

The Effects and Benefits of  
Sensory Integration Therapy  
on Children with Autism

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ABSTRACT

For children with autism or Pervasive Developmental Disorder (PDD), sensory integration dysfunction can greatly affect their potential to learn and behavior in the school environment. Some of the inappropriate behaviors a child with autism may display in school include, but are not limited to, fine and gross motor developmental problems, academic problems, fear and anxiety in unfamiliar settings, stereotyped repetitive behaviors (verbal and non-verbal), and the need for routine/structure. Other sensory related problems include increased sensitivity to certain sounds, smells, tastes and touch. As the prevalence of autism continues to rise, it is important for teachers, staff, and parents to utilize techniques which improve the quality of students' daily functioning. Although the research is still growing in this field, several studies confirm the effectiveness of therapy based on sensory integration theory. The purpose of this research is to examine sensory integration theory and autism in a literature review. Furthermore, a single-subject study is proposed which could measure the effectiveness of instituting a "sensory diet" into the existing treatment plan of a child with autism or PDD.

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## Chapter I: Introduction

### *Rationale*

The prevalence of autism has increased dramatically in recent years (Department of Public Instruction, 2005). When looking at information provided by the Wisconsin Department of Public Instruction, a great deal of data on the prevalence of autism has been collected over the years to emphasize the growing numbers, not only in Wisconsin, but in the whole United States. In 1992-93, the number of autistic children receiving special education in the state of Wisconsin was 203. By 1997 it had risen to 1,052 and data from the current (the 2003-2004) school year indicates that approximately 3,669 children received services under the autism label.

This raises concerns for not only parents, but educators and clinicians as well. Pervasive Developmental Disorder (PDD) can affect a person on many levels (Newschafter, Falb & Gurney, 2005). The symptoms can especially interfere with a child's functioning within a school setting: behavior problems; fine and gross motor developmental problems; avoidance of touch with others or seeking an inappropriate amount of touch; academic problems; difficulty establishing and maintaining relationships with peers; fear and anxiety in unfamiliar settings; stereotyped repetitive behaviors (verbal and non-verbal); need for routine/structure; and increased sensitivity to certain sounds, smells, tastes (and other sensory related). Autism is often defined as a spectrum disorder; therefore, the severity varies considerably between persons with the disorder (Newschafter, et al., 2005).

Because of the increasing number of children being diagnosed as autistic and because the disorder is multidimensional in nature, educators and parents are seeking interventions which can help children reach their potential. Even though there are many interventions and programs available to children with autism, finding successful interventions and treatments to meet the

needs of a particular child remains a difficult challenge. Interventions tend to focus on behavioral therapy with rewards and punishment, sensory input, and teaching through early childhood curriculum. The goal of many interventions tends to focus on increasing the child's positive behavior and decreasing negative behavior.

Persons working with autistic clients often witness the advantages and effects of therapy based on sensory integration theory or Sensory-Integrative-Based Therapy (Bundy, Lane & Murray, 2002). This type of therapy is commonly referred to as sensorimotor play, sensory play, or sensory therapy. Another commonly known strategy is that of the "Sensory Diet." This strategy consists of carefully planned practical sensory activities which are scheduled according to each child's individual needs throughout the day (Dimatties & Sammons, 2003). Similar to a diet designed to meet a child's nutritional needs, this contains certain elements designed to meet their sensory integration needs and is based on the notion that controlled sensory input can affect one's functional abilities (Wilbarger & Wilbarger, 2002). This is not necessarily a separate program but can be inserted into the child's already existing treatment plan.

As the prevalence rate of autism continues to increase, parents and educators need to be well equipped with techniques and strategies to help autistic children overcome their difficulties. Therapy based on sensory integration theory may help children increase their positive behavior and decrease negative behavior. Research will help to determine the success of this type of therapy on behavior change in children with autism.

#### *Purpose of the Study and Research Question*

The purpose of this research paper is to examine the constructs of sensory integration theory and autism in a review of literature. Furthermore, a proposed research study will be suggested. This methodology could be used to determine whether therapy based on sensory

integration, when strongly emphasized in an autistic child's existing treatment plan, will benefit autistic children through behavior change.

The research question of the proposed study focuses on observable change in a child who receives sensory therapy: Will a child who is receiving sensory therapy, in conjunction with his/her regular programming, show a positive behavior change in a predetermined target behavior?

*Definition of Terms:*

*Autism-* autism means a developmental disability significantly affecting a child's social interaction and verbal and non-verbal communication, generally evident before age 3, that adversely affect learning and educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences. The term does not apply if a child's educational performance is adversely affected primarily because the child has an emotional disturbance (Wisconsin Department of Public Instruction, 2005).

*Pervasive Developmental Disorder (PDD)-* Pervasive Developmental Disorders are characterized by severe and pervasive impairment in several areas of development: social interaction skills; communication skills; or the presence of stereotyped behavior, interests, and activities (DSM-IV-TR, 2000, p.69).

*Sensory Diet-* the therapeutic use of sensation incorporated into daily activities (Wilbarger & Wilbarger, 1991).

*Sensory Integration-* The neurological process that organizes sensation from one's own body and from the environment and makes it possible to use the body effectively within

the environment; the entire sequence of central nervous system events from reception to the display of an adaptive environmental interaction (Bundy, Lane & Murray, 2002).

*Sensory Integrative Based Therapy-* A program of intervention involving meaningful Therapeutic activities characterized by enhanced by sensation, especially tactile, vestibular, and proprioceptive active participation, and adaptive interaction (Bundy, Lane & Murray, 2002).

*Sensory Integrative Dysfunction-* Difficulty with CNS processing of sensation, especially vestibular, tactile, or proprioceptive, which is manifested as poor praxis, poor modulation, or both.

*Single-Subject Research Design-* A study on one subject which measures the effect of an independent variable on a dependent variable, the subject (Kerr & Nelson, 2002).

### *Limitations of Study*

The proposed study will be a single-subject design. Sensory therapy will be applied as an intervention to a single child and measurement of behavior change will be conducted. Therefore, the results will be difficult to generalize to other autistic children. However, the study can still serve as a framework for measuring the success of interventions with autistic children.

Other limitations may include breaks in the quantitative data collection due to school vacations, the child being sick, examiner not being present daily, etc. Although these external variables cannot be controlled, they should be taken into consideration when analyzing the final results. Because of these factors, the reliability and validity of the study may be altered.

### *Methodology*

This literature review will outline current information, historical perspectives, and recent research on two major constructs: sensory integration (SI) theory and autism. The interaction of

both these constructs will also be examined as a discussion of how SI theory can help in the development of interventions for autism is explored. Furthermore, a single-subject study is proposed which could measure the effectiveness of instituting a “sensory diet” into the existing treatment plan of a child with autism or PDD.

## Chapter II: Literature Review

### *Sensory Integration Theory*

#### *Review of Sensory Integration Theory and Intervention*

Sensory Integration (SI) is defined as “the neurological processes that organizes sensation from one’s own body and from the environment and makes it possible to use the body effectively within the environment” (Bundy, Lane & Murray, 2002). Sensory Integration is the way human brains interpret and organize information from the senses and allows people to use that information to function in their world. One cannot see sensory integration being observed as it is taking place in the brain. Instead, we can only look at the product or outcome, which is the behavior or mood change a child exhibits as he/she is integrating or organizing sensory input from the environment. It is said that “we hypothesize that it occurs on the basis of evidence from neuroscience. However, although we observe deficits in behavior, we only hypothesize that these deficits are the result of poor sensory integration” (Bundy, et al. 2002, p. 3). In other words, people are able to see the results of how effectively someone is integrating sensory input by examining the behavior exhibited.

Human senses include the commonly known systems of touch (tactile), taste (gustatory), sight (visual), sound (auditory), and smell (olfactory) (Dimatties & Sammons, 2003). However, there are also two other senses which are quite powerful in nature: vestibular, which includes movement and balance, and proprioception, which includes joint and muscle senses (2003). According to SI theory, behavior and learning are optimized when input from these senses are being effectively organized by the brain.

Sensory integration dysfunction is commonly defined as the "inability to modulate, discriminate, coordinate or organize sensation adaptively” (DiMatties & Sammons, 2003).

Certain signs of a sensory integration dysfunction include, but are not limited to, hyper-or hypo-sensitivity to touch, poor coordination, and poor behavioral control (Ramirez, 1998). For example, a child with autism who has sensory dysfunction may not have the same response to touch, taste, and sounds that a normally developing child has. Often times an autistic child may become irritated with the noise of the television in the background and complain the television too loud, even though others believe it is at a comfortable volume. "Sensory Dysfunction is widely believed to affect individual's performance in daily life roles and tasks" (Bundy, et al. 2002, p. 169). Even though sensory dysfunction affects the child on a regular basis, the type of sensory issues he/she experiences may be different day to day.

Persons who struggle with sensory dysfunction often receive therapy to overcome their difficulties. Therapists engage clients in sensory activities which illicit positive responses (Bundy, et al. 2002). The response could be any type of reaction from the child, such as an unexpected interaction, a change in temperament, an ability to concentrate on a task, initiation of an activity, or simply a laugh. The sensory activities can vary from a bear hug, trying foods, looking through a telescope, listening to music, or smelling something new. The goal of intervention based on SI theory is to engage the child in an activity that produces a positive response and allows him/her to change a negative behavior and optimize learning.

If one were to envision this in a schematic representation, there would be a continuous circle of treatment. It starts with the sensory intake, as mentioned in examples above, which leads to the central nervous system processing. The child's brain then plans and organizes the behavior, leading to the output (or learning). The output then yields a response or feedback (Bundy, et al. 2002, p. 5).

### *History and Development of Sensory Integration Theory*

Sensory Integration Theory was developed over 25 years ago by an occupational therapist named A. Jean Ayres in order to “explain the relationship between deficits in interpreting sensation from the body and the environment and difficulties with academic or motor learning” (Bundy, et al., 2002, p.3). She not only was an occupational therapist, but had advanced training in neuroscience and educational psychology (Dimatties & Sammons, 2003). In 1975, Ayres began to examine the integration of vestibular stimulation with other sensory input in adults. She was highly criticized by many in her field for it, but published her research anyway (Bundy, et al. 2002). Through many years working with this assessment, the theory we now call Sensory Integration was born. Ayres believed that the results of her studies provided initial support for her hypothesis that improving sensory integration resulted in enhanced learning for those utilizing it as an intervention, especially for those with children with learning disabilities and sensory integrative dysfunction as well as those with auditory-language problems (2002). Also, she concluded from the results of these studies were valid in her belief of her hypothesis that “improving sensory integration resulted in enhanced learning” (Bundy, et al., 2002, p. 21).

### *Research on SI and Efficacy of Interventions*

Research on interventions based on SI theory illustrates their effectiveness. Below describes four studies which demonstrate the usefulness of sensory therapy on persons with sensory dysfunction.

A case study done by Case-Smith and Bryan (1999), explored the effectiveness of sensory integrative treatment on the play and social interaction behaviors of autistic preschoolers. The researchers’ goal was to provide evidence which shows sensory therapy is effective with autistic preschoolers. This was an AB single subject design. During three weeks

of baseline and 10 weeks of intervention, four five-year-old males and one four-year-old male were videotaped during their free play to measure their social interaction behaviors. During the intervention phase, therapy was facilitated by an experienced and certified sensory integration therapist. One child left at eight weeks due to uncontrollable events. The results found that two of the remaining four boys “displayed significant increases on measures of adult interaction” (1999). The authors linked sensory integration with positive behavioral changes for autistic children.

Ottensbacher (1982) used a literature review process to examine 49 studies which measured the effectiveness of sensory integration therapy. Of the 49 studies, eight of these studies met the following criteria and were used for further analysis: (a) they investigated the effect of sensory integration therapy; (b) they included dependent measures of academic achievement, motor or reflex performance, and/or language function; (c) they included a comparison between at least two groups; and (d) they reported quantitative results of the effect of sensory integration therapy. The eight studies contained a total of 47 statistical hypotheses that evaluated the effectiveness of sensory integration therapy. After analysis of these tests was measured using quantitative reviewing methods, the results revealed that subjects participating in sensory integration therapy performed significantly better than members in the control groups who did not receive sensory integration therapy (1982).

A study conducted by Linderman and Stewart (1999), examined the efficacy of sensory integrative approaches and treatments on the behaviors of children with PDD. These behaviors included: social interaction, functional communication during meal times, approach to new activities, response to holding, and response to movement. A single subject AB design using two preschool-aged males was conducted using direct observation and parent interviews to measure

the affects of sensory integration treatment on functional behaviors at home. The results concluded that both subjects showed significant improvements and had increases in the following areas: spontaneous speech, purposeful play, attention to activities and conversation. The frequency of disruptive behaviors such as aggressiveness appeared to decrease as well. Even though the researchers could not control extraneous variables, such as other interventions, they still contend, “this investigation reveals the positive effects of sensory integration therapy for children with autism” (1999). Replication of this study is needed for future generalization.

Another study, by Vargas and Camilli (1999), used meta-analysis to examine 16 studies which researched the efficacy of sensory therapy and alternative treatments. Considering many factors, the results concluded that when comparing sensory integration effects to no treatment at all, the sensory integration was more effective in earlier studies than later studies. When comparing sensory integration to alternative treatments, there was not a significant difference between treatments. In other words, alternative methods were just as effective as interventions based on SI theory (1999).

#### *Boundaries of the Theory and Current Views*

Ayres’ theory was criticized early in its development and still continues to have boundaries today. Much of the criticism stems from the fact that SI theory can’t explain “why” positive changes happen within a child when given sensory therapy, even though the behavioral outcomes are good. Sensory Integration was originally developed to “describe the difficulties of a particular group of individuals” (Bundy, et al., 2002, p. 12).

Furthermore, it is possible that as sensory integration has grown in popularity, the applications of it may be used in ways that exceed the theory. Some say that the term sensory integration is sometimes used inappropriately where intervention is concerned (Bundy et.al,

2002). When looking at the functions of the brain, it is easy to misinterpret the theory. Ayres originally hypothesized that sensory integration dysfunction was related to the central nervous system processing of sensation and not intended to explain the neuromotor deficits. When speaking of the vestibular and proprioception senses, this can easily be misconstrued since they primarily deal with movement (Bundy, et.al, 2002).

Sensory integration theory is primary focused on children, and although many in the field may assume it is still only for children, it also can be applied to adults who continue dysfunction from childhood. This is a possible limitation because it is not meant to deal with adult-onset deficits in general.

One other possible misinterpretation of SI therapy is that some believe it is a single tool to utilize when working with children with sensory deficit issues. This is not the case however. SI is meant to be used in an already existing therapy program or treatment plan for a child. It should be used in conjunction with behavioral therapy and academic support.

### *Autism*

Therapy based on SI theory is often used to treat certain characteristics of autism. By definition, “Autism is one of the pervasive developmental disorders, which are characterized by an impairment in the development of reciprocal social and communicative skills, abnormal language development, and a restricted repertoire of behaviors and interests” (Mash & Barkely, 1996, pp.311). Autistic disorder is the most widely known of all of the PDD (or Pervasive Developmental Disorder) spectrum disorders (Batshaw, 2002).

### *Characteristics and Diagnosis*

Basic characteristics that define autism include the following: difficulty developing relationships with people; delayed speech acquisition and inability to use speech once it

develops; repetitive and stereotypical behaviors; lack of imagination; good rote memory; obsessive insistence on sameness of routine; normal physical appearance (Turnbull, Turnbull, Shank & Leal, 1995).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (2000), the diagnostic criteria for autistic disorder is laid out more clearly in three groups. Group One includes the following: “marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction; failure to develop peer relationships appropriate to developmental level; a lack of spontaneous seeking to share enjoyment, interests or achievements with other people; lack of social or emotional reciprocity” (p.369). In Group Two the following characteristics are included: “delay in, or total lack of the development of spoken language; marked impairment in the ability to initiate or sustain a conversation with others (in those who have adequate language); stereotyped and repetitive use of language or idiosyncratic language; lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level” (p. 369). Finally, Group Three includes the following: “encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus; apparently inflexible adherence to specific nonfunctional routines or rituals; stereotyped and repetitive motor mannerisms; persistent preoccupation with parts of objects” (p.369).

In order to meet the criteria for diagnosis, one must meet a total of six or more items from these three groups/lists. In addition, delays or abnormal functioning prior to the age of three must be met in at least one of these areas: social interaction, language as used in social communication, and symbolic or imaginative play (2000). Lastly, Rett disorder and childhood disintegrative disorder must be ruled out as causes of the symptoms.

From another perspective, the Wisconsin Department of Public Instruction (DPI) sets the following criteria for autism: “a developmental disability significantly affecting a child’s social interaction and verbal and non-verbal communication, generally evident before the age of three that adversely affects learning and educational performance.” It also goes on to state more specific characteristics often associated with the disorder, including “engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences” (2005).

Even though a criterion has been set for a diagnosis of autism, autism is a multidimensional disorder. Characteristics vary greatly from one person to another. Often the term autism is associated with children with many behavior problems or someone who has a very specific talent in one specialized area. These may be true to someone with autism, but may not be the case for all. Some children are very high functioning and one may not be able to tell that they have the disorder.

When making a diagnosis of autism, there are many factors to be considered. It has to be based on both the history of the child and current functioning (Batshaw, 2002). Most children who are identified are recognized prior to age three, as the symptoms and characteristics usually come to the surface by this time. However, many children are not diagnosed until later in their elementary years, which can be detrimental to their long-term future and treatments.

### *Etiology*

While the causes of autism are not fully known, there are many speculations and research on the etiology. “It now appears clear that PDD’s are the product of developmental brain abnormalities with a significant genetic influence” (Batshaw, 2002, p.371). It was previously believed that the causes were attributed to parenting styles, environmental circumstances,

vaccinations, and social learning. It is unlikely that autism is a result of maternal stress, poor nutrition, or an infection of some sort (Batshaw, 2002).

Genetics, perhaps, play the largest role in the onset of autism. Research on family studies, especially with a direct correlation between twins, is convincing. The evidence shows that “the rate of autism is much greater among identical twins (70-90%) than among fraternal twins, as well as the rate being much higher among siblings of children with autism than the general population” (Batshaw, 2002, p. 371). In many epidemiological studies, the pooled frequency of autism in siblings with autism was approximately three percent, which is 50 times greater than the prevalence in the general population (Mash & Barkely, 1996). In addition to this, the risk increases for those parents who have previously had a child diagnosed with the disorder to have a second child diagnosed (Batshaw, 2002).

Research which studies the brains of those who have died with autism shows abnormalities in the cerebellum and cerebral cortex (Turnbull, Turnbull, Shank & Leal, 1995). There is also reason to believe that some imbalances occur within the brains of these individuals in relation to neurotransmitters, in particular serotonin. The levels of serotonin are typically higher in the brains of those with autism, as compared to those without autism (1995). However, although this has been examined by researchers, along with other possibilities like dopamine and norepinephrine, the results are inconsistent due to methodological differences (Mash & Barkely, 1996). In exploring the most recent research, the push is toward the biomedical model when looking at the causes of PDD and/or autism.

### *Prevalence*

The Department of Public Instruction (DPI) provides data on the prevalence of autism. In 1992-93, the number of autistic children receiving special education in the state of Wisconsin

was 203 (2005). By 1997 it had risen to 1,052, and currently (the 2003-2004 school year), there are approximately 3,669 children who receive services under the autism label. The numbers have increased at a rapid pace within the last decade. This increase was partly due to the fact that prior to 1992, autism was not solely identified but served under other existing disabilities labels: cognitive disability, emotional behavioral disability, other health impairment, specific learning disability, and/or speech language disability (2005). Other reasons for this steady increase are not known, although there is continuous research being done.

Males are more often diagnosed than females with PDD or autism, with approximately three or four males for every one female (Mash & Barkely, 1996). The reasons as to why this is so are unknown and more research is being done to discover links. Females diagnosed with autism tend to have an increased number of symptoms, but autistic males' symptoms tend to be more severe (1996).

### *Intervention*

There are proven effective in-home and school therapy programs for autistic children. The long-term prognosis for an autistic child is very good when an intervention is implemented soon after diagnosis and in the early years of a child's life. "With the advent of better diagnostic instruments and a better ability to recognize autism within the first two years of life, there will be a greater demand for interventions designed for toddlers and preschoolers" (Mash & Barkley, 1996). Early signs of sensory impairments need to be treated "because a child with sensory integration dysfunction cannot automatically compensate for the inadequacies on their own" (Ramirez, 1998, p. 10). A child's sensory issues should not be seen as a problem at home or school but rather as a dysfunction which should be evaluated and treated by a professional

(1998). A child will need support from caregivers, teachers, and occupational therapists once the treatment is underway.

Many existing programs such as the Wisconsin Early Autism Project (2005), concentrate on an extremely intensive in-home technique centered on the child. This consists of routine and structure, dependent on the age and severity of the diagnosed child, and it is based on the Lovaas principles of therapy for young children with autism (Connor, 2003). Other behavioral programming is available to autistic children around the state, as well as the country. These include: the Early Intensive Behavioral Intervention (EIBI), Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH), and Applied Behavior Analysis (ABA). Other programs such as “Early On” stem off of this framework and have been established in schools, Head Start Centers, and daycares for children on the PDD spectrum. Common to all of these programs is the emphasis on early intervention and one-on-one attention.

Other simple interventions include environmental modifications. Some experts suggest reducing distracting visual materials from the classroom and/or child’s bedroom at home (Dimatties & Sammons, 2003). Others suggest adapting the child’s daily routines to avoid stressful activities and altering how others interact with the child as to reduce irritating stimulation (Wilbarger & Wilbarger, 1991).

“Children with PDD are frequently thought to have abnormal processing of sensory information” (Bundy, Lane & Murray, 2002, p. 13). Therefore, sensory activities and therapy are often used with children with autism. Studies thus far on this population are limited because of their emphasis on single case research. However, the limited research which is available is positive (2002). “Some of the findings ranged from decreases in tension and anxiety or self-

stimulatory behavior to increases in social interaction, new approach to activities child engages in and being more receptive to holding, hugging and movement by others” (2002, p. 13).

From an intervention standpoint, SI would be most easily incorporated as sensorimotor activities. These activities, which concentrate on the five senses (touch-pressure, olfactory, visual, vestibular and auditory), would be “applied to, rather than sought by, the individual” (Bundy, Lane & Murray, 2002, p. 13). In other words, the sensations are appropriately given to the child before he/she needs to seek them inappropriately. This can be most easily accomplished through the “sensory diet” discussed earlier. Sensory activities are added or modified throughout the child’s day while the existing treatment plan continues to be implemented.

### Chapter III: Methods

The following is a proposed study which could be used to measure the effectiveness of instituting a “sensory diet” into the existing treatment plan of a child with autism or PDD. The purpose is to identify whether this mode of treatment is a successful intervention. The details for selecting a subject, the research design, and the data collection and analysis techniques will be outlined.

#### *Subject*

The proposed study will utilize a single-subject design. It will be carried out in an elementary school in Minnesota or Wisconsin where the researcher has been placed for her internship in school psychology. Through a memo, the researcher will ask the building special education teachers for nominations of students who they feel would be a good choice for this study. (See Appendix A.) The nominated children will have to meet the following criteria: he/she must have an autism or PDD spectrum label, must be receiving special education services in some capacity, must exhibit some behavioral challenges (examples may include, but are not limited to, inappropriately touching peers or teacher/aggression toward others, exiting seat often to cause a distraction to others, speaking too loudly or talking at inappropriate times, outbursts during transitions, avoidance of social interactions, etc.), and must appear to have difficulties with sensory dysfunction. Sensory dysfunction in the classroom may appear in behaviors such as the following: an inappropriate amount of touch-seeking or not wanting to be touched at all; unresponsive to trying new things that involve a sense in any way (ie. not wanting a birthday treat that someone brings because they do not want to try it); and exaggerated responses to sounds or visual stimuli that other children do not display. These are merely examples of what a child with sensory dysfunction may show; other behaviors may also be evident.

After the special education teachers have nominated students for the study, the researcher will randomly select a subject for the research. The child's parent(s) will be contacted for written consent, and no research will be done until permission is granted by the parent, school administrator, and Stout's Human Subject Review Committee.

### *Research Design and Data Collection*

The first step to this research study is to operationalize several target behaviors in which the subject's special education teacher feels he/she most struggles with. In order to operationalize these behaviors, the researcher will conduct an interview with the teacher to determine what difficult behaviors he/she displays. (See Appendix B.) From there, the researcher will define the behavior in measurable terms. The purpose of operationalizing target behaviors is so the researcher is able to measure changes in these behaviors throughout the study.

A reversal design (ABAB) will be used to measure the effects of the intervention on the single subject.

“A reversal design (ABAB design) is a single-subject research design in which an intervention condition is reversed in order to verify the existence of a functional relationship; its four phases include baseline (A), intervention (B), contratherapeutic reversal of intervention, which may be similar but is not identical to baseline (C), and reinstatement of intervention (B)” (Kerr and Nelson, 2002 p. 459).

By discontinuing the intervention in the third phase and returning to baseline, the researcher replicates the study. This is needed in order to determine whether the intervention is truly having an affect on the behaviors it is being used to change. This may also be referred to as “reversal-replication design and is so named because it includes a reversal to baseline conditions followed by a replication of the treatment phase” (Martin & Pear, 1999).

The first phase, ‘A,’ is a baseline. It is an observation period without any intervention. The ‘B’ phase is a treatment phase where the subject will be involved in the sensory diet

approach. The third phase, 'A,' is a second baseline, and the final phase, 'B,' is a second treatment phase. This type of design was selected for this particular study due to the simplicity of not needed to change the intervention through either of the treatment phases. Furthermore, it will show whether the sensory diet changes the behavior, even though other external variables may be present.

During the treatment phases, the sensory integration techniques will be implemented by a professional trained in the techniques chosen for the child's sensory diet. This will likely be the child's special education teacher or aide. The specific techniques used cannot be selected until the child's needs are identified. However, as a sensory diet prescribes, there will be several times during the subject's school day in which the subject will be involved in sensory activities which are specific to his/her needs.

Data will be collected through all four phases by measuring the target behaviors. Observations of the child will be done by the researcher. The researcher will stay unknown to the child as to eliminate the Hawthorne Effect (Crowl, 1993). The researcher will also not give any attention to other students in the classroom to eliminate the John Henry Effect (Crowl, 1993).

An interval recording observation system will be used to measure the target behaviors during all four phases of the ABAB design due to the fact that the child's behaviors may be discrete or continuous. (See Appendix C.) The researcher will use an interval recording system in the classroom three times per week for one hour. Decisions on when to observe will be based on when the teacher reports the child has the most difficult time with behavior.

Furthermore, interviews with the child's parents and teachers will provide narrative data which can be used to as qualitative measures of behavior change. This information can be used to support or negate the observation data.

### *Data Analysis*

Once the quantitative data has been collected by direct observation and measurement of the target behaviors, it will be analyzed by the researcher in partnership with her advisor. The information gathered from the interval observation system will be graphed. (See Appendix D.) Graphing the data will help determine whether the intervention of sensory diet was beneficial to the child. If the behavior improves during both treatment phases, the sensory diet can be determined responsible for the behavior change and be deemed effective. Percentage of behavior change will be calculated between the four phases.

### *Summary*

Components of a methodology, which can determine behavior change in an autistic child, have been outlined. After data analysis is completed, there will be evidence to determine whether the intervention of a sensory diet was successful. It will be difficult to generalize this data to other children since the methodology is a single-subject design and because children with these disorders are so different from one another. However, research on behavior change is often done through case study designs. Furthermore, it can provide special education teachers and other staff a framework for measuring behavior change when applying interventions for sensory dysfunction, and it can provide the staff with knowledge and methods of working with these children.

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Appendix A: Memo to Teachers/Staff for Nominations of Subjects

**To: Staff and Teachers**

**From: Sara H. Gardner, School Psychologist**

**Date:**

**Re: Research Study**

I am seeking an elementary-aged student to be the subject of my research project to complete my Education Specialist degree. I am asking special education teachers to nominate a student to be part of the study. This study will examine the effects of sensory integration therapy utilizing a sensory diet for an autistic child.

If you have a student in your classroom who may benefit from the study and would like to nominate him/her, please be sure he/she meets the following criteria:

- The student must have an autism or a PDD spectrum label.
- The student must be receiving special education services.
- The child must exhibit some behavioral challenges. Examples may include, but are not limited to, inappropriately touching peers or teacher, exiting seat often to cause a distraction to others, speaking too loudly or talking at inappropriate times, outbursts during transitions, avoidance of social interactions, etc.
- The child must also appear to have difficulties with sensory dysfunction. Sensory dysfunction in the classroom may appear in certain unusual behaviors such as: an inappropriate amount of touch-seeking or not wanting to be touched at all; unresponsive to trying new things that involve the senses in any way (ie. not wanting a birthday treat that someone brings because they don't want to try it); and exaggerated responses to sounds or visual stimuli that other children don't display. These are only some examples of what a child with sensory dysfunction can show. Many other similar behaviors may also be evident in addition to these or others are present.

Once students are nominated for the study, one will be selected randomly to undergo the intervention. If a student from your classroom is selected, I will be in the classroom to observe and measure behaviors for one hour 3 times per week during times you designate as particularly difficult for the child. It is also possible that you will be involved in implementing some of the sensory techniques with the child. If this is not something you are willing to participate in, please do not nominate a student.

Please see me if you have any questions before making a nomination. Thank you so much for taking the time to read this and for your consideration.

Sara H. Gardner, School Psychologist

## Appendix B: Teacher Interview Form

Teacher \_\_\_\_\_  
Consultant \_\_\_\_\_  
Date \_\_\_\_\_  
Student \_\_\_\_\_

1. Can you describe in detail to me in your own words what the problem behavior(s) seem to be?
  
  
  
  
  
  
  
  
  
  
2. Could you be more specific with the general behaviors you just listed?
  
  
  
  
  
  
  
  
  
  
3. How often do these behaviors take place every day and if so, what times of the day?
  
  
  
  
  
  
  
  
  
  
4. (If no) Would you say these behaviors happen every week, every other week?
  
  
  
  
  
  
  
  
  
  
5. Does there seem to be a pattern regarding when the behavior (s) occur?
  
  
  
  
  
  
  
  
  
  
6. Is there anything else you can tell me about these behaviors or this student?
  
  
  
  
  
  
  
  
  
  
7. Do you have any questions regarding what the intervention will look like more specifically?

(Form devised from model in Kerr & Nelson text, 2002, p. 53)

## Appendix C: Sample Interval Recording Form

Student \_\_\_\_\_ Grade \_\_\_\_\_ Observer \_\_\_\_\_

Week of \_\_\_\_\_ Activity \_\_\_\_\_ Teacher \_\_\_\_\_

Session \_\_\_\_\_ Time Started \_\_\_\_\_

Design Phase A B A B (circle one)

Target Behavior \_\_\_\_\_

Observation #1 Date \_\_\_\_\_

Minutes

5 10 15 20 25 30 35 40 45 50 55 60

--	--	--	--	--	--	--	--	--	--	--	--	--

Observation #2 Date \_\_\_\_\_

Minutes

5 10 15 20 25 30 35 40 45 50 55 60

--	--	--	--	--	--	--	--	--	--	--	--	--

Observation #3 Date \_\_\_\_\_

Minutes

5 10 15 20 25 30 35 40 45 50 55 60

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+ = Behavior exhibited during interval

- = Behavior not exhibited during interval

Appendix D: Graph template of ABAB data

### Observation Data from ABAB Design

