Multisensory environments, autism, and sympathetic nervous system

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Abstract

Objective: This study compared a client-center approach versus and manual approach use of a multi-sensory environment (MSE) with young children with Autism Spectrum Disorder (ASD). It was hypothesized that the client-centered approach would result in less activation of the Sympathetic Nervous System (SNS), compared to the manual approach in the MSE.

Method: This study included 20 children, ages four to seven, who have been diagnosed with ASD. The participants attended seven sessions: the first session was to fill out necessary paperwork for the study and to complete the CARS, followed by three sessions in the protocol approach and three sessions in the individualized approach. In the individualized approach, participants were to indicate what they wanted turned on and the protocol approach, the equipment was turned on in a sequential manner. Electodermal response (EDR), an indicator of SNS activation, was taken using a sweat response monitor worn on the participant's wrist (Affectiva Q Sensor).

Results: Though the magnitude of change in electrodermal activity was greater in the individualized condition, as reflected by the effect size, the change was not statistically significant. The effect is in the opposite direction to the stated hypothesis. There was also a high degree of variance in the measure. Taken together, these factors lead to difficulty in interpreting whether there is an effect of the condition on sympathetic nervous system activity.

Conclusion: Given the results of this study, occupational therapist should use their own clinical judgment as to which approach to use in the MSE. Further research is needed in this area to guide best practices when using a MSE.

Multisensory Environments, Autism, and Sympathetic Nervous System

Multisensory Environments

Use of Multisensory Environments (MSEs), rooms equipped to deliver light, smell, and texture stimuli, may improve the health and well-being of people with intellectual disabilities. Bos (1997) demonstrated that time spent in a MSE may result in increased concentration, alertness, general awareness of surroundings, and calmness. By relieving agitation and promoting relaxation, the use of MSEs may have a soothing effect for children with autism. It has been suggested that repeated use of a MSE results in long lasting changes in neurodevelopment through consistent, organized series of sensory stimuli, movements, and activities (Christopher Douglas Hidden Angel Foundation, 2011).

An example of a MSE is the Snoezelen room. This room gives the client controlled sensory input (ex. sights, smells) during therapy to help them deal better with sensory stimuli (Kaplan, Clopton, Kaplan, Messbauer, & McPherson, 2006). Controlled Sensory Input (CSI) is designed to promote choice, stimulation of the senses, and interaction. It has also been suggested to reduce anxiety and stress in people with intellectual disabilities (Messbauer, 2012). Kaplan, Clopton, Kaplan, Messbauer, and McPherson, (2006) completed a study on the Snoezelen room, where three adults participated in two experiments. An ABA design was used in this experiment. In the first phase, the participant received occupational therapy services in the Snoezelen room and then received non-Snoezelen occupational therapy services. The results of this study indicated that adults with autism showed improvement in behaviors after several sessions in the Snoezelen room. The first experiment measured engagement in a functional task immediately following treatment in the room and the second experiment measured the changes in the frequency of challenging behaviors days after the treatment session.

Autism Spectrum Disorder

Autism spectrum disorder (ASD) is a neurodevelopmental disorder which occurs in about one out of 88 children (Autism Society of America, 2004d). Most children are diagnosed within the first three years of life. The degree of symptoms can range from mild to severe (Centers for Disease Control and Prevention, 2009). Parents of children with ASDs notice delays in speech, lack of social participation, and behaviors such as focusing on a specific object, which is why it can be diagnosed early in life. The cause of ASD is unknown though multiple factors are likely to be involved including genetics, the environment, and neurological and metabolic conditions that affect the brain (Autism Society of America, 2004c). For a child to have an ASD, he/she must have deficits in the areas of social relatedness, communication/play, and restricted interest and activities (American Academy of Child & Adolescent Psychiatry, 2010). Social relatedness is trouble with intrapersonal intimacy. The child may not be able to relate to children his/her own age. Problems with communication/play could mean the child has a delay, does not speak, or has trouble communicating. The child might not engage in social play or make-believe play. The child may have restricted interest and activities which can include motor mannerisms or fixation on specific objects. He/she may have adhered to non-functional routines.

Some early *red flags* consist of a child not responding to his/her name by 12 months old, not pointing to objects of interest by 14 months, and not playing “pretend” games, by 18 months (Centers for Disease Control and Prevention, 2010). Behaviors associated with ASD can vary greatly. Some children might have excessive arm flapping and be completely non-verbal. Others may be verbal but may have impaired social skills. Others might engage in self-stimulating behaviors like walking on their toes, rocking from side to side, or making strange noises, (Centers for Disease Control and Prevention, 2009). The child also might experience sensory hyposensitivity or hypersensitivity (Baird, Cass, & Slonims, 2003).

If a child is suspected to have autism, he/she would be taken for behavioral evaluation because there is no medical test for ASD. Autism can be accompanied by anxiety, depression, sleep disorders, mental retardation, and sensory issues. Along with autism, the child might have Fragile X Syndrome, a seizure disorder, or Prader-Willi Syndrome (Autism Society of America, 2004b).

Children with ASD are less likely to engage in occupations than their typically developing peers. Occupational therapists often focus on enhancing young children's sensorimotor performance, social-behavioral performance, self-care, and participation in play (Case-Smith & Arbesman, 2008). Children with Autism often have more difficulty regulating their responses to social situations and sensory stimuli. These children tend to compensate by self-stimulation or avoidance behaviors (Pfeiffer, 2011). Occupational therapists can use MSEs and other sensory techniques to prevent the child from having these behaviors and allow them to more freely participate in every day occupations.

Autonomic Nervous System (ANS)

The autonomic nervous system (ANS) controls involuntary, homeostatic functions. The ANS regulates muscles and glands (Vanderlei, Pastre, Hoshi, Carvalho, & Godoy, 2009). In case of emergency, the ANS creates the *fight or flight* response, and in non-emergency situations it allows people to *rest and digest*. The autonomic nervous system is made up of three parts, the parasympathetic, sympathetic, and enteric nervous systems.

Parasympathetic Nervous System (PNS). The PNS coordinates the rest and digest response of the autonomic nervous system. It communicates with the body through four cranial nerves that originate in the brainstem and spinal nerves that originate in the sacral section of the spinal cord. It slows the heart rate, lowers blood pressure, and increases the release of endorphins. The parasympathetic nervous system adapts the neuro-endocrine and visceral organs to maintain homeostasis and self-regulation (Scaaf, et al., 2010). The PNS is the antagonist to the SNS.

Sympathetic Nervous System (SNS). The SNS coordinates the fight or flight response of the autonomic nervous system through release of adrenaline. If the body is under stress for prolonged periods of time, cortisol is also released to adjust the body's metabolism (Society for Endocrinology, 2013). The SNS activates when there is a sudden change in the body and/or environment. When the SNS activates, heart rate increases, blood vessels constrict, and the pupils dilate. The visceral organs slow down to allow more oxygen and blood to the heart and lungs. SNS activation also results in the sweat response (Science Daily, 2012).

Client-Centered Approach

A client-centered approach is a "collaborative approach aimed at enabling occupation with clients who may be individuals, groups, agencies, governments, corporations, or others" (Canadian Association of Occupational Therapists, 1996, p 1). Occupational therapy takes a client-centered approach on therapy because the client/family decide on treatment, facilitate client participation, flexible and individualized treatment plans, and focus on person-occupation-environment relationships. Manualized therapy has a specific protocol for the therapy that is being given (Miller, Coll, & Schoen, 2007). A manualized approach is difficult to utilize in occupational therapy, due to the emphasis on the individualized needs of the clients.

This study investigated whether a client-centered approach to engagement in a MSE would result in less SNS activation as compared to engagement within the MSE in a protocol-driven approach. Parallel studies investigated the effects on the PNS and engagement.

Methods

This study was conducted at the Sensory Playroom within ProMedica Toledo Children's Hospital Autism Center**.** The University of Toledo's Biomedical Institutional Review Board approved the study procedures. Consent was obtained by all parents and/or legal guardians prior to participation in this study.

Participant Characteristics

Twenty child participants were included in this study. To be included in this study, male and female children between the ages of four and seven who had a diagnosis of an Autism Spectrum Disorder. Children who had primary sensory loss, history of seizures, complications that affect cardiac activity, or other major medical diagnosis, such as Cerebral Palsy or Down Syndrome, were excluded from the study. Participants were recruited through the community and facilities and organizations that serve children with ASD and their families. After each session, the participants were offered a small token of either a pencil or a sticker for their participation. Upon completion of the study, participants' families were compensated with a gift card in the amount of $100.

Study Design

This study utilized a counter balanced design. Each participant attended six MSE sessions: three sessions in the protocol-driven condition and three sessions in the individualized condition. Block randomization was used to randomize and counter balance sessions, across the participant pool. Sessions were scheduled and held at the convenience of parents/ guardians, but they did not span a period greater than four months.

Apparatus and Conditions of MSE

The MSE is located at the Children's Hospital of Toledo Autism Center. The dimensions of the room are approximately 18' X 18', featuring equipment arranged in various configurations, to include a variety of multi-sensory equipment. A detailed description is provided (see Appendix A).

Protocol-driven condition. In this condition sensory equipment was activated in slow and sequential manner, in a clockwise direction around the MSE. The first piece of equipment was turned on immediately, with subsequent pieces being turned on at two –minute intervals thereafter. Once activated, sensory equipment was left on. Participants were to remain in the MSE for approximately 30 minutes.

Individualized condition. Participants were free to engage and play in the MSE for 30 minutes. Participants requested which MSE items/equipment they would like activated through their usual means of communication. Equipment was deactivated when participants ceased to engage with it.

Measures

Demographics Questionnaire. Parents completed an initial questionnaire in order to obtain demographic information. The questionnaire asked questions regarding the participant's age, gender, age of diagnosis, medical history, family structure, current therapy received and socioeconomic status (see Appendix B). It also assessed socioeconomic status through marital status, employment status, educational attainment and occupational prestige.

Sensory Profile. Participants were also assessed using the Sensory Profile (Dunn, 1999) which was administered at the beginning of the first session, to determine a baseline measure of the child's sensory processing pattern. The Sensory Profile is a 125-question caregiver completed profile that documents the frequency of the child's response to a variety of sensory stimuli. The parent/guardian was asked to check a box to rate the frequency of a given behavior in which the child engages. The choices were then rated on a Likert scale: (1) Always; (2) Frequently: (3) Occasionally; (4) Seldom; and (5) Never. This is an interval level of measurement and the lower scores denote greater symptoms. Items are classified by the sensory systems of touch, movement, body position, visual, auditory, and taste/smell and by the behavioral categories of activity level and social/emotional. This information was used to infer participant's sensory processing patterns.

Dunn (1999) described the psychometric properties of the Sensory Profile as follows: Cronbach's alpha for internal consistency ranged from 0.47 to 0.91 for a number of sections of the profile. Internal validity correlations ranged from 0.25 to 0.76 and construct validity showed a correlation ($P< 0.05$) when comparing the results of the Sensory Profile to Electrodermal Responses (EDR).

Child Autism Rating Scale (CARS). The severity of participants' autism symptoms were measured by the Childhood Autism Rating Scale (CARS, Schopler et al., 1994) The CARS (is a behavioral rating scale with 15 items developed to identify, describe and quantify the severity of the child's Autism. The evaluator rated the child on a scale from 1 to 4 (with midpoint scores) across the items. The scores were added up ranging from 15-60, placing the child within a category of severity of Autism. The CARS has been used in studies with children, adolescents and adults (Schopler et al., 1994; Njardvik et al., 1999; Elia et al., 2000). Schopler and colleagues (1994) described the psychometric properties of the CARS as follows: coefficient alpha of 0.94 for internal consistency and inter rater reliability criterion related validity were established.

Engagement. Panasonic high definition video recorders with audio capabilities were used to record each session, in an attempt to ensure data collection was accurate. A parallel study investigated engagement (Smet, 2014).

Parent/ Guardian Opinion. Parent/guardians were asked to give their opinion on the use of the MSE under the two conditions. Results were reported by Smet (2014).

Autonomic nervous system activation. The SNS and PNS have a dynamic relationship and were described and measured as follows:

Sympathetic nervous system (SNS). Electrodermal responses (EDR), indicating SNS activation, were measured by an Affectiva Q Sensor (Waltham, MA, USA). The sensor is embedded in a lightweight, washable wrist band that measures EDR, temperature and acceleration. The sensor was placed on the participant's right or left wrist prior to entering the MSE. The participant's wrist was cleaned with a hypoallergenic wipe. Data was streamed via Bluetooth wireless communication to a Dell E 6430 computer and was logged on the internal USB drive on the sensor. The results are reported here.

Parasympathetic nervous system (PNS). Heart rate variability (HRV), an indicator of PNS activation, was be taken from the inter-beat heart (R-R) and was measured via the RS800cx Polar WearLink transmitter (New York, NY, UA). The transmitter was mounted on a moistened chest strap, placed around the participant's chest just below the pectoral muscles. The transmitter sent heart rate data to a wrist-worn hard drive and a local laptop via the propriety WindLink technology. The Polar RS800 wrist band did not need to be worn with the chest strap but only needed to be in the same room as the participant. Gamelin and colleagues (2008) described the validity of the Polar810 to measure R-R intervals in children. Results are reported by King (2015).

Procedure

Participants attended seven sessions (one introductory session and six MSE sessions). In the first session, the research personnel obtained informed consent from the parent/legal guardians and assent from the participants. The parent/ legal guardians were asked to complete the Demographics Questionnaires and the Sensory Profile, while the research personnel conducted the CARS with the participants. The child participant and guardian were oriented to study protocol. The researcher demonstrated the use of the physiological measurement devices and asked that the parent/guardian assist in applying them on the participant. A doll or stuffed animal may have been used to demonstrate donning/doffing of the devices to the participants.

In subsequent sessions, the parents/guardians were asked to assist the research personnel in applying the physiological measurement devices. Participants were allowed to remove the devices if they wished. The participants were then encouraged to rest quietly for two-10 minutes. Afterwards, the child participant was led to the MSE to engage in a session for up to 30 minute. Parents/legal guardians had the option to inconspicuously observe the sessions/ accompany the child through closed circuit video. Research personnel remained with the participant in the MSE to ensure safety. If participants engaged in behaviors that were unsafe or destructive, they were redirected by research personnel. If unsafe or destructive behaviors persisted after three attempts to redirect, the parent/guardian was asked to intervene and the sessions were terminated.

During the final session, the parent/ guardians were asked to complete reflective questions, while the child participant was playing (Smet, 2014). After completion of all MSE sessions, parents/ guardians were asked to observe videotaped sessions and count incidents of desired and undesired behaviors, as they define them. The parents/guardians received a $100 gift card and the child received a small token (not exceeding 0.25 cents per item) for completing participation in the study.

Data Analysis

Data was obtained from the video and digital recordings of each of the sessions. The first two minutes of each session was used to allow the ANS to adapt to the sensory challenges offered by the MSE. EDR is reported as the Skin Conductance Level (SCL) measured each 500 milliseconds (Gilissen, et al., 2007). Signals were imported to Matlab (MathWorks, Natick, MA, USA) for analysis. Averages were calculated for a one- to two-minute baseline period (Baseline Epoch) and for a subsequent 10-minute period after the child began his/her interaction in the MSE (Session Epoch). Data from these epochs were averaged for the second and third session in each condition. The first session in each condition was excluded to remove effects of novelty. The second and third session were averaged to address individual variability. Data were included in analysis only for participants who were present for all sessions, wearing the recording device. The change in electrodermal activity during the session, as a proportion of the baseline activity, was used for statistical analysis. The mean proportional change under the two conditions was compared with a Wilcoxon Signed Rank Test using SPSS (IBM, Armonk, NY, USA). Effect size is reported as Cohen’s d.

Results

A total of 20 children aged four to seven participated in this study. Out of the 20 children, 14 participants have the diagnosis of Autism, while six have a diagnosis of Pervasive developmental disorder not otherwise specified (PDD-NOS). There were 16 male participant and four female participants. See Table 1 for demographic factors.

The Childhood Autism Rating Scale (CARS) was used to indicate the severity of Autism among participants. After viewing the videotapes of the first introductory session, each participant was given a score on this scale. One participant was not scored due to technical difficulties. The score from the CARS are listed in the Table 2. Sensory Profile scores varied across participants, with no participants having typical scores in all four quadrants. See Table 3 for Sensory Profile scores.

This study compared the use of a MSE with children with ASD using a client-centered approach verses a protocol-driven approach. This study tested the hypothesis, that within the MSE, the client-centered approach would result in less SNS activation, as compared to the protocol approach. Skin conductance level, a proxy for activation of the SNS, was utilized as the primary outcome measure.

Skin conductance level (SCL) data were lost for eight participants, for some who did not tolerate the wrist worn device and for some for whom there were technical difficulties. Average electrodermal activity (μS) in the first one to two minutes and the subsequent ten-minute epoch under the two conditions tested in this study. Statistical analysis was conducted on the proportional change of the session epoch to the baseline epoch. Comparison of electrodermal activity for 12 participants revealed no significant differences in SNS activity under the two conditions, individualized and protocol (see Table 4 for average electrodermal activity in the two conditions at baseline and within the session and the results of statistical tests). Though the magnitude of change in electrodermal activity was greater in the individualized condition, as reflected by the effect size, the change was not statistically significant. Further, the effect is in the opposite direction to the stated hypothesis. There was also a high degree of variance in the measure. Taken together, these factors lead to difficulty in interpreting whether there is an effect of the condition on sympathetic nervous system activity.

Discussion

This study investigated whether a client-centered approach to engagement in a MSE would result in less SNS activation versus engagement within the MSE in a protocol-driven approach. This hypothesis was not supported by data analysis. There was a high degree of variability in SNS activation in both conditions and a non-significant increase in SNS activity in the individualized condition compared to the protocol-driven approach. One factor that may contribute to these results may be the differences among participants' severity of autism symptoms. Some participants had mild Autism and others more severe (as rated by the CARS). The participants with severe Autism, who tended to be non-verbal, had a more difficultly indicating which pieces of MSE equipment they wanted turned on by the researcher in the individualized condition and also appeared to be unsure of the equipment if they were in the client-centered approach first. Under the client-centered approach, some participants were uninterested in the room and appeared to not understand what they were suppose to do, which led to some leaving the room before their 30 minute session had ended. During the protocol approach, some participants would exhibit undesirable behaviors, as identified by the parents, when a particular piece of equipment was not turned on when they desired. The researcher had to redirect some participants when there was a safety concern, which may have caused the participants to become distressed and/or uninterested in the room.

Published reports (McCormick, et al., 2014; Schaaf, Benevides, Leiby, & Sendecki, 2015) provide conflicting findings regarding whether sympathetic nervous system activity in children with ASD differs from typically developing children, but that they may have unique responsivity to sensory stimuli, stress, and social interactions. There was high variability in sympathetic nervous system activity, as measured by skin conductance level, in both conditions in this study. As discussed, this may result from the small sample size and the heterogeneity within the sample, yet it suggests that the magnitude and direction of changes in SNS activity during MSE interventions will be difficult to predict. More research is needed to determine what individual characteristics influence baseline SNS activity and SNS responsivity.

Young children with ASD are faced challenges in the areas of sensory processing, social interaction, and communication, which make it difficult to engage in meaningful activities (Pfeiffer, 2011). Occupational therapists have knowledge on sensory processing disorders and use sensory integration principles in practice. With this knowledge, occupational therapists can create a unique sensory experience for each individual child that will help with their sensory needs. The MSE can be used as an intervention technique for a child with sensory needs.

The findings of this study can provide occupational therapists, caregivers of children with Autism, and facilities using a MSE insight on how the room can be used. The results of this study show a high degree of variability on the autonomic nervous system among both conditions, which suggests that occupational therapists should use their best clinical judgment when using the MSE with young children with Autism. When making this decision, therapists should assess the child's behavior, and observable signs of SNS activation, such as sweating, flushing of the face, and dilated pupils.

Limitations

There are several limitations when interpreting the results of this study. There was a small sample size of only 20 participants in this study, which were all located in the Toledo area. On multiple occasions, participants paused the session to use the restroom, or choose to leave the room after expressing disinterest in the MSE. Technical difficulties are also a limitation to this study. Several of the devices had malfunctioned, resulting in lost physiological data. Video data had also been lost during this study. Some children also did not react well to the devices used to measure the physiological data and would remove them during the session. On occasion the participants would interact with the researcher, which could be a limitation to this study. Also, this study was conducted by three different researchers which can lead to variability.

Conclusion

Further research is needed in the area of best practice for occupational therapy and the use of a MSE intervention for young children with Autism. Future studies should include a larger sample size, from a more diverse region, and focus on children with more severe Autism, as this study only had four participants in that range.

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Table 1

Participant demographics (n = 20)

Gender (n)	Age (years, mean ± SD)	Age of Diagnosis (years, mean ± SD)	Therapies (n)	Race/Ethnicity (n)	Family structure (n) *	SES (Hollingshead, mean ± SD) *	Min/Max SES (Hollingshead)
Male: 16 Female: 4	5.5 ± 1.1 years	3.2 ± 1.1	OT: 16 Speech: 14 Psychology: 3 Other: 8	White: 15 African American: 2 Biracial: 2 Hispanic origin: 1	Married: 18 Single: 2 Only child: 4 One sibling: 7 Two or more siblings: 9	36.5 ± 12.6	Min SES: 15 Max SES: 59.5

Note: *One parent did not include complete SES questionnaire

Table 2

CARs Results (n=19)

Severity of Autism (Score Range)	Number of Participants in Range
Typical (0-29)	5
Mild/Moderate (30-37)	10
Severe (38-60)	4

Note: One participant was not scored using the CARS assessment due to technical errors.

Table 3. Summary of Sensory Profile quadrant results for participants, number of participants whose scores fell into each range (n = 20)

	Low Registration	Sensory Seeking	Sensory Sensitivity	Sensory Avoiding
Probable Less	0	0	0	0
Typical	3	0	2	2
Probable Difference	3	4	6	7
Definite Difference	7	9	4	4

Table 4

Electodermal Response (µS)

	Baseline Epoch	Session Epoch	Proportional Change	Z	Effect size (d)
Protocol	0.174±0.12	0.356±0.19	1.98±3.0	-1.098 p=.272	-.95
Individualized	0.158±0.16	0.644±0.74	5.27±9.9		

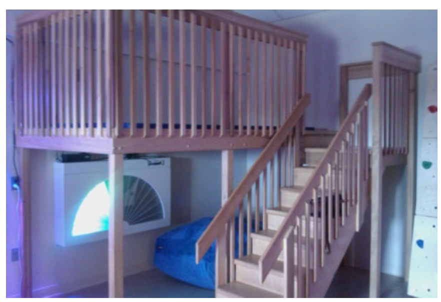
Appendix A

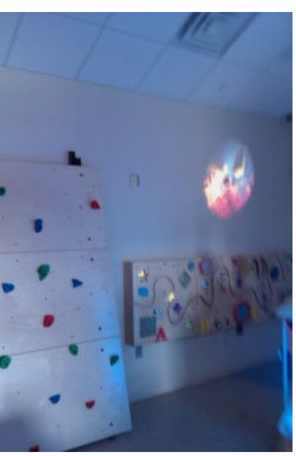
Community MSE Equipment Description and Content List

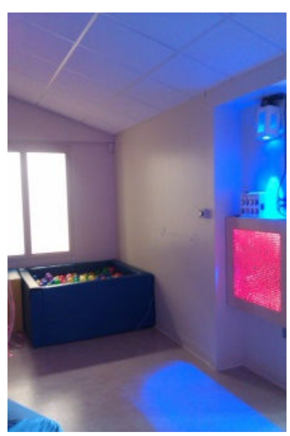
Equipment	Description
Bubble tube	Large clear tubes filled with water with streams of bubbles that float throughout. The tubes are illuminated and change color to allow for visual stimulation.
Vibrating bubble tube plinth	The vibrating seat surrounding the bubble tube provides added sensory stimulation. The intensity of the vibration can be adjusted using the remote control. The vibration has a calming effect for participant's seeking this input.
Fiber optic light wand	Long, smooth fiber optic cables with light travelling though the center for a glowing effect. The light wand is smooth to the touch and can be explored with the participant's hands (i.e. braiding it). The light can change colors as well as be draped over the child for further exploration. The light wand is great visual stimulus, a tool for visual tracking, and good for participants with low vision.
Ball pit/crash pit	A large pit that has 4" soft foam sides covered by safety approved (CPSC) vinyl square shaped unit with a soft foam pad cushion at the bottom. The pit can be filled with small plastic balls to arouse the senses or it can be filled with a large weighted blanket to create a soft, calming space.
Small climbing wall	A small, vertically mounted climbing wall comprised of three sturdy birch panels. Each panel measures 57" W by 29" H and comes with preinstalled handhold mounts. This is an excellent tool for motor planning skills, and bilateral hand movements.
4 multisensory wall panels (tactile, auditory and visual)	Interactive wall mounted panels, which allows for tactile, visual and sounds sensations. The moveable objects in the tracks allow for tactile input and development of motor skills. Clients with visual impairments enjoy the fiber optic lighting and mirrors.
Speakers and stereo for music	Music, particularly soothing music can enhance the MSE experience. A large selection of gentle melodies will be offered to promote relaxation.
Projector with varying wheels	Slowly rotating patterns and special effects are projected onto the walls around the room.

Vibrating rocker chair	A variety of oversized foam rocking chairs with built in speakers to provide vibration to arouse the senses.
Bean bag chairs (Including and excluding vibration and sound)	Large, brightly colored chairs filled with polystyrene beads. The chairs provide great proprioceptive input and relaxation.

The pictures below are of the Sensory Playroom with equipment installed







Appendix B

The following information is being asked in order for us to accurately describe the group of people who participated in our study. This information will be kept strictly confidential.

Please answer the following questions:

1. What is your child's age? _______ years

2. Date of Birth: _______________________

3. Gender: ____________________

4. Diagnosis:______________________Age of initial diagnosis: _________________________

5. Medical history: ____

____

____

6. Family structure: ____

____

7. Current therapy received: ____

____

Indicate the race of the child participant. Please mark any of the following which apply: [¯] White [¯] Black or African American [¯] American Indian or Alaska Native [¯] Asian [¯] Native Hawaiian or other Pacific Islander [¯] Some Other Race	Please indicate whether the child participant is: [¯] Not of Hispanic, Latino, or Spanish origin [¯] Of Hispanic, Latino, or Spanish origin

Please provide responses about yourself in this column	Please provide responses about any other adult living in the home, such as your spouse or committed partner in this column
Level of school completed, select one: [¯] Less than seventh grade [¯] Junior high school (9th grade) [¯] Partial high school (10th or 11th grade) [¯] High school (private, parochial, trade, or public) [¯] Partial college or specialized training [¯] Standard college or university [¯] Graduate professional training	Level of school completed, select one [¯] N/A (i.e. you are single, widowed, divorced) [¯] Less than seventh grade [¯] Junior high school (9th grade) [¯] Partial high school (10th or 11th grade) [¯] High school (private, parochial, trade, or public) [¯] Partial college or specialized training [¯] Standard college or university [¯] Graduate professional training
If employed, please list current job title:	If employed, please list current job title:

Date:_____________ Participant # ____________