increased the amount of attention to task for each client. It may be beneficial to further study whether or not these factors and treatment produce a higher rate of learning. For example, since the participants attended better to task during ABA, perhaps they learned more during this time as well. A learning measure comparing baseline phase (ABA) to the end of treatment phase could further give insight as to whether the treatment and attention to task also increased the amount of learning that took place during that time. Furthermore, the present study utilized an alternating treatments design. Though this design provided beneficial information, it would also be excellent to utilize a reversal design (return to baseline) in the order of baseline, SIT-weighted vests, baseline and then ABA. This design would aid in reducing carryover effects of the two treatments, providing an even clearer picture of their effects on the participants. Finally, for this study, partial-interval recording was used to measure occurrences of behaviors for the participant, estimating a percentage of intervals in which the behaviors occurred overall. Utilizing a duration measure may cast a different light on the results. For example, measuring the time in which a behavior occurred during an interval and determining if it occurred during the complete interval or the number or seconds it occurred exactly during an interval may also yield results that would be quite beneficial.

Conclusion

In summation, the present study supports that ABA seems to work better for reducing stereotypy and increasing attention to task in children with autism spectrum disorder than does SIT (specifically weighted vests). Clearly this study was preliminary, focused on behaviors during a brief period of time and included children whose presentation and developmental levels were different. Understanding the functioning of children with the disorder is quite important

and could help to alleviate many educational concerns of children in this population. Identifying treatments that are effective and innovative is more than important. However, as other professionals have questioned the effectiveness and proof of the usefulness of weighted vests, this study finds that they do lower the rates of stereotyped behaviors, however, they are not quite as effective and do not produce acceptable levels of on-task behaviors, especially when compared to ABA. The current studies of SIT lack solid experimental methodology, have limited sample sizes and have inconsistent definitions of sensory integration. Furthermore as stated by the Association of Science in Autism Treatment (2008):

> An important area for future research is to evaluate Sensory Integration in studies with strong experimental designs. Professionals should present Sensory Integration as untested and encourage families who are considering this intervention to evaluate it carefully (para 3).

It appears that SIT has much to prove and must provide efficacious data supporting the claims of significant effectiveness of wearing weighted vests as a specific therapeutic technique.

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VITA

Nina Ellis-Hervey

Candidate for the Degree of

Doctor of Philosophy/Educational Psychology

DISSERTATION TITLE: THE COMPARISON OF SENSORY INTEGRATIVE THERAPY (SPECIFICALLY WEIGHTED VESTS) AND APPLIED BEHAVIORAL ANALYSIS (SPECIFICALLY A DIFFERENTIAL SCHEDULE OF REINFORCEMENT) IN THE TREATMENT OF CHILDREN WHO HAVE AUTISM SPECTRUM DISORDER

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Title of Study: THE COMPARISON OF SENSORY INTEGRATIVE THERAPY (SPECIFICALLY WEIGHTED VESTS) AND APPLIED BEHAVIORAL ANALYSIS (SPECIFICALLY A DIFFERENTIAL SCHEDULE OF REINFORCEMENT) IN THE TREATMENT OF CHILDREN WHO HAVE AUTISM SPECTRUM DISORDER

Pages in Study: 93 Candidate for the Degree of Doctor of Philosophy

Major Field: Educational Psychology: School Psychology

Scope and Method of Study:

Alternating treatments design was utilized and each student received both of the treatments on alternating days.

Findings and Conclusions:

For many years several different treatments have been utilized, and not all have empirical support. Applied Behavioral Analysis is a treatment shown to improve some of the problematic behaviors displayed by children with autism, which is likely the reason for its widespread use. On the other hand, Sensory Integrative Therapy, specifically the use of weighted vests to eliminate stereotyped behaviors, is also used for this very population; however, there is not enough research in support of it to evaluate its effectiveness. The present study tested the efficacy of such treatments and sought to determine how effective they are in treating those who have autism. Participants included 4 elementary school students who have been diagnosed with autism and display a class of stereotyped behaviors consistent with the diagnosis. These behaviors included body-rocking, hand and limb flapping, repetitive verbalizations, repeated actions, spinning objects and self-injurious behaviors. Alternating treatments design was utilized and each student received both of the treatments on alternating days. The findings and implications of this study suggest that though there are limitations to both treatments, Applied Behavioral Analysis was the most effective across participants.

ADVISER'S APPROVAL: Gary Duhon Ph.D.