

# EFFECTS OF A MULTISENSORY ENVIRONMENT ON INDIVIDUALS WITH AUTISM

## **The Effects of a Multisensory Environment on Negative Behavior and Functional Performance on Individuals with Autism**

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### **ABSTRACT**

The purpose of this study was to determine the effects of a multi-sensory environment on functional performance and negative behavior on individuals with autism.

A single-subject research design consisted of 2 residents from a local institution diagnosed with autism (one female subject, age 17, and one male subject, age 16).

In this design, self injurious behavior, physical aggression, non-compliance, and agitated/disruptive behavior, as well as functional behaviors, were measured via preexisting behavior charts and daily questionnaires. Following a 2-week baseline, subjects entered the sensory room individually for 20 minutes with staff supervision for a period of 2 weeks (School days: M-F). After 2 weeks of intervention, another 2 weeks of baseline data was collected to determine whether the intervention affected behavior and whether any change had a lasting effect. Data was graphed (number of target behaviors vs. days). Results did not show a clear positive or negative effect of sensory room intervention on negative behavior. However, individual patterns of behavior were noted in the 2 subjects.

### **INTRODUCTION**

Sensory integration theory was introduced by Jean Ayres, Ph.D, O.T.R. in 1968, to explain the relationship between sensory processing and behavior. Sensory integration, the ability to organize sensory information for use, or more specifically, the ability of the central nervous system to process sensory information, namely vestibular, proprioceptive, tactile, auditory, and visual information, to make an adaptive response to the environment (Jacobs, ed., 1999). Ayres, describes two problems: 1) registration and 2) modulation control or the ability to react with a controlled response at times and other times over/under react. Disturbances of sensory processing and perception reflect poor modulation or inadequate registration of incoming stimuli. Many children with sensory integration problems develop a tendency to avoid or reject simple sensory or motor challenges, responding with refusals or tantrums when pushed to perform (Case-Smith, 1996).

According to Ayres, sensory integration theory has three major postulates:

- 1) Learning is dependent on the ability of normal individuals to take in sensory information derived from the environment and from movement of their bodies, to process and integrate these sensory inputs within the central nervous system, and to use this sensory information to plan and organize behavior.
- 2) When individuals have deficits in processing and integrating sensory inputs, deficits in planning and producing behavior occur that interfere with conceptual and motor learning.
- 3) The provision of opportunities to enhance sensory intake, provided within the context of a meaningful activity, and the planning and organizing of an adaptive behavior, will improve the ability of the central nervous system to process and integrate sensory inputs, and, through this process, to enhance conceptual and motor learning (Fisher, Murray, Bundy, 1991, p.4).

These postulates have several underlying assumptions. The first major assumption of sensory integration theory is that there is plasticity within the central nervous system, i.e. the brain's structure can be changed or modified. The second major assumption is that the sensory integrative process occurs in a developmental sequence. Another assumption is that the brain functions as an integrated whole, but is comprised of systems that are hierarchically organized. The development and functioning of the cortical centers of the brain (abstraction, perception, reasoning, language, and learning) are dependent on the development and functioning of the lower, subcortical centers of the brain (sensory intake and intersensory association). Both cortical and subcortical centers contribute to sensory integration. The fourth major assumption of sensory integration theory is that eliciting an adaptive behavior promotes sensory integration, and in turn, the ability to produce an adaptive behavior reflects sensory integration. An adaptive behavior is goal-directed, purposeful, and meets the "just-right" challenge of the individual. The final assumption is that people have an inner drive to develop sensory integration through participation in sensorimotor activities (Fisher, et. al, 1991).

Sensory system modulation refers to the central nervous system grading inputs for organization and use at higher level functioning. A sensory modulation disorder involves hyper- or hyposensitivity to sensory input. Functional support capabilities, such as tactile discrimination, muscle tone, and bilateral integration, help integrate and modulate input from the arousal/reactivity and information/discriminative components of the sensory systems, underlying and supporting the end-product abilities. The end-product abilities, such as praxis, behavior, and activity level, are the products of the integration of the sensory modulation and functional support systems (Fisher, et.al, 1991).

Individuals with sensory modulation disorders are unable to properly process sensory stimulation, being hypo- or hyper responsive to incoming sensory stimuli. As reported by Case-Smith (1996), autism is defined as a pervasive developmental disorder characterized by severe, complex, and permanent behavioral and cognitive disabilities. "High sensitivity to certain stimuli, or abnormal responses, [is] characteristic of autism. The child may become very excited or obsessed by self-produced stimulation" (Trevarthen, 1998). "All people need stimulation. In its absence, individuals may resort to self-injury, anger or repetitive behavior as a substitute. Therefore, the exposure to a wide range of sensory stimulation should be the cornerstone of treatment designed to reduce, avoid, or channel these traits" (Moore, Harris, Staphens, 1994, in Pagliano, 1999, 158).

Ellen Cohn's (Miller, Tickle-Degnen, 1999) American Journal of Occupational Therapy article, *Parental Hopes for Therapy Outcomes: Children With Sensory Modulation Disorders*, research indicated 3 main child-centered goals for occupational therapy:

- 1) Social participation
- 2) Self-regulation
- 3) Perceived competence

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Self-regulation is the ability to control one's own behavior by using coping mechanisms or strategies. Children with autism may seek sensory stimulation from the environment in order to calm, or self-regulate, their nervous systems. For example, Temple Grandin, a high-functioning individual with autism, designed "The Squeeze Machine" to provide self-regulated deep pressure. She writes, "Using the squeeze machine on a daily basis calms my anxiety and helps me to unwind" (Grandin, 1995, p.64).

Research involving environmental factors led to the usage of the word 'snoezelen', the Dutch translation, which means to smell and to doze. Cleland and Clark are the founders of the concept of a multi-sensory room ("sensory cafeteria") (Pagliano, 1999, 155). Hulsegge and Verheul further expanded this concept, coining the term 'snoezelen', creating a series of sensory rooms (tactile, oral, visual, ball bath, water, smell, and taste). "Snoezelen has given

us the means to provide a wide range of sensory experiences that increase the quality of life of the individual” (Kewin, 1994 in Pagliano, 1999, 7). Snoezelen became a registered trademark, and multi-sensory environment became the generic term used today.

A multi-sensory environment (MSE) is a designated space where stimulation can be controlled, manipulated, intensified, or reduced. The central concept behind the use of the rooms is the stimulation of the primary senses by utilizing a range of objects and materials (Hope, 1997). This dynamic environment allows the user to choose the stimulation of which they are in need. Through research conducted by Pagliano (1999), the MSE attributes include:

- 1) Opportunity for affective/emotional development
- 2) Stimulation for all senses
- 4) Relaxation
- 5) Facilitation of therapy
- 6) Enhancement of communication
- 7) Minimization of challenging behavior
- 8) Development of self-determination
- 9) Opportunity for social interaction with non-disabled children/families

(Pagliano, 1999, p.24)

Studies have reported a decrease in tactile defensiveness, improvement in communication skills, reduction in stress, reduction in self-injurious behaviors, improvement of staff/client interaction, increase in length of calmness, and increase in skill repertoire. In a study using a multi-sensory room with older people with dementia found that a multi-sensory environment facilitated relaxation and communication, appearing to offer potential as an adjunct to the care of older people with dementia (Hope, 1997). An example of the impact MSE had on one student, Zoe, was described through a narrative in Pagliano’s *Multisensory Environments* (1999). Zoe was extremely tactile defensive and had loud vocal outbursts (similar to a cockatoo). In the MSE, however, she had no vocal outbursts and began to increase her tolerance of tactile stimulation (Pagliano, 1999). The use of multi-sensory rooms has emerged in a range of clinical arenas including mental health nursing, pain clinics, maternity and pediatric settings (Hope, 1997).

Pagliano (1999) summarizes literature by Longhorn (1988), “The acceptance of the MSE in the UK was supported by the publication of a sensory curriculum by Longhorn”. She argued that children with severe and profound multiple disabilities may be unable to learn from general teaching methods because the children were insufficiently aware of the world around them. The non-disabled child develops sense ability spontaneously, but with children

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with severe sensory disability may need to have their senses ‘awakened’ through increased sensory stimulation” (Pagliano, 1999, 20).

Deakin (1995) discovered residents of Rampton Hospital, Nottinghamshire, with long histories of displaying disruptive behavior lacked the abilities to calm themselves down. A relaxation multi-sensory room was offered to residents when they were not being disruptive, because entering the room during agitated progressed. Out of the 15 residents who received sessions, all but two progressed. Results suggest multi-sensory rooms enhance relaxation, provide an enjoyable experience, and positive behavioral change can be elicited (Deakin, 1995).

Occupational therapy professionals have been leaders in developing and promoting MSE. Therapists use MSE to both relax and stimulate the individual with a disability, making assessment and treatment easier and more successful. “The occupational therapist needs to play a foundation role in the initial design and construction of the MSE in order to ensure that the environment is designed to maximize opportunities for learning and development of

functions and skills necessary for daily living” (Pagliano, 1999, 61).

In summary, multi-sensory environments are used with individuals with sensory modulation disorders, such as autism. The multi-sensory environments can provide individuals opportunities to engage in self-stimulating activities that help to regulate their nervous system. Due to previous studies conducted on multi-sensory environments, further research may also support a decrease in negative behaviors.

## **BACKGROUND**

Individuals with Autism are unable to properly process sensory stimulation, being hypoor hyper- responsive to incoming stimuli. Many become excited or obsessed by self-produced stimulation. Without appropriate stimulation, individuals may resort to self-injury, anger, or repetitive behavior as a substitute. This type of behavior interferes with completion of activities of daily living. A form of intervention, designed to reduce or avoid these traits is a multi-sensory environment (MSE). An MSE provides an area that offers individuals an opportunity to control, manipulate, intensify, or reduce stimulation within a safe environment.

## **METHODS**

**Subjects.** Subjects were chosen non-randomly by the occupational therapist at the facility. Subjects were chosen from the convenience sample of residents due to their specific sensory needs and potential benefit from intervention. Subjects had a common diagnosis of autism and exhibited non-verbal communication. Subject 1, a 17 year-old white female and Subject 2, a 16 year-old white male, both lived in a division of the institution.

**Design.** A single subject ABA design was used with an A phase (baseline condition), a B phase (intervention condition), and an A phase (follow-up condition). Baseline observation served to establish the current number of target behaviors occurring in the mornings and afternoons during the school days.

Data for the A phase was collected during the school day, Monday thru Friday, over a 2-week period. The intervention phase (B) consisted of data collection over 2 weeks (M-F) in which the subjects entered the sensory room. Data was collected during the follow-up phase (A), after B phase was completed.

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**Procedures.** Permission for conducting research was granted through the Clinical Science Internal Review Board of Human Subjects (IRB) of the University of Wisconsin-La Crosse, followed by approval from the University of Wisconsin-La Crosse IRB. At the same time, written approval was awarded from the institution. Following approval from the three human subject committees, informed consent forms were sent to parents/guardians, requesting permission to participate in the six-week study. Communication was initiated with the OTR concerning the scheduling of sensory room time, staff availability, approval of the Daily Questionnaire (used to monitor functional performance), and maintenance of confidentiality. The Daily Questionnaire forms were created to gain additional information regarding functional performance (school tasks, recycling cans, etc.) To ensure confidentiality of the subjects, the participants were referred to as Subject 1 and Subject 2. Once consent forms were received, data collection was initiated. On the first day of data collection, all necessary forms were placed in the subjects’ “books” (contain behavior charting, behavior programs, toileting charts, and updates on their programs). Staff were given both verbal and written instructions to complete the Daily Questionnaire and to place completed forms in the designated red folder located in the supervisor’s office. Staff were also given written instructions on sensory room guidelines for when intervention takes place. A container of sensory items

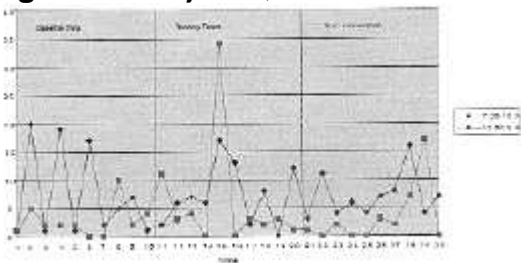
were placed in the supervisor's office available for sensory room time only. Communication was maintained through memos that notified lead staff of transitions between the baseline period of data collection (1/22/01 – 1/26/01, 1/29/01 – 2/02/01), intervention (2/05/01 – 2/09/01, 2/12/01 – 2/16/01), and post-intervention data collection (2/26/01 – 3/02/01, 3/04/01 – 3/09/01). Researchers collected the completed data at the end of each week, including the Daily Questionnaire forms and copies of the behavior charts.

**Data Analysis.** To interpret the results, data was organized into a line graph, plotting the number of negative behaviors that occurred on each day of data collection.

## RESULTS

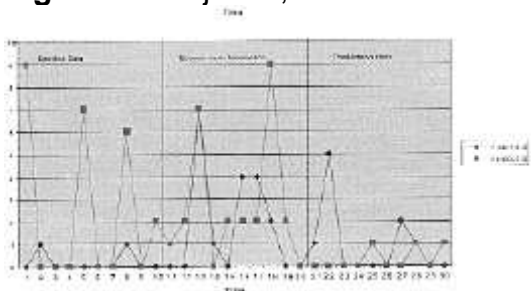
The results are summarized for each subject and are presented separately in Figures 1 through 6. Graphs are compiled from data collected through behavior charts. The Daily Questionnaire was not used to analyze functional performance due to insufficient and inaccurate documentation.

**Figure 1. Subject 1,**



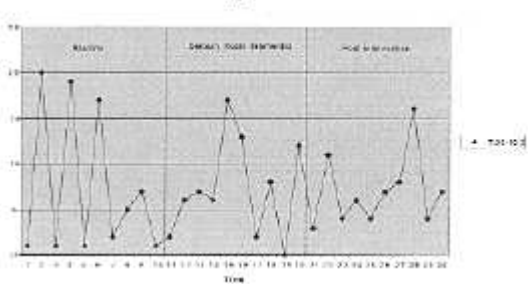
Number of Morning and  
Afternoon Target Behaviors  
Over a Period of Six Weeks  
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**Figure 2. Subject 2,**



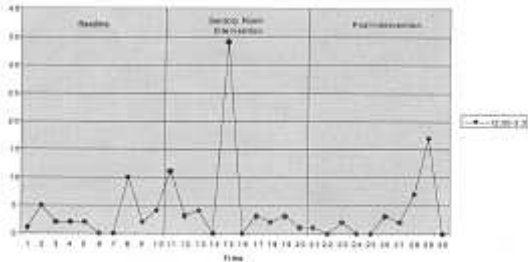
Number of Morning and  
Afternoon Target Behaviors  
Over a Period of Six Weeks

**Figure 3. Subject 1,**



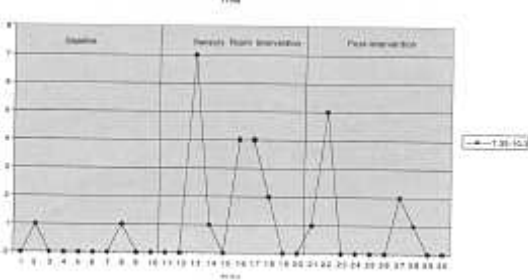
Number of Morning Target Behaviors Over a Period of Six Weeks

**Figure 4. Subject 1,**



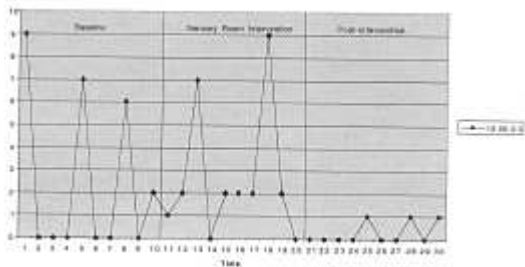
Number of Afternoon Target Behaviors Over a Period of Six Weeks

**Figure 5. Subject 2,**



Number of Morning Target Behaviors Over a Period of Six Weeks

**Figure 6. Subject 2,**



**Number of Afternoon Target Behaviors Over a Period of Six Weeks**

In Figure 1, Subject 1 shows no significant decrease in number of target behaviors between baseline and intervention, nor between intervention and post-intervention. However, in comparing Figure 3 and Figure 4, a notable pattern exists of high number of behaviors occurring in the morning and fewer in the afternoon. In Figure 2, Subject 2 also shows no significant decrease in number of target behaviors between baseline and intervention, nor between intervention and post-intervention. No clear pattern of behavior exists for Subject 2.

## **DISCUSSION**

The findings of this research study demonstrate no clear pattern of decreased target behaviors during periods of sensory room intervention for Subject 1 and Subject 2. In this study, the findings for Subject 1 suggest that the participant exhibited more target behaviors in the mornings than the afternoons. Subject 1 experienced periods of incontinence during sensory room time, possibly due to the relaxing effects of the environment. The findings indicate that sensory room intervention needs to be individualized in order to be effective in decreasing target behaviors among autistic children and young adults. For example, intervention for Subject 1 would be most effective in the early morning where most target behaviors tend to occur.

Further research is needed to explore the effects of a multi-sensory environment on negative behavior in individuals with severe autism.

## **LIMITATIONS AND RECOMMENDATIONS**

The length of data collection was not extensive enough to note a significant change in behavior following intervention. Also, the sensory room intervention may not have been long enough to allow for proper adaptation of the subjects to occur. Individuals with autism require a daily routine and structured activities due to their sensitive nervous system, making any changes in scheduling difficult. Multiple staff completion of data led to inconsistency in documentation of behaviors in question. Different times of intervention led to a gap of one and one-half hours before and after intervention. Therefore, recommendations include a longer period of data collection to allow patterns of behavior to be established and adjustments to schedule changes to occur. Also, a standardized assessment specific to autistic individuals with high validity and reliability is recommended to minimize any variability in documentation. Researchers, rather than multiple staff, would complete the data collection.

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