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Effect Of Sensory Stimulation On Off-Task Behavior In Children Within The Autistic Spectrum

Erin Elizabeth Downs
Eastern Illinois University

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The Effect of Sensory Stimulation on Off-Task

Behavior in Children within the Autistic Spectrum
(TITLE)

BY

Erin Elizabeth Downs

THESIS

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11/1/04 DATE	THESIS COMMITTEE MEMBER Lynn Wilkerson, M.S., CCC-SLP/A

ABSTRACT

Sensory Integration is the ability to organize sensations for use. Sensory Integration Dysfunction occurs when an individual is unable to efficiently process information received through the senses. If the sensory system becomes overwhelmed and/or confused, sensory defensiveness may occur. Behavior problems can be a neurological response resulting from the sensory system reacting defensively to information the brain and body cannot accurately interpret (Richard, 1997).

Appropriate sensory integration implies a normal functioning neurology during early development. Any disruption during the preschool development years can result in a sensory integration dysfunction. Autistic Spectrum Disorder (ASD) is an example of a syndrome disorder in which individuals frequently exhibit sensory integration dysfunction. The communication deficits that most children within ASD experience result in an inability to accurately communicate sensory needs due to the poor organization of sensory input they are experiencing.

According to Ayres (1979), the sensory processing deficits evidenced in children with autism result in a sequence or events leading to disruptive behavior. Neurologically, sensory input is registered through either a hypo- or hyper- reactive response because the sensory input is not modulated correctly; a defensive reaction to the stimuli is triggered. Consequently, the sensory input results in a negative behavioral response from the child. Based on Ayres theory, off task behavior in children with autism may be directly related to sensory deviation and confusion (Ayres, 1979).

This study evaluated the effect of sensory stimulation provided before speech-language therapy on off-task behavior in three male children within the autistic spectrum.

Each child was assigned a different schedule of days in which they received five minutes of alerting, calming or no sensory stimulation. The days in which stimulation was provided, the clients received five minutes of sensory stimulation in the clinic's sensory room and then proceeded into the regular therapy room and speech-language treatment continued. On the days in which stimulation was withheld, the children went straight to the regular treatment room and participated in speech-language treatment.

An observable difference was noted in the response to sensory stimulation in two of the three subjects. These two subjects demonstrated fewer off-task behaviors following sensory stimulation and more following no sensory stimulation. However, the third subject had the opposite response. He demonstrated more off-task behaviors following sensory stimulation and fewer following no stimulation. There were many factors that may have contributed to this finding. First of all, children each have individual and distinctive neurological systems and no two are identical; therefore their responses will not always be the same, making it difficult to generalize results. Second, the children were all within the Autistic Spectrum, which suggests that neurological development was disrupted or significantly different at some point in time. This study concurred with previous research studies regarding the connection between sensory stimulation and off-task behavior. Overall, this study added to the modest amount of empirical research on this subject.

Acknowledgements

I would like to thank everyone involved with this project for making it a successful and extraordinary experience. I gained knowledge, insight, and enthusiasm for the field of speech-language pathology through each of you. I extend my greatest appreciation to my fellow students that assisted in my thesis through research, data collection and analysis. Thank you to my friends and family for their patience, understanding, and continuous support through phone calls, cards, and care packages. To Joy, my roommate and fellow "thesis girl", I never would have made it without you, your understanding and support, and most of all, our trips to Dairy Queen.

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The Effect of Sensory Stimulation on Off-Task Behavior in Children within the Autistic Spectrum

Erin Downs

Eastern Illinois University

Chapter I

Introduction

Sensory integration is the ability to organize sensations for use. Sensory Integration Dysfunction occurs when an individual is unable to efficiently process information received through the senses. If the sensory system becomes overwhelmed and/or confused, sensory defensiveness may occur. Behavior problems can be a neurological response resulting from the sensory system reacting defensively to information the brain and body cannot accurately interpret (Richard, 1997).

There are various forms of sensory stimulation, some of which are calming while others are alerting. Individuals have a sensory system unique unto themselves; what is calming for one person may be alerting or even disruptive to another. The resulting behavior evidenced in response to sensory overload is dependent upon the individual; an overload can result in a complete breakdown or an extreme disruption. For individuals with sensory integration difficulties, processing sensory information is not an automatic function; but requires consistent focus (Yack, Sutton & Aquilla, 1998).

Appropriate sensory integration implies a normal functioning neurology during early development. Any disruption during the preschool development years can result in a sensory integration dysfunction. Autistic Spectrum Disorder (ASD) is an example of a syndrome disorder in which individuals frequently exhibit sensory integration dysfunction. The communication deficits that most children within ASD experience result in an inability to accurately communicate sensory needs due to the poor organization of sensory input they are experiencing.

According to Ayres (1979), the sensory processing deficits evidenced in children with autism result in a sequence of events leading to disruptive behavior. Neurologically, sensory input is registered through either a hypo- or hyper- reactive response because the sensory input is not modulated correctly; a defensive reaction to the stimuli is triggered. Consequently, the sensory input results in a negative behavioral response from the child. Based on Ayres theory, off-task behavior in children with autism may be directly related to sensory deviation and confusion (Ayres, 1979).

In 1999, Mauer composed an overview of the theory and principles of sensory integration. The article looked at the characteristics of sensory integration dysfunction, assessment and treatment, and the impact SI has on learning and academic success. Mauer concluded that children with a sensory integration disorder often have disorganized, maladaptive interactions with the environment because of their inefficient sensory feedback. This leads to difficulties in general development, learning, and behavior, all which are dependent upon the organization of information and adaptation to information and situations. Mauer (1999) stated sensory integration therapy is theorized to facilitate development of language and interactions, as well as lay the groundwork for later, more complex language and behavioral management.

According to Mauer, clinical reports have found "...significant changes in behavior during and after therapy...increased language...improved social interactions and play...and increased ability to attend to the task (Mauer, 1999)." On the other hand, Mauer maintained that this type of intervention remains controversial and there are problems with the studies that have been conducted. Past studies have been criticized for small sample size, types of sensory integration used, inconsistent outcome and inconsistent definitions of dependent variables (Mauer, 1999).

In 1999, Griffer concurred with Mauer's criticism in regard to the evidence on the effectiveness of sensory integration in children with language-learning disorders. Griffer stated the diagnosis of sensory integration dysfunction must include evidence of central processing deficits in engaging the vestibular, tactile and/or proprioceptive sensory systems. According to Griffer, candidates for sensory integration include people across the age span and with a variety of disorders (Griffer, 1999).

Mauer (1999) and Griffer (1999) agreed that empirical evidence regarding sensory integration is limited, mixed, and inconclusive, demonstrating the need for more research evaluating the effectiveness of sensory integration. Research regarding the use of sensory integration within autistic spectrum disorders is minimal and conflicting. Informal observations and impressions are the primary basis of support for the use of sensory motor techniques. The lack of empirical evidence is further exacerbated by inconsistencies in methodology and research variables. Well-designed studies are needed in order to evaluate the effectiveness of sensory integration and its impact on various areas of development.

The present study was designed to measure the effect of sensory stimulation on off-task related behavior for individuals within the autistic spectrum. The following questions were addressed:

1. Is there a significant difference in the frequency of off-task behavior when sensory stimulation is provided versus withheld, in an individual with autism?

2. Is there a significant difference in off-task behaviors when the sensory stimulation provided is activating or calming to the individual?

CHAPTER II

Literature Review

Sensory Integration

Sensory integration is the ability to organize sensations for use. This ability is the basis for the successful development of one's motor abilities, attention, organization, interpersonal relationships, and language. People receive important information regarding the physical condition of their body and the environment from the senses. Immeasurable amounts of different sensory information enter the brain at every moment, from every place in our bodies (Ayres, 1979). Five steps of sensory integration development must occur for appropriate organization of sensory information.

The five steps of sensory integration development include sensory registration, orientation, interpretation, organization of a response, and execution of a response. Sensory registration is the first to occur, which happens when an individual becomes aware of sensory information. The second step is orientation which allows an individual to attend to the new sensory information that has registered. Interpretation is the third step, at which point the brain interprets the sensory information and its qualities. Once the brain interprets the qualities of the sensory information, it determines if a response is necessary. If a response is necessary, the fifth step of execution occurs, in which the appropriate motor, emotional, or cognitive response is made. When these components are working properly, the sensory system is able to aid in the development of motor skills, attention, impulse control, emotional reaction, balance, as well as utilize sensory feedback (Yack, Sutton & Aquilla, 1998).

Sensory integration is a continuous process that builds and relies on previous stages of sensory development to achieve more complex developmental processes. In normally developing children, this complex system is in place by the time a child enters preschool. There are four levels in the development of appropriate sensory integration. The first, most basic level, is the primary sensory system. The primary system is generally developed by two months of age and includes the development of the tactile, vestibular, proprioceptive, visual and auditory senses. The second level involves the perceptual-motor foundations of the sensory system. This is developed by one year of age and includes body awareness, bilateral coordination, motor planning and lateralization. The third level involves the perceptual-motor skills of one's sensory system. This level is developed by three years of age and entails purposeful activity, visual-motor integration, eye-hand coordination, and visual and auditory perception. The fourth and final level of sensory integration is developed by six years of age and engages academic skills, regulation of attention, organized behavior, visualization, complex motor skills, self-esteem, self-control, and specialization of the body and brain (Kranowitz, 1998).

Sensory integration can be divided into the following seven sensory systems: tactile, vestibular (balance and movement), proprioception (body position), visual, auditory, gustatory (taste), and olfactory (smell). The tactile system relays information about one's surroundings and characteristics of objects. The vestibular system reports on information regarding balance and movement. The third system is proprioception, which includes body awareness (i.e., where body parts are located and if they are moving). The visual system relays information regarding people and objects. The visual system also aids in identifying boundaries in space. The auditory system supplies information regarding sounds in the environment. This system alerts individuals as to whether a sound is near, far, loud, or soft. The gustatory system indicates different tastes, such as sweet, sour, bitter, and salty. The olfactory system allows individuals to receive information about various smells, such as pungent, musty, putrid, or flowery (Ayres, 1979).

Sensory Integration Dysfunction

Sensory Integration Dysfunction occurs when an individual is unable to efficiently process information received through the senses. Dysfunction occurs when the five-step sensory integration development process is disrupted. There may be an inefficient intake of sensory information, neurological disorganization of the sensory information and/or inefficient/inappropriate responsive output (Kranowitz, 1998).

Sensory integration dysfunction indicates a problem in the central nervous system. The reticular formation functions as a sensory screen for incoming sensory stimuli. Sensory information that requires higher-level processing is sent to the cortex via the reticular formation. The reticular formation is also responsible for arousal of the cortex by alerting it to incoming sensory information. After the cortex is alerted and aroused, the information can be processed and meaning attached (Richard, 1997). When there is a problem with the reticular formation, the brain is unable to evaluate, classify, and integrate sensory messages. This results in an individual having difficulty responding to sensory information in a meaningful way. When an individual's sensory system is unable to correctly process sensory information, it cannot function efficiently (Kranowitz, 1998).

If the sensory system becomes overwhelmed and/or confused, sensory defensiveness may occur. Behavior problems can be a neurological response resulting from the sensory system reacting defensively to information the brain and body cannot accurately interpret (Richard, 1997). "The brain-behavior connection is very strong. Because the child with SI Dysfunction has a disorganized brain, many aspects of behavior are disorganized. For the out-of-sync child, performing ordinary tasks and responding to everyday events can be enormously challenging. The inability to function smoothly is not because the child won't, but because he can't (Kranowitz, 1998)."

A sensory evaluation generally consists of medical history, developmental history, observations, interviews with caregivers and a standardized evaluation of the sensory integrative function level with a test such as the Sensory Integration and Praxis Test (SIPT) (Mauer, 1999). This evaluation is beneficial in determining the best form of sensory integration for each individual. The goal of sensory integration therapy is to reach a level of comfort for the individual, as well as a level conducive to productive behavior and learning. Due to the multiple areas impacted by sensory integration dysfunction, it is imperative that team planning be utilized to meet the physical health, communication, and educational needs of each child.

Sensory integration is a continuous process; each level of integration makes it possible for the next level to occur. The process continues throughout one's lifetime. It is vital for self-care, play, and work. Individuals with normal sensory systems organize and apply sensory information instinctively. For individuals with sensory integration difficulties, processing sensory information is not an automatic function; but requires consistent focus (Yack, Sutton & Aquilla, 1998).

Individuals with sensory integration dysfunction may exhibit a variety of symptoms. For example, if there is vestibular system dysfunction, individuals may appear apprehensive around playground equipment, kites, or stairs. They may become ill in cars or elevators, avoid balancing activities, and/or seek fast moving activities. If there is a tactile system dysfunction, the individual may avoid touch, become irritated when wearing certain clothing or when someone is in close proximity. These individuals may explore objects with their hands or mouths, and may have problems maneuvering small objects (Yack, Sutton & Aquilla, 1998). A proprioceptive system dysfunction could result in an individual who applies too much or too little pressure when handling objects. They may enjoy rough and tumble play, and benefit from deep pressure massage. When there is visual system dysfunction, the individual may seem sensitive to strong sunlight and/or changes in lighting. These individuals may focus on shadows and reflections when others enter a room. When there is an auditory system dysfunction, a person may become upset when they hear loud and/or unexpected sounds. These individuals may also sing or hum in order to block out unwanted sounds. When individuals are experiencing difficulties with the olfactory and gustatory systems, they may crave or dislike strong smells or tastes, eat inedible foods, and might even smear feces (Yack, Sutton & Aquilla, 1998).

Autistic Spectrum Disorders

Appropriate sensory integration implies a normal functioning neurology during early development. Any disruption during the preschool development years can result in a sensory integration dysfunction. Autistic Spectrum Disorder (ASD) is an example of a syndrome disorder in which individuals frequently exhibit sensory integration dysfunction. The diagnostic criteria for ASD is under Axis One of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV, 1994). The disorders that are classified within ASD include Rett's, Autism, Asperger's, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified(DSM-IV, 1994). Each of the disorders listed under the autistic spectrum have specific diagnostic criteria. They are listed under the autistic spectrum because they share common characteristics of impaired social interaction, impaired communication, and/or stereotypic behaviors (Yack, Sutton & Aquilla, 1998). Diagnosis of the specific disorders mentioned above is a medical diagnosis based on observed characteristics. There are no genetic tests or blood tests available for these diagnoses; they are based on developmental information and clinical judgment.

Common characteristics evidenced in ASD include withdrawal, poor reality contact, delayed or splintered motor development, attention deficit, ritualism, poor identity concept, impaired social interaction, echolalia, perseveration, and self-stimulation (Richard, 1997). A lack of interest in peers, inability to show affection, limitations in speech and nonverbal communication, and sensorimotor deficits are additional characteristics of autism. Individuals within ASD display a range of abilities with some individuals functioning at a severely impaired cognitive level while others function at average or above average cognitive levels (Richard, 1997).

Individuals with ASD commonly display hypersensitivity or hyposensitivity to sensory information. Hypersensitivity is the over-registration of sensory information. Hyposensitivity is the under-registration of sensory information. For example, individuals with hypersensitivity to certain clothing may feel like sandpaper is rubbing against their skin, a ceiling fan may sound like fingernails on a chalkboard, and a hug from a parent may be unbearable. Other examples of hypersensitivity may be displayed in response to certain sounds, light, textures, smells, and/or tastes (Yack, Sutton & Aquilla, 1998).

Individuals experiencing hyposensitivity may be unaware when their name is verbalized or may not feel pain unless it is extreme. Additional examples of hyposensitivity to sensory information may be displayed by a disregard for sudden and/or loud noises, delayed responses, lack of attention to people, things, and the environment, and a lack of awareness to cuts and bruises (Kranowitz, 1998). While some individuals may seem unresponsive or hyposensitive to sensory stimulation, they may, in fact, be highly sensitive. The appearance of being hyposensitive is due to the nervous system shutting down to incoming sensory information as a protective mechanism. Individual responses to sensory stimulation can be inconsistent and vary from day to day (Yack, Sutton & Aquilla, 1998).

Sensory Integration Dysfunction and Autistic Spectrum Disorders

Individuals within the autistic spectrum who have a sensory integration dysfunction may demonstrate an inability to follow verbal directions and interact with others. This may be partially due to the individual becoming distracted by the form of sensory stimulation being received from the surrounding environment (Kranowitz, 1998). Individuals within the autistic spectrum with sensory integration dysfunction often become confused by new or unfamiliar sensations. As a coping strategy, they develop routines and rituals to maintain order in a world that is often overwhelming due to new and different sensations. Inappropriate behavioral and emotional responses often occur when individuals are confused or intimidated by unfamiliar sensory stimuli. For example, an individual may scream and cry uncontrollably when they hear a new unfamiliar sound or have to wear clothing made from an unfamiliar texture (Kranowitz, 1998).

Sensory Integration As Treatment

Sensory integration dysfunction occurs in a variety of developmental disorders. Therefore, sensory integration is a frequent component of intervention plans within a variety of developmental disabilities, such as learning disability, attention deficit disorders, pervasive developmental disorders, mental retardation, neurological impairment, as well as behavioral problems (Mauer, 1999). Sensory integration has become widely accepted as an intervention approach, but continues to be a source of controversy among professionals. Sensory integration treatment programs have little or no empirical support to substantiate the effectiveness of the treatment in a clinical population (Gresham, Beebe-Frankenberger & Macmillan, 1999). "The relevant research regarding this topic is limited and there are conflicting results among the studies that do exist"(Griffer, 1999).

Occupational therapists generally diagnose and treat sensory integration dysfunction. The development of speech and language is dependent upon several sensory processes. Because of this, it is becoming more apparent that speech-language pathologists (SLPs) must understand the normal sensory integration processes necessary to acquire and develop adequate communication abilities.

Sensory Integration As Treatment Within ASD

According to Prizant and Rubin (1999), there is broad variation among children with autism and their ability to organize their behavior and gain information from sensory stimulation. An important goal for young children is to participate as successful partners in social communication exchanges with their family and peers and for these exchanges to be emotionally fulfilling. Children vary in the support needed to achieve these goals. Consultation with occupational therapists suggest that sensory integration is an integral part of supporting a child's optimal state of attention, arousal, and emotional regulation. Intervention approaches must be individualized to a child's developmental level and learning strengths and weaknesses (Prizant & Rubin, 1999).

The communication deficits that most children within ASD experience result in an inability to accurately communicate sensory needs due to the poor organization of sensory input they are experiencing. According to Ayres (1979), the sensory processing deficits evidenced in children with autism result in a sequence of events leading to disruptive behavior. Neurologically, sensory input is registered through either a hypo- or hyper- reactive response because the sensory input is not modulated correctly; a defensive reaction to the stimuli is triggered. Consequently, the sensory input results in a negative behavioral response from the child. Based on Ayres theory, off-task behavior in children with autism may be directly related to sensory deviation and confusion (Ayres, 1979).

Sensory Integration Research

In 1978, DePauw conducted a study in which she examined the importance of sensory integration to students with aphasia. Aphasia is a specific learning disorder in which language is impaired or dysfunctional as a result of neurological defects or organic damage to the brain. The subjects in the study consisted of forty-two preschoolers, similar in age and disability with a diagnosis of aphasia. The subjects were pre-tested, using the perceptual motor section of the Southern California Sensory Integration Test (SCSIT) and clinical observations based on neurodevelopmental observations identified by Ayres in 1972. The subjects in the experimental group received a sensory integration program for twenty minutes a day for seven months. One control group received a regular remedial physical education program for twenty minutes a day for seven months and a second control group received neither program. The sensory integration program received by the experimental group consisted of sensory stimulation and motor activity (DePauw, 1978). The activities used were designed to stimulate the vestibular, tactile, and proprioceptive systems, as well as motor planning ability and motor development.

The results of the study indicated that students with aphasia benefited from sensory integration. Significant differences between pretest and posttest scores were noted on four tests for the experimental group, one test for the first control group, with no significant improvement found on any tests for the second control group. Aphasic students demonstrated a need for sensory integration in order to assist neurological and motor development, as well as lessen the impact of any perceptual deficits (DePauw, 1978). One limitation in the study was that only a portion of the SCSIT was given to the students pre and posttest. In order to have a legitimate diagnosis of sensory integration dysfunction, the entire test must be administered. However, the results of this study provide evidence that the sensorimotor program provided to the experimental group had an impact on the improvement of sensory integration in this group of students (DePauw, 1978).

In 1982, Ottenbacher conducted a study analyzing the effectiveness of sensory integration in children with learning disabilities, mental retardation, and a variety of other disabilities. A meta-analysis revealed sensory integration to be effective with a number of individuals. When analyzing motor performance and reflex functioning, twelve out of nineteen individuals demonstrated significant improvement in groups receiving sensory integration. When analyzing academic achievement, nine out of seventeen individuals in the sensory integration group demonstrated significant improvement in achievement levels.

In 1989, Densem, Nuthall, Bushnell, and Horn conducted a study on the effectiveness of a sensory integration program for children with perceptual-motor deficits. The subjects in this study consisted of fifty-five 5 to 10 year-old children who had been referred to a sensory integration program between August and February of 1982. Eighty-four percent of the children had been referred to the program because of perceptual-motor difficulties and thirty-three percent had been referred to the program because of learning disabilities. The majority of children in this study demonstrated difficulties in both areas (Densem, et. al., 1989). The subjects were randomly assigned to three groups: a sensory integrative experimental treatment group, a physical education control group, and a no-treatment control group. The children were assessed pre- and post- treatment on measures of perceptual-motor development, language development, reading development, self-concept, and handwriting skills. The treatment used with the experimental group focused on activities to improve balance, fine and gross motor skills, responsiveness to touch, motor movement planning, and integration of both sides of the body. The physical education control group focused on activities for fitness, the teaching and practice of physical skills, and games. The no treatment control group had no contact with the program between pre and post testing (Densem, et. al., 1989).

The results of this study indicated that the group receiving the sensory integration program did not demonstrate significantly greater gains in language, perceptual-motor development or handwriting than the control groups. A significant effect did result in the area of reading progress in children that could read at the time of pretesting (Densem, et. al., 1989).

In 1992, Wilson, Kaplan, Fellowes, Grunchy, and Faris compared the effectiveness of sensory integration to traditional tutoring in two hundred school–aged children. The children in the study all exhibited language and motor deficits. The Broad Cognitive Index, Reading & Perceptual Speed Clusters from the WJPEB was used to measure academic skills in the subjects. Results indicated no statistically significant treatment effects in the sensory integration group when compared to the traditional tutoring group. This suggests that sensory integration was no more effective than traditional tutoring in the remediation of academic difficulties.

In 1999, Mauer composed an overview of the theory and principles of sensory integration. The article looked at the characteristics of sensory integration dysfunction, assessment and treatment, and the impact SI has on learning and academic success. Mauer concluded that children with a sensory integration disorder often have disorganized, maladaptive interactions with the environment because of their inefficient sensory feedback. This leads to difficulties in general development, learning, and behavior, all which are dependent upon the organization of information and adaptation to information and situations.

Mauer (1999) reports that children with sensory integration dysfunction often demonstrate an inability to sustain appropriate attention and focus throughout activities. Children within the autistic spectrum display deficits in vestibular activities and often over or under respond to sensory information received, which can lead to problems in functional and/or play related activities. These behavioral characteristics are often thought to be related to the deficits in sensory integration. Mauer (1999) stated sensory integration therapy is theorized to facilitate development of language and interactions, as well as lay the groundwork for later, more complex language and behavioral management.

Mauer asserted that sensory integration therapy should focus on various types of stimulation to the vestibular, tactile, and proprioceptive systems. Sensory integration therapy should take into account the client's characteristics and level of sensory integrative dysfunction, appropriately challenging the interests of the child. Typically, the occupational therapist who implements sensory integration therapy is not targeting cognition, language or behavior; therefore, it is difficult to determine sensory integration's effect on these developmental areas. Nevertheless, Mauer stated some intervention studies have detected improvements in these areas after sensory integration therapy (1999). According to Mauer, clinical reports have found "...significant changes in behavior during and after therapy...increased language...improved social interactions and play...and increased ability to attend to the task (Mauer, 1999)." On the other hand, Mauer maintained this type of intervention remains controversial and there are problems with the studies that have been conducted. Past studies have been criticized for small sample size, types of sensory integration used, inconsistent outcome and inconsistent definitions of dependent variables (Mauer, 1999).

In 1999, Griffer concurred with Mauer's criticism in regard to the evidence on the effectiveness of sensory integration in children with language-learning disorders. Griffer contended that the diagnosis of sensory integration dysfunction must include evidence of central processing deficits in engaging the vestibular, tactile and proprioceptive sensory systems. According to Griffer, candidates for sensory integration include people across the age span and with a variety of disorders. Examples of candidates are individuals with cerebral palsy, mental retardation, learning disabilities, autism, pervasive developmental disorder and chronic psychosocial dysfunction (Griffer, 1999).

Based on Griffers review, empirical evidence supporting sensory integration therapy with children with language learning disorders is inconclusive and limited. Griffer states that more statistically powerful and methodologically sound studies are needed in this area of research (1999).

Mauer (1999) and Griffer (1999) concur that empirical evidence regarding sensory integration is limited, mixed, and inconclusive, demonstrates the need for more research evaluating the effectiveness of sensory integration. The inconsistent results reported in sensory integration studies may be due in part to the diversity of disorders, degrees of severity and deficits evidenced in subjects being evaluated in sensory integration group therapy.

Sensory Integration and ASD Research

In 1998, Linderman and Stewart conducted a single-subject research study to examine the effects of sensory integration based occupational therapy on functional behavior in children with Pervasive Developmental Disorder (PDD). The subjects included in the study were two boys and the areas assessed for each were based on their individual needs. Subject one was three years, nine months and exhibited symptoms of mild autism. The areas of social interaction, approach to new activities, and responses to holding and hugging were observed for subject one. Subject two was three years, two months and was diagnosed with autism. The areas of social interaction, functional communication, and responses to movement were observed for subject two. The study consisted of a baseline period followed by a treatment period. A sensory integrative therapy program was designed for the two subjects, based on their individual sensory needs. A variety of materials and activities were used during treatment (e. g., small trampoline, trapeze bar, swing, body socks, and textured toys). Each therapy session was child directed in order to allow them to gradually and comfortably explore new activities and experiences (Linderman & Stewart, 1998).

The results of this study demonstrated significant gains in both subjects in all areas with the exception of functional communication during mealtime for subject two. At baseline, neither subject demonstrated self-stimulation but both demonstrated frequently disruptive behavior. The occurrence and length of disruptive behaviors were reduced and progressed towards more functional behavior. The results of this study supported the use of sensory integration to attain and sustain functional, rather than disruptive behavior (Linderman & Stewart, 1998).

In 1999, Case-Smith and Bryan conducted a single-subject research study to examine the effects of sensory integration on preschool children with autism. One question addressed in the study was if the frequency of non-engaged behaviors decreased as a result of SI therapy. There were five subjects in the study, all between the ages of four to five years, three months. The subjects received one-on-one direct and consultative occupational therapy with an emphasis on sensory integration. Each therapy program was specifically designed to meet the needs of the child. Therapy was play centered and directed towards the child's interests with the use of a variety of materials and activities (e. g., bolster swings and brushing). The occupational therapist consulted with the preschool teacher and helped develop opportunities for sensory input in play activities in the preschool room (Case-Smith & Bryan, 1999).

Non-engaged behaviors were defined as aimless, stereotypic, and/or unfocused behavior. Results indicated that all but one subject demonstrated significantly reduced non-engaged behaviors during treatment. It should be noted that the subject who did not exhibit a significant decrease in non-engaged behaviors demonstrated the least amount of non-engaged behaviors at the beginning of the study. The children with tactile defensiveness were more likely to demonstrate repetitive behaviors associated with autism. This study suggests that children use self-stimulation to meet their needs and reach a state of balance. The sensory information may have been better integrated during treatment, resulting in a reduced number of non-engaged behaviors (Case-Smith & Bryan, 1999).

In 1999, Fertel-Daly, Bedell, and Hinojosa conducted a study examining the effects of a weighted vest on attention to task in preschool children with Pervasive

Developmental Disorder. Deep pressure stimulation (e. g., a weighted vest) is a form of tactile stimulation thought to calm individuals with PDD. The five subjects, ranging from two to fours years of age, had diagnoses of PDD with attention-to-task difficulties reported. The study measured focused attention to task, number of distractions, and the type of self-stimulatory behaviors observed during a five minute motor activity while wearing a weighted vest versus not (Fertel-Daly, Bedell, & Hinojosa, 1999).

All subjects demonstrated an increase in the length of focused attention while wearing a weighted vest. The extent to which the vest influenced attention to task varied among subjects. The attention to task was not sustained when the weighted vest was removed; all subjects showed a decrease in length of attention to task during the withdrawal phase. Although distractibility varied among the subjects, all of them showed a decrease in distraction while wearing the weighted vest. Four of the five subjects demonstrated a decrease in the duration of self-stimulatory behaviors while wearing the weighted vest and self-stimulatory behaviors increased in all subjects upon removal of the weighted vest (Fertel-Daly, Bedell, & Hinojosa, 1999). The results from this study offer a foundation for implementing sensory stimulation in children with PDD that demonstrate attention to task difficulty and self-stimulatory behaviors (Fertel-Daly, Bedell, & Hinojosa, 1999).

In 1999, Patterson conducted a study in which the effect of providing tactile stimulation was analyzed in relation to its effect on behavior. Behaviors examined included the frequency of off-task behaviors, extraneous physical behaviors, task-related and non-task-related verbalizations. Subjects in the study consisted of two school age males diagnosed with Pervasive Developmental Disorder (Autistic Spectrum Disorder) who demonstrated intelligence within the normal range. Data was collected during an activity in which a book was read, and receptive and expressive language questions pertaining to the book were asked. The form of tactile stimulation presented to the subjects was a stress ball. The stress ball was provided to the subjects in an alternating treatment design with a counterbalanced method of presentation in order to control for extraneous variables (Patterson, 1999).

Results indicated that the number of off-task behaviors for both subjects significantly decreased when tactile stimulation was provided versus unavailable. The frequency of extraneous physical behaviors in the presence of tactile stimulation also significantly decreased in both subjects. Results of this study suggested that sensory integration had a positive impact on behavior in children with Pervasive Developmental Disorder (Patterson, 1999).

In 2003, a pilot study was conducted in which the effects of sensory stimulation on a child with PDD were examined. The subject was a ten-year-old boy with a medical diagnosis of PDD with autistic characteristics and a severe receptive and expressive language delay. The subject received sensory stimulation for five minutes before speech and language therapy began. The treatment design alternated between calming sensory stimulation (lying in a ball pit), alerting sensory stimulation (jumping on a mini-trampoline), and no sensory stimulation, followed by forty-five minutes of speech and language therapy.

The results of this study indicated an observable difference between the type of sensory stimulation provided and amount of off-task behavior. The calming sensory stimulation produced the least amount of off-task behavior for the subject in this study, whereas the alerting sensory stimulation and no sensory stimulation resulted in similar amounts of off-task behavior. The results of this study suggest that calming sensory stimulation was more conducive to reducing the amount of off-task behavior in the subject.

Research regarding the use of sensory integration within autistic spectrum disorders is minimal and conflicting. Informal observations and impressions are the primary basis of support for the use of sensory motor techniques. The lack of empirical evidence is further exacerbated by inconsistencies in methodology and research variables. Well-designed studies are needed in order to evaluate the effectiveness of sensory integration and its impact on various areas of development.

The present study was designed to measure the effect of sensory stimulation on off-task related behavior for individuals within the autistic spectrum. The following questions were addressed:

1. Is there a significant difference in the frequency of off-task behavior when sensory stimulation is provided versus withheld, in an individual with autism?
2. Is there a significant difference in off-task behaviors when the sensory stimulation provided is activating or calming to the individual?

CHAPTER III

Methods

The effectiveness of sensory stimulation, as well as type of sensory stimulation, on off-task behavior in children with autistic spectrum disorder were evaluated in this study. The dependent variable was the frequency of off-task behaviors; the independent variable was the presence or absence of sensory stimulation.

Subjects

Subjects included in the study had a diagnosis within the autistic spectrum disorder. Subjects consisted of 3 males within an age range of 5 years, 0 months to 5 years, 7 months. No obvious cognitive deficits were noted as well as no comorbid complicating diagnoses. Subjects resided in central Illinois and English was the primary language spoken in the home. No obvious hearing impairments were observed. All subjects received individual speech-language therapy from different student clinicians at a university speech-language-hearing clinic. Parents of all subjects received a verbal explanation of the study and returned a signed permission form (Appendix A).

Table 1

Subject Information

	Gender	Age	Diagnosis	Treatment Goals	Off-Task Behavior
Subject 1	Male	5:7	Articulation disorder and pragmatic delay associated with Asperger Syndrome	Articulation & Pragmatics	Severe
Subject 2	Male	5:4	Receptive, expressive and pragmatic delay associated with Asperger Syndrome	Language & Pragmatics	Mild-Moderate
Subject 3	Male	5:0	Receptive & expressive language delay associated with ASD	Articulation & Language	Moderate-Severe

Equipment

Sessions were recorded using a Panasonic SZBP four-head videocassette recorder, model AG-1350. Recorded sessions were compiled on Maxell standard grade 6-hour videocassettes that were designed for frequent re-recording. Recordings were viewed on a Panasonic 13 inch color television. Time interval recordings were developed on a 90 minute Sony cassette tape used in a Panasonic cassette recorder, model RQ 2101.

Sensory stimulation equipment used in the study included a ball pit, mini trampoline, ceiling-suspended hammock, and floor mat. All equipment was located in a sensory room within a university speech-language-hearing clinic.

Procedures

Therapy sessions were conducted two days a week (e. g., Monday and Wednesday or Tuesday and Thursday) for 50 minutes per session. Each subject saw his or her clinician in their regular therapy room on their scheduled days and time. The study utilized an alternating treatment design with a counterbalancing method of presentation in order to control for possible sequencing effects of the independent variable, maturation of the subjects, and historical events. Whether or not a subject received sensory stimulation before speech and language therapy was alternated, as was the type of sensory stimulation received.

Alerting sensory stimulation consisted of swinging, jumping on a trampoline or jumping in a ball pit. Calming sensory stimulation consisted of lying in a ball pit, lying on a mat, or deep pressure massage. On the day subjects received sensory stimulation, they went to the sensory room for five minutes at the beginning of the therapy session to receive the scheduled stimulation provided by the student clinician. Following five minutes of sensory stimulation, the subjects went to their scheduled therapy room and followed the appropriate therapy schedule for the remainder of the session. On the day that no sensory stimulation was presented, the subjects went directly to their designated therapy room and followed the appropriate schedule.

The researcher conducted a meeting in which the process of providing the two types of sensory stimulation to the subjects was explained to the clinicians providing therapy services to the subjects. Student clinicians were trained on proper usage of sensory equipment, and the precautions to take in order to provide a safe environment and minimize possible risk of physical injury to the client during sensory activities. The sensory stimulation schedule is summarized in Table 1. "A" represents an alerting sensory stimulation, "C" represents a calming sensory stimulation, and "N" represents no sensory stimulation provided.

Table 2.

Proposed Sensory Stimulation Schedule

	Monday/Wednesday	Tuesday/Thursday
Week 1	C	A
Week 2	N	C
Week 3	A	N
Week 4	C	A
Week 5	N	C
Week 6	A	N
Week 7	C	A

Data was collected during each therapy session conducted at a university speech-language-hearing clinic over a six-week period. The therapy sessions were recorded each week and data was collected by viewing videotapes of the recorded sessions. The researcher viewed all videotaped sessions and recorded data as defined in the following section. Interference with task focus was determined to be any physical, verbal or self-stimulatory behavior that hindered the presentation, application, and/or comprehension of a therapy activity

1. Physical Off-Task Behaviors
   - Subject's physical behavior interferes with task focus.
     - Examples: Jumping, stomping foot/feet, hitting/pounding, getting out of chair, rolling around on the floor or looking out the window/in the mirror.
2. Verbal Off-Task Behaviors
   - Subject generates verbalizations that interfere with task focus.
     - Examples: Yelling, crying, or verbalizations not related to task.
3. Self-Stimulatory Behaviors
   - Subject engages in self-stimulatory behaviors that interferes with task focus
     - Examples: Hand flapping or rocking/swinging that avoids or disrupts the task.

The dependent variables were charted using interval recording. An audiocassette tape with fifteen second intervals for observing the subject's behaviors, followed by ten second intervals for recording behavior, were used for the charting of observations. The observer recorded the type of dependent variable observed during the fifteen-second recording intervals on the data collection form (Appendix B).

Analysis

Interjudge reliability was obtained by comparing the observer's recording of dependent variables to another student in speech-language pathology. A second research student observed 25 percent of the videotaped sessions in order to obtain interjudge reliability. The researcher conducted a meeting with the second research student in which the data collection form and the procedure for viewing and collecting data on the dependent variables were explained.

A point-by-point agreement ratio (Kazdin & Tuma, 1982) was applied to determine the interjudge reliability between the researcher's recordings of dependent variables and the research assistant's recordings of dependent variables. The ratios for each dependent variable and each subject are summarized in the following charts.

Table 3.

Interjudge Reliability for Subject 1

Total Off-Task	98.5%
Verbal Off-Task	97%
Physical Off-Task	100%

Table 4

Interjudge Reliability for Subject 2

Total Off-Task	99.7%
Verbal Off-Task	100%
Physical Off-Task	99.4%

Table 5

Interjudge Reliability for Subject 3

Total Off-Task	99%
Verbal Off-Task	99.4%
Physical Off-Task	98.8%

Chapter IV

Results

The purpose of this study was to measure the effect of sensory stimulation on off-task behavior in children within the autistic spectrum. The primary research question was the following:

1. Is there a significant difference in the frequency of off-task behavior when sensory stimulation is provided versus withheld, in an individual with autism?

A secondary question evaluated was the following:

2. When sensory stimulation is provided to individuals in the autistic spectrum, is there a significant difference in off-task behaviors when the sensory stimulation provided is activating or calming to the individual?

Average numbers of off-task behaviors across sessions with sensory stimulation and sessions without sensory stimulation were obtained for each subject. A t-test for dependent means was conducted on the averages. Overall, for two subjects, there were more off-task behaviors when sensory stimulation was withheld (M= 16.82, S. D. = 3.40), however, the difference was not statistically significant (t (2)=1.31, p= .32 (two-tailed).

Table 6

Mean Frequency of Off-Task Behavior when Sensory Stimulation was Provided Versus Withheld

	Sensory Stimulation	Sensory Stimulation
Subject 1	20.13	40.33
Subject 2	13.33	29.25
Subject 3	17.00	11.75

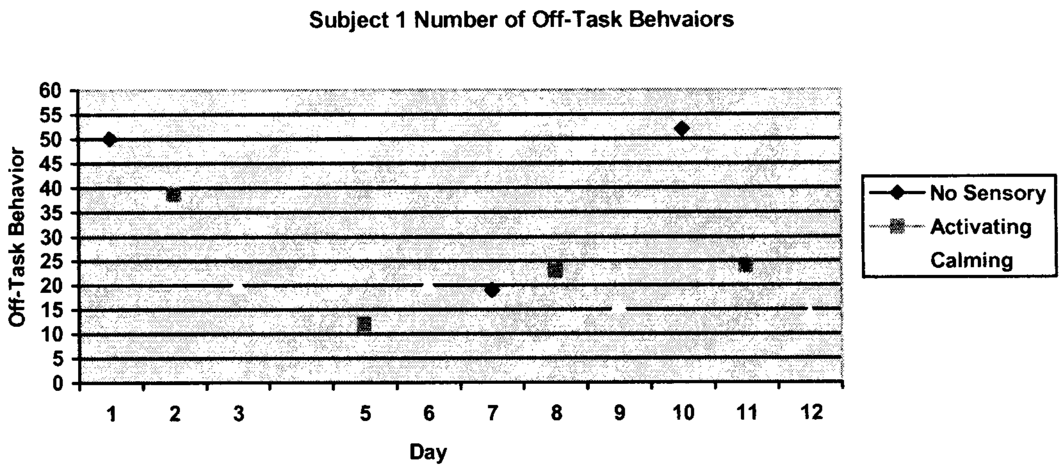

Figure 1. Number of off-task behaviors following calming, activating, or no sensory stimulation for Subject 1.

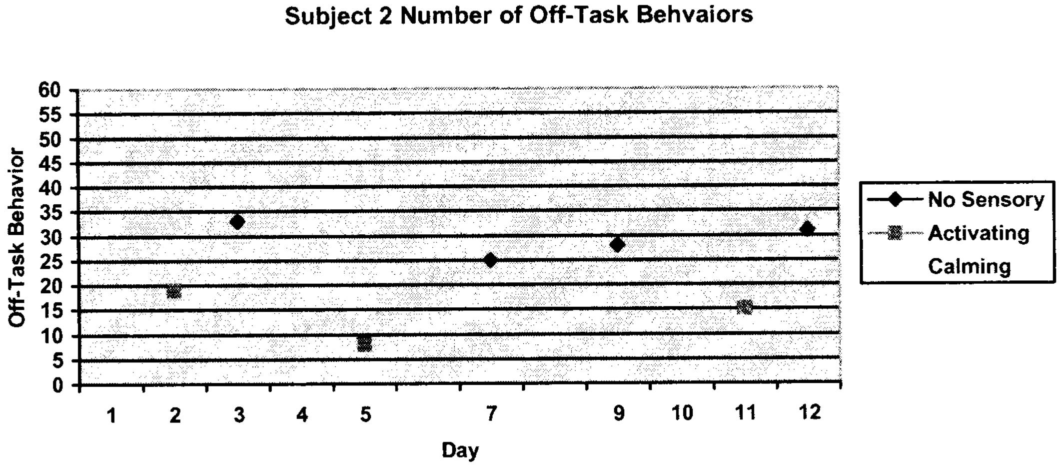

Figure 2. Number of off-task behaviors following calming, activating or no sensory stimulation for Subject 2.

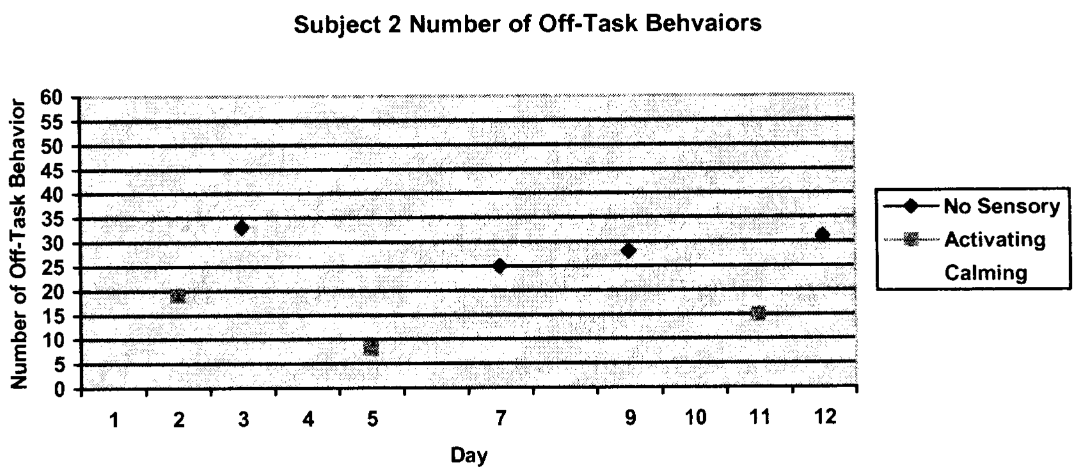

Figure 3. Number of of-task behaviors following calming, activating, or no sensory stimulation for Subject 3.

The average number of off-task behaviors across sessions with activating and calming sensory stimulation was obtained for each subject. A t-test for dependent means was conducted on the averages. Overall, there were more off-task behaviors when activating sensory stimulation was provided (M= 21.69, S. D. = 7.22) versus when calming sensory stimulation was provided (M= 12.89, S. D. =4.50); however, a statistically significant difference was not found (t(2) = 1.56, p=.26).

Table 7.

Mean Frequency of Off-Task Behavior when Sensory Stimulation was Activating Versus Calming

	Activating Stimulation	Calming Stimulation
Subject 1	22.75	17.50
Subject 2	14.00	12.67
Subject 3	28.33	8.50

A two-way analysis of variance or mixed factorial designs, was conducted on the total number of off-task behaviors. The subjects served as the between-subjects factor, while the type of sensory stimulation was the within subjects factor. Results of this analysis indicated a significant interaction between the subjects and type of sensory stimulation received, F (4, 12) = 3.98, p= .028. The interaction accounted for 57% of the variance in the total number of off-task behaviors. For subjects 1 and 2, the condition of no sensory stimulation led to the highest number of off-task behaviors (M= 40.33 and M= 29.67, respectively). The opposite effect was true for subject 3; the condition of no sensory stimulation led to the lowest number of physical off-task behaviors (M= 7.33).

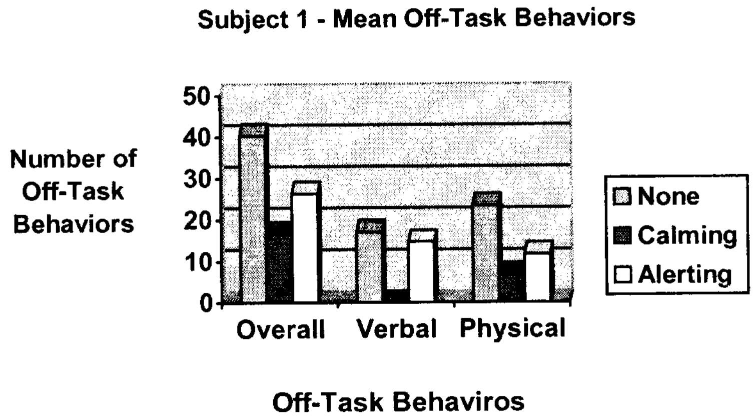

Figure 4. Mean number of off-task behaviors following the presentation of alerting, calming or no sensory stimulation for Subject 1.

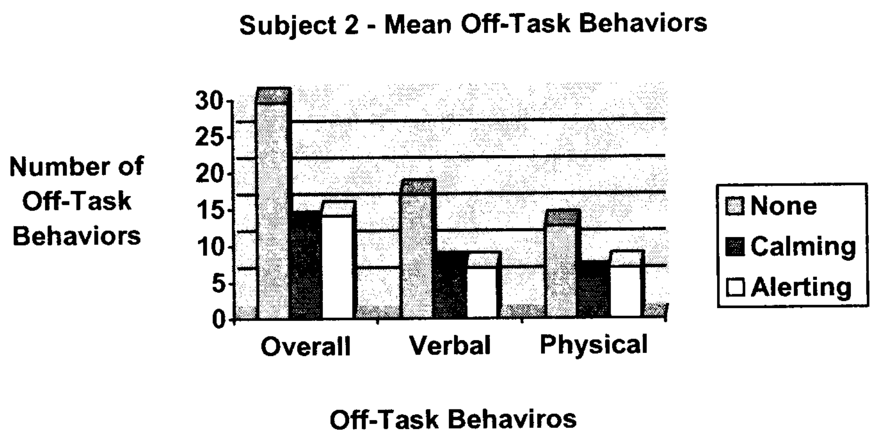

Figure 5. Mean number of off-task behaviors following the presentation of activating, calming, or no sensory stimulation Subject 2.

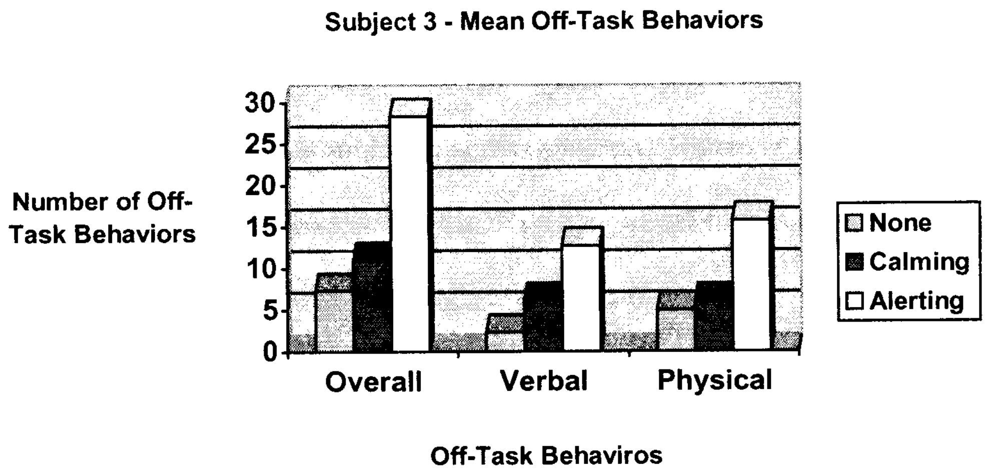

Figure 6. Mean number of off-task behaviors following the presentation of calming, activating, or no sensory stimulation for Subject 3.

As demonstrated in figure 4, the most off-task behaviors occurred when no sensory stimulation was provided and the least amount occurred when calming sensory stimulation, rather than activating sensory stimulation, was provided. As displayed in figure 5 the most off-task behaviors occurred when no sensory stimulation was provided. The least amount of off-task behaviors occurred when calming rather then activating sensory stimulation was provided; however, these means were quite similar. As expressed in figure 6, the least amount of off-task behaviors occurred when no sensory stimulation was provided; however, this amount was similar to the amount of off-task behaviors that occurred when calming stimulation was provided. In contrast to the other two subjects, the most off-task behaviors occurred when alerting stimulation was provided.

In conclusion, although the tables and figures demonstrate an observable difference, a statistically significant difference was not evidenced in regard to the type or presence/absence of sensory stimulation across subjects. However, a statistically significant difference was evidenced in the frequency of off-task behaviors in regard to the type of stimulation provided within specific subjects.

Chapter V

Discussion

There is a limited amount of empirical research investigating the effects of sensory integration on off-task behavior in children within ASD. Clinical impressions suggest that sensory stimulation may have a beneficial effect on behavior in children within the autistic spectrum, however, this has yet to be consistently substantiated within empirical research. Research in sensory stimulation typically encounters an array of obstacles and difficulties in aspects of implementation, subject size, characteristics, and analyses. The purpose of this study was to determine the effectiveness of sensory stimulation on off-task behaviors in children within the autistic spectrum.

In 1998 Linderman and Stewart conducted a single-subject research study that examined the effect of a sensory integration treatment program on disruptive behavior in two boys. The materials used in the treatment program were similar to those used in this study (i.e. trampoline, swing). The results of this concurred with Linderman and Stewart in that the introduction of sensory integration had a positive effect decreasing the amount of disruptive behavior.

In 1999, Fertel-Daly, Bedell, and Hinojosa examined the effect of a weighted vest on children within PDD. All subjects showed an increase in length of focused attention while wearing the vest and a decrease when the vest was removed. All but one subject also demonstrated a decrease in self stimulatory behaviors while wearing the vest. The present study demonstrated similar results with increased focused attention following the introduced sensory stimulation.

The results of this study demonstrated a decrease in off-behaviors in two of the three subjects. Similarly, in 1999, Case-Smith and Bryan conducted a study in which all subjects except one showed a significantly reduced number of non-engaged behaviors. In both studies, the subject who did not demonstrate the same results as the majority of participants demonstrated the least amount of off-task behaviors prior to the start of the study.

Results of a 1999 research study conducted by Patterson were consistent with the present study in that both substantiated that tactile stimulation reduced the number of off-task behaviors in two male children within ASD. Although there was not a statistically significant difference evidenced in the present study, there was an observable decrease in off-task behaviors following sensory stimulation in two of the three male subjects

Although a statistically significant difference was not realized across subjects in the number of off-task behaviors and the presence and type of sensory stimulation in the present study, statistical trends and clinical insights can be ascertained. A difference was apparent within individual subjects in regard to the presence and type of sensory stimulation received. On average, off-task behaviors were at their highest level when sensory stimulation was not provided for each subject; off-task behaviors were at their lowest when calming sensory stimulation was provided for each subject.

Results of this study appear somewhat inconsistent due to two research variables that are difficult to control within the autistic spectrum-intrasubject variability and intersubject variability. That is, results varied within each subject as well as between subjects. This is inherently important due to the fact that the chemical make-up for children within the autistic spectrum will vary from child-to-child and day-to-day. There were days in which alerting stimulation resulted in the least amount of off-task behaviors for a subject, days when calming stimulation resulted in the least amount of off-task behaviors for the subject, and days when no stimulation resulted in the best behavioral results. The study revealed a statistically significant interaction ($p = .028$) between the individual subjects and the type of sensory stimulation received. That is, the number of off-task behaviors that occurred following provision of different types of sensory stimulation was dependent on the child. This finding was consistent with the premise that each child's neurological system is different, especially within the autistic spectrum.

A significant difference ($p = .26$) was not evidenced in the average number of off-task behaviors after calming versus activating sensory stimulation, however, an observable difference was noted. There were more off-task behaviors following activating stimulation (m=21.69, S.D.= 7.22) than following calming stimulation (m=12.89, S.D.= 4.50). Once again, these results were likely impacted by neurological differences in children within the autistic spectrum. During the study, it was noted there were days in which a child scheduled for one type of stimulation would want a different type of stimulation and/or no stimulation at all; it appeared that many times the subjects recognized what their bodies needed. A substantial amount of off-task behaviors occurred on these days. The children were allowed to choose an activity in accordance with the type of stimulation (i.e., choice in type of alerting sensory stimulation); however, they were not allowed to choose the type of stimulation (i.e., alerting versus calming sensory stimulation versus none).

For discussion purposes, a two-way analysis of variance for mixed-factorial designs was conducted on the number of verbal off-task behaviors. Results indicated a significant interaction between the subjects and whether or not sensory stimulation was received, F (2, 6) =12.68, p=.007. The interaction accounted for 81% of the variance on the number of verbal off-task behaviors. For subjects 1 and 2, the condition of no sensory stimulation resulted in the highest number of verbal off-task behaviors (M = 17.00). For subject 3, receiving no sensory stimulation led to the least amount of verbal off-task behaviors (M = 2.33). The same analysis was conducted for the amount of physical off-task behaviors. The results of this analysis indicated a marginally significant interaction between the subjects and whether or not sensory stimulation was received, F= (2, 6) =3.91, p=.082. The interaction accounted for 57% of the variance in the number of physical off-task behaviors. Similar to the verbal off-task behavior results, subjects 1 and 2 demonstrated the most physical off-task behaviors with no sensory stimulation; subject 3 demonstrated the least with no sensory stimulation. Once again, a two-way analysis of variance for mixed factorial designs was conducted on the total number of off-task behaviors. Results of this analysis indicated a significant interaction between the subjects and whether or not sensory stimulation was received, F (2, 6) = 6.04, p=.037. The interaction accounted for 67% of the variance in the total number of off-task behaviors. Again, for subjects 1 and 2 the most off-task behaviors occurred with no sensory stimulation; for subject 3, the least occurred with no sensory stimulation.

Additionally, for discussion purposes, further analyses including subjects 1 and 2 were performed. A two-way analysis of variance for mixed factorial designs was conducted on the total number of off-task behaviors. The subjects (subject 1 vs. subject 2) served as the between-subjects factor and the type of stimulation (alerting vs. calming) received served as the within subjects factor. The results indicated a significant interaction between the subjects and the type of stimulation received $F(2, 6) = 6.04$, $p = .037$. The effect of alerting and calming stimulation on the total number of off-task behaviors was similar. Subject 1 demonstrated 22.75 off-task behaviors following alerting stimulation and 17.50 following calming stimulation. Subject 2 demonstrated 14 off-task behaviors following alerting stimulation and 12.67 following calming stimulation. Both subjects demonstrated fewer off-task behaviors following calming stimulation.

The same analysis was performed on the data for subjects 1 and 2 in order to further analyze the number of verbal off-task behaviors and the number of physical off-task behaviors. Neither of these analyses resulted in significant effects; both subjects responded similarly to each type of stimulation.

No significant effects were found in the above three analyses which indicates two main points: the subjects did not significantly differ from each other in their responses (no significant main effect of subjects to stimulation) and there were no significant differences in responses to the stimulation (no significant main effect on type of stimulation).

Limitations

Significant limitations in this study included the small sample size, short experimental time, and limited data points. The client population at the university speech-language-hearing-clinic of similar disorder and ages to draw from was a severe constraint. A larger sample size might allow for better generalization of results. The second half of a semester schedule (6 weeks of therapy) was an additional constraint. A longer experimental time frame might contribute to more robust results and provide a better foundation of data. In addition, limited data points were available due to the design and site of the study. To match data analysis points, an entire week of data had to be deleted each time a child was absent. Consequently, if a child was sick one day of the week, the entire week was deleted from the results, significantly reducing possible data points. A different form of data collection and analysis might prove beneficial in future research projects.

An important limitation that became apparent in this study was the methodology used to match subjects. The three subjects that participated in the study were matched on chronological age and disorder; however, their developmental ages were different. One child was already reading while another child was working to acquire letter identification and letter sound production. Children within the autistic spectrum may be at the same chronological age but evidence significantly different developmental ages. Determining a developmental age based on neurological acquisition of skills might be a better subject match criterion than chronological age.

Future Research

Considering the implications and limitations of this study, future research should address the following:

1. The effect of sensory stimulation, regardless of type, on off-task behavior in children within the autistic spectrum;
2. The effect of personal choice in type of sensory stimulation received on off-task behaviors in children within the autistic spectrum;
3. The effect of sensory stimulation on children with developmental disorders other than the autistic spectrum.

While the results of this study did not find a statistically significant difference in the average number of off-task behaviors after sensory stimulation was received or withheld, a clinically observable difference was found. Overall, more off-task behaviors occurred when sensory stimulation was withheld than when it was provided. The results of this study might be beneficial for consideration by a variety of professionals in various settings, such as speech-language pathologists, special education teachers, regular education teachers, other therapists, and parents. Sensory stimulation may facilitate a reduction in off-task behaviors in certain individuals, resulting in more productive therapy and academic sessions.

Future research in this area is needed to build a stronger foundation supporting the integration of sensory stimulation into treatment sessions for children within the autistic spectrum. A larger sample size might provide data for better generalization of results. A lengthier experimental period could possibly increase the effect, providing stronger support for the use of sensory stimulation. While the study provided evidence of sensory stimulation benefiting some children within the autistic spectrum, additional research is necessary to further investigate and substantiate this treatment approach.

In conclusion, the present study provides a foundation from which future research can examine the relationship between sensory stimulation and off-task behavior in individuals within the autistic spectrum. The information obtained in this study might encourage other professionals to consider the use of sensory stimulation for individuals within the autistic spectrum to facilitate improved attention and redirection in off-task behaviors.

Appendix A

Parental Permission Form

The purpose of this research is to evaluate the effectiveness of sensory stimulation on off-task behavior in children within the autistic spectrum. Sensory stimulation is becoming more prevalent in various treatments within the autistic spectrum. Therefore, I am investigating whether or not sensory stimulation has a beneficial effect on speech and language therapy with children within the autistic spectrum, as well as types of sensory stimulation-alerting or calming.

Children who participate as a subject will continue to receive their scheduled speech and language services at the Eastern Illinois University Speech-Language-Hearing Clinic. On select days, in addition to their regular services, their clinician will provide five minutes of sensory stimulation in the EIU Clinic's sensory room. There is no risk involved to your child's health and the study will not compromise your child's speech and language goals and treatment. Your child's name will not be used in the data collection process or in any reports of the research.

Participation is voluntary and no penalties will be imposed for your refusal to participate. Your cooperation and interest are greatly appreciated.

I grant permission for my child, ________________________________,
(name)

_____________________, to participate in the research study, "The Effects of Sensory
(birthdate)

Stimulation on Off-Task Behavior in Children within the Autistic Spectrum."

Erin Downs, graduate student in the Department of Communication Disorders and Sciences, at Eastern Illinois University, Charleston, Illinois under the direction of Dr. Gail J. Richard, will conduct this study. I understand that information in the study will be reported anonymously.

____
Parent Signature

____
Today's Date

Appendix B

Data Recording Sheet

Date: Subject # _____ Type of Sensory Stimulation:

	Verbal Off-Task	Interval
		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

Physical Off-Task	Verbal Off-Task	Interval
		29
		30
		31
		32
		33
		34
		35
		36
		37
		38
		39
		40
		41
		42
		43
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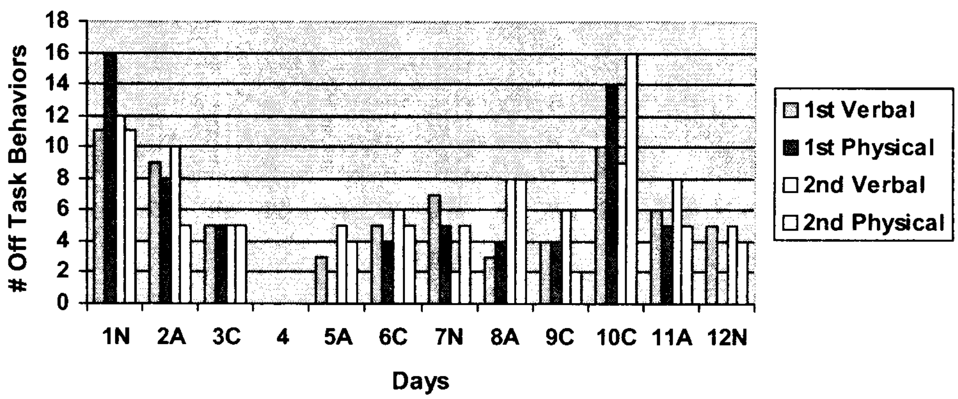
		55
		56

Appendix C

Subject Data Information

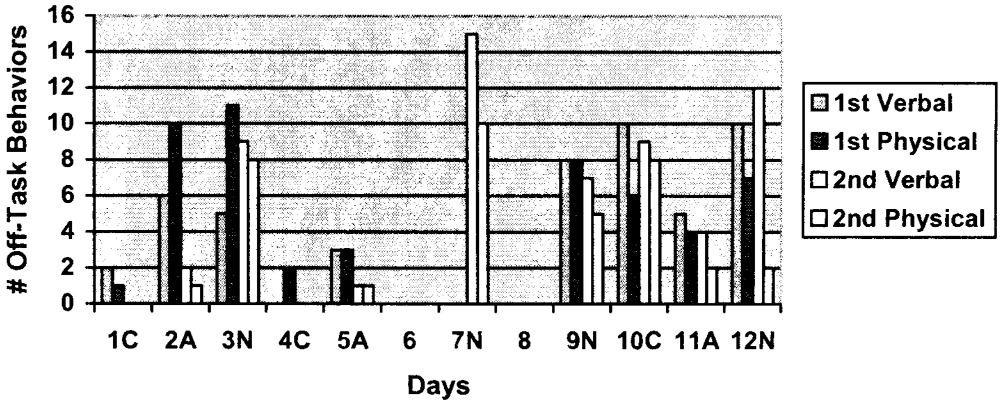
Subject 1

	1st Interval	2nd Interval
Day 1 (N)	11V & 16P	12V & 11P
Day 2 (A)	9V & 18P	10V & 5P
Day 3 (C)	5V & 5P	5V & 5P
Day 4 (N)	NO DATA	NO DATA
Day 5 (A)	3V & 0P	5V & 4P
Day 6 (C)	5V & 4P	6V & 5P
Day 7 (N)	7V & 5P	2V & 5P
Day 8 (A)	3V & 4P	8V &8P
Day 9 (C)	4V & 4P	6V & 2P
Day 10 (N)	10V & 14P	9V & 19P
Day 11 (A)	6V & 5P	8V & 5P
Day 12 (C)	5V & 0P	5V & 4P



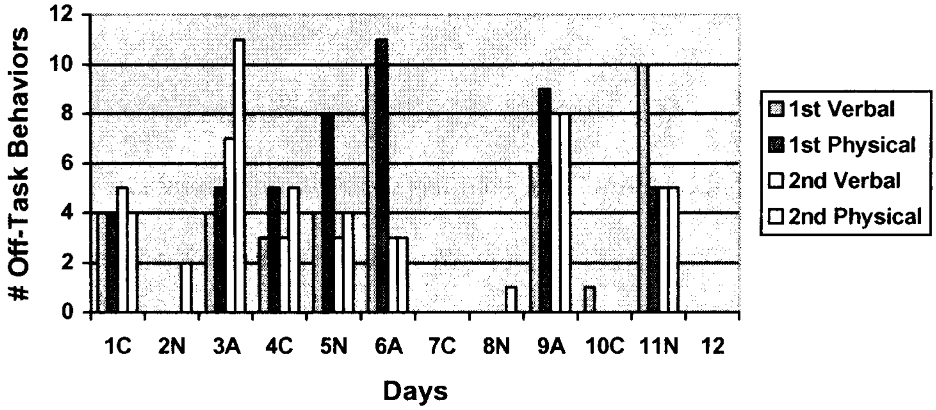
Subject 2

	1st Interval	2nd Interval
Day 1 (C)	2V & 1P	0V & 0P
Day 2 (A)	6V & 10P	2V & 1P
Day 3 (N)	5V & 11P	9V & 8P
Day 4 (C)	0V & 2P	0V & 0P
Day 5 (A)	3V & 3P	1V & 1P
Day 6 (N)	NO DATA	NO DATA
Day 7 (N)	0V & 0P	15V & 10P
Day 8 (A)	NO DATA	NO DATA
Day 9 (N)	8V & 8P	7V & 5P
Day 10 (C)	10V & 6P	9V & 8P
Day 11 (A)	5V & 4P	4V & 2P
Day 12 (N)	10V & 7P	12V & 2P



Subject 3

	1st Interval	2nd Interval
Day 1 (C)	4V & 4P	5V & 4P
Day 2 (N)	0V & 0P	0V & 2 P
Day 3 (A)	4V & 5P	7V & 11P
Day 4 (C)	3V & 5P	3V & 5P
Day 5 (N)	4V & 8P	3V & 4P
Day 6 (A)	10V & 11P	3V & 3P
Day 7 (C)	0V & 0P	0V & 0P
Day 8 (N)	0V & 0P	0V & 1P
Day 9 (A)	6V & 9P	8V & 8P
Day 10 (C)	1V & 0P	0V & 0P
Day 11 (N)	10V & 5P	5V & 5P
Day 12 (A)	NO DATA	NO DATA



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