

The Effect of A Multisensory Program on Children with Autism

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Abstract

Children with autism often show a wide range of difficulties in sensory processing where they might experience over or under sensitivity to sound, touch, taste, smell and light. There is a need to provide appropriate sensory stimulation or comfort to help children with autism to integrate their senses and have more pleasurable interactions with people and their environment. Snoezelen® is a multisensory environment that provides a range of sensory stimulations that are tailored to meet the needs of children with autism. The multisensory environment provides direct and indirect stimulation of sensory modalities and can be used individually or collectively to provide sensory training. The purpose of this study was to experiment with the use of equipment in the multisensory program, as an intervention approach to provide appropriate sensory stimulation or comfort in a sensory environment that addresses the sensory processing needs of children with autism. The study focused on three main sensory areas - visual, auditory and tactile. The study comprised of six children with autism from ages 5-8 years old. Each autistic child attended an hour session twice a month over a year (24 sessions). The findings show that children with autism improve in their visual, auditory and tactile sensory functioning, using a structured program. The children learn to follow instructions, understand specific concepts, and became more aware of their surroundings.

Keywords: Autism, Children with special needs, Multisensory

Introduction

“Snoezelen” is a contraction of two Dutch words equivalent to the English “sniffing and dozing”. The word promotes the concept and sensation of relaxation and calmness (Burns et al, 2000). The program was developed in Holland with the intention of helping people with mental, sensory, learning and behavioral disabilities. It originates from the belief that we all need stimulation and calming, but people with special needs require appropriate stimulation and calming to grow and progress. Snoezelen® is a multisensory environment that provides a range of sensory stimulations tailored to meet the needs of children with special needs. The world of children with autism circles around primary sensation rather than intellectual interests. Primary sensation refers to immediate and direct sensation as a response to stimulus. Children with autism often show a wide range of difficulties in sensory processing where they might experience over or under sensitivity to visual, auditory, taste, smell and tactile senses. There is a need to provide appropriate sensory stimulation to help children with autism to integrate their senses so that they can have more pleasurable interactions with people and their environment. The sensory experiences are arranged to stimulate the primary senses using some interactive activities. By creating these sensory experiences in a controlled environment, the experiences of enjoying the environment are accessible and autistic children can explore safely at their own pace and time. The multisensory room provides a comfortable and safe environment, yet stimulates with a unique combination of music,

lighting effects, gentle vibration, tactile sensations and aromatherapy (Kwok et al, 2003).

The multisensory environment provides direct and indirect stimulation of sensory modalities and can be used individually or collectively. The designed equipment is used to stimulate or calm the senses of children with autism. The effectiveness of the multisensory program for children with autism depends on the structure and the facilitation of the therapist.

EFFECTIVENESS OF A MULTISENSORY PROGRAM

Snoezelen® rooms are multisensory environments that are often used to improve the behavior and quality of life of individuals with mental retardation and mental illness (Hogg et al., 2001; Lancioni, et al., 2002; Stephenson, 2002). There was much positive evidence of the effect of a multisensory environment on individuals with special needs. Ayres' theory of sensory integration (Ayres, 2005) posits that sensory integration is a neurobiological process that organizes sensation from one's own body and from the environment, thus using the body effectively. It provides a conceptual framework for educators to assist special needs children to improve their concentration levels when learning.

The use of Snoezelen® benefits autistic children as it helps them to gain pleasure from the visual, auditory and tactile experiences (Devlin et al, 2011). The stimulation is believed to promote a sense of enjoyment and a relief from tension and pressure, with consequent improvement in general behavior (Lindsay et. al, 2001). Research on two adolescents with autism conducted by Stadelé and Malaney (2001) reported a decrease in tactile defensiveness, an improvement in communication skills, a reduction in stress, a reduction in self-injurious behaviors, an improvement of staff-client interaction, an increase in length of calmness, and an increase in skill repertoire. Findings from Stadelé and Malaney (2001) also indicated

that sensory room intervention needs to be individualized in order to be effective in decreasing target behaviors among autistic children and young adults. Rozen (2005) concluded that the Snoezelen® environment had a positive effect on a seven year old boy with severe autism. It reduced his maladaptive behaviors, as well as encouraged a positive relationship between the facilitator and the boy. As a result, the boy's parent requested Snoezelen® sessions to become an ongoing part of his treatment and leisure experience. Collier and Truman (2008) in their research explored the use of a multisensory environment to enhance individual engagement and participation, and thus reduced their aggression, agitation, wandering and poor-coordination. He found significant improvement among the participants. In general, much of the literature demonstrates a wide range of positive outcomes (Hogg et al., 2001). However, there is no specific model displaying the strategies and techniques used in the multisensory environment.

Objectives

The purpose of this study was to experiment with the use of equipment in the multisensory program, as an intervention approach to provide appropriate sensory stimulation or comfort in a sensory environment that addresses the sensory processing needs of children with autism.

Methods

(a) Participants and data collection

This study was conducted at a free service centre in Penang, Malaysia. Six children with autism aged from 5 years old to 8 years old (No. of 5 year old children=2, No. of 6 year old children=1, No. of 7 year old children=2, No. of 8 year children=1) were selected to form a group to participate in the Snoezelen program using the stratified sampling method. They were diagnosed by a pediatrician

and psychologist with levels 2 and 3 (moderate to severe) Autism Spectrum Disorder. All of them had common traits such as delayed mental development (functioning below a three year old's mental age), passive in learning, and needing total care and close supervision by adults. All the children had needs or problems identified by the Occupational Therapist. They had hypersensitivity or hyposensitivity problems such as: visual issue – not able to cope with distinct lighting and visually distracted; audio issue – not able to cope with varieties of pitch and sound; tactile issue – strong response towards temperature, textures such as soft, furry and hard objects and sensitive when certain body parts are touched. Besides these, all of them also fulfilled the following criteria: (i) first time participating in the program, (ii) poor understanding of basic language concept, (iii) poor focus and concentration, (iv) unable to follow verbal instructions, (v) unable to accept change nor participate in structured activities, and (vi) unaware of people and environment. Upon selection, a meeting with all the parents of the children was conducted and the parents were briefed on the purpose, commitment and requirements of the program. All the parents then signed a full parental consent to allow their children to participate in the program.

(b) Equipment

Rompa® designs and installs multisensory equipments. It is the first company to sell the concepts of Snoezelen® and multisensory environments to help children with special needs. The Multisensory room is dedicated for sensory relaxation as well as sensory stimulation. In this room, multisensory work can be controlled, intensified, reduced and presented in single or combined forms to fit and achieve relaxation or stimulation needs. The room must be sound proof and its space, temperature and lighting need to be under the control of the facilitator. Below is a

brief description of the basic equipments in the Snoezelen room.

(c) Lighting

Projectors, an aquatic bubble tube, a mirror ball and fibre optic sprays provide a variety of effects whilst helping to create warm and cool sensations. Gentle changes of light patterns and colors are relaxing and interesting. Besides that, the lights also provide visual stimulation to address the children's visual hypersensitivity issues by desensitizing. The projector rotates a special effect wheel which creates images and pictures on the screen. The images are great for visual stimulation. Images and pictures include Under Water World, Butterfly and The Countryside. In the aquatic bubble tube, bubbles of air propel multi-colored balls upwards inside an illuminated column of water. The bubbles float gently to the top giving a great visual effect. The plastic tube gently vibrates and hums for added stimulation. It is filled with some fish and sea creatures. When a spotlight shines onto the mirror ball, reflections of light are cast all around the room creating moving lights/patterns for added visual arousal. Light travels through the fibre optic sprays to give a glimmering effect. The cables are smooth to touch. Gathering the ends of the cables together provides bright visual/light stimulus.

(d) Sounds

Selected rhythmical music such as music with strong tempo and rhythm, with or without vocals, fast or slow, are used in conjunction with the lighting equipment (projector, aquatic bubble tube, mirror ball and fibre optic sprays) to regulate the children's audio issues. It is important to note that the sound and the variety of the tone, pitch, rhythm and spacing are important in calming or arousing the children. Sound effects such as bird and sea animals' noises, wind and water effects or musical instruments such as piano, guitar and

violin are used to attain the objective of providing audio stimulation for the children while producing calming effects. Sound effects with repeated tempo led by bass drum are used to create activities for the children and musical instruments were given to the children to play as they followed the tempo.

(e) Furnishing

A foam floor mat and soft pillows in the room are of value in creating relaxing areas. A foam multi-colored floor mat, with a rubber top texture, provides safe and soft flooring. A multi-colored surface adds excitement. Soft cover pillow fabrics provide additional comfort and a nice effect.

(F) Developed Snoezelan Program

The 24 sessions, each of one hour duration per session, were divided into three terms (8 sessions per term). Each term focuses on a different sensory input such as visual, auditory and tactile. All the lighting equipment was used throughout the three terms. In terms 2 and 3, auditory and tactile input were added and emphasized. Basic concepts, motor skills training and social skills training are also implemented into the Snoezelen program. Each one hour session is comprised of structured or unstructured activities which vary from session to session.

Parents were briefed on the Snoezelen program and agreed to commit to attend the 24 sessions. They were required to fill out an individual profile form, which covered sensory intensity of the child, with the help of the facilitator. Items covered in the sensory profile form were sensory responses of light, temperature, sound, space, texture and patterns. The rating scale was 3=Positive Response

2=Acceptable Response, 1=No Response, -1=Dislike (with verbal expression), -2=Dislike (no verbal expression), -3=Respond with Temper Tantrum. The profile of the concerns and needs of the child helped the facilitator to plan the program. The first session was used to brief the parents, orientate the children and observe their responses to the intensity of the sensory input. All the parents were required to accompany their children for the one hour session and they had to cooperate with the facilitator to handle their children's behaviour during the session. Parents were also required to observe their child's behaviour and write a short report of his or her performance after every session.

Below is the curriculum over three terms (one year):

- (i) Term 1 (Sessions 1-8) focused on visual sense.
- (a) Objectives of Term 1 are:
 - (ii) Desensitize and/or stimulate visual sense.
 - (iii) Introduce vocabulary of objects and sea creatures, body parts.
 - (iv) Learn the concept of numbers (1-10).
 - (v) Learn the concept of sizes (big, small).
 - (vi) Learn the concept of direction (front, back).
 - (vii) Training of motor skills (tap, point, step, swing, twist).
 - (viii) Training of social behavior of turn-taking and sharing space.
 - (ix) Encourage children to engage in structured group activities.

Equipment	Procedure
Projector (with special effect wheel of “Under Water World	<ul style="list-style-type: none"> • Children observed the “Under Water World” screen while listening to “Sounds of dolphins”. • Facilitator introduced objects and sea creatures (e.g. ship, submarine, diver, corals, fish, seahorse, turtle, dolphin, whale, shark, jellyfish) on the screen verbally as the projection moved on. • Children sat in front of the screen and said/repeated the objects and sea creatures. • First two sessions, the facilitator concentrated on big objects and sea creatures; third and fourth sessions, the facilitator concentrated on small sea creatures; and after the fifth session, the focus was on counting fish. • From the fifth session onwards, the facilitator would switch off the projector and ask the children to recall the sea creatures, and draw them on the paper (with physical and verbal prompting from the parent).
Mirror Ball	<ul style="list-style-type: none"> • Children observed the lights/patterns of the mirror ball coming from the front (facing mirror ball)/from the back (opposite mirror ball). • Children learnt to tap, point and step on the lights/patterns of the mirror ball using their hands and legs.
Fibre Optic Sprays	<ul style="list-style-type: none"> • Children played with a bunch of fibre optic cables freely, and they were encouraged to lie down on it and cover their body with it. • Children used the fibre optic cables to touch their own and friend’s body part such as ear, mouth, hand and leg. • Children learnt to twist and swing the fibre optic cables with their fingers.
Aquatic Bubble Tube	<ul style="list-style-type: none"> • Children observed the fishes and sea creatures, bubbles and lights in the aquatic bubble tube. • Children took turns and came out one by one to look at and feel the aquatic bubble tube. • Children were asked to point at the sea creatures using one finger.
CD and CD player	<ul style="list-style-type: none"> • Before every sessions ended, all the children were asked to lie down and rest for 5 minutes in the dark room with relaxation music as background music (volume 26-30).

(b) Term 2 (Sessions 9-16) focused on auditory sense. Objectives of Term 2 are:

- (i) Desensitize and/or stimulate audio sense.
- (ii) Introduce vocabulary of the butterfly and colors.
- (iii) Learn the concept of colors (primary and secondary colors).

- (iv) Learn the concept of speed (fast, slow).
- (v) Learn the concept of sizes (big, small).
- (x) Learn the concept of numbers (1-10).
- (vi) Learn the concept of directions (front/back).
- (vii) Training of motor skills (tap, point, pick, step, thread).

(viii) Training of social behavior of turn-taking and sharing space.

(ix) Encourage children to engage in structured group activities.

Equipment	Procedures
Projector (with special effect wheel of “Butterfly”)	<ul style="list-style-type: none"> • Children observed the “Butterfly” screen while listening to a variety of background stimulating music (upbeat music). • Children were asked to observe and say the size and colour of the butterfly. • Facilitator introduced big and small butterflies on the screen verbally as the projection moved on. • Children sat in front of the screen and repeated the words said by the facilitator. • In the first and second sessions, the children were directed to focus on big and small butterflies; third and fourth sessions they focused on the colours of the butterflies; and from the fifth session they described the sizes (big and small) and colours of the butterflies. • From the fifth session onwards, the facilitator would switch off the projector and asked the children to recall the shapes and colours of the butterflies, and draw them on the paper (with physical and verbal prompting from the parent).
Mirror Ball	<ul style="list-style-type: none"> • Children observed the lights/patterns of the mirror ball coming from the front (facing mirror ball)/from the back (opposite mirror ball). • Children learnt to tap, point, pick and step on the lights/patterns from the mirror ball using their hands and legs, following the tempo of the music.
Fibre Optic Sprays	<ul style="list-style-type: none"> • Children swung a bunch of fibre optic cables with their right and/or left hand following the tempo of the music. They would add on/take away one or two fibre optic cables as instructed by the facilitator. • Facilitator changed the speed of swinging the fibre optic cables by introducing “fast/slow”. • Facilitator placed big and small butterflies in between the fiber optic cables. • Children threaded the big/small butterflies using the fibre optic cables as instructed.
Aquatic Bubble Tube	<ul style="list-style-type: none"> • Children observed the fishes, sea creatures, bubbles and lights in the aquatic bubble tube. • Children raised their hands and when called by the facilitator, came out one by one to see and feel the aquatic bubble tube. • Children pointed at the fishes and sea creatures with one finger. • Children pointed at and counted the fishes and sea creatures (1-10).
CD and CD player	<ul style="list-style-type: none"> • Before every sessions ended, all the children were asked to lie down and rest for 5 minutes in the dark room with relaxation music as (no ‘the’) background music (volume 26-30).

- (c) Term 3 (Sessions 17-24) focused on tactile sense. Objectives of Term 3 are:
- (i) Desensitize and stimulate tactile sense.
 - (ii) Introduce vocabulary of shapes, body parts, plants, insects and animals.
 - (iii) Learn the concept of numbers (1-10).
 - (iv) Learn the concept of temperature (warm, cold).
 - (v) Learn the concept of tactile (hard, soft).

- (vi) Learn the concept of directions (front/back).
- (vii) Training of motor skills (tap, thread).
- (viii) Training of social behavior of turn-taking and sharing space.
- (ix) Encourage children to engage in structured group activities.

Equipment	Procedure
Projector (with special effect wheel of “Countryside”)	<ul style="list-style-type: none"> Children observed the “Countryside” screen while looking for hidden/shadows of animals and insects on the screen. Facilitator introduced the names of animals, insects and objects on the screen verbally as the images moved on. Children sat in front of the screen and repeated the words said by the facilitator. In the first and second sessions, the children were directed to focus on the animals, insects and objects; third and fourth sessions they focused on colors of the animals, insects and objects; and from the fifth session onwards they described the sizes and colors of the animals, insects and objects. From the fifth session onwards, the facilitator would switch off the projector and asked the children to recall an animal/insect/object, and choose the card with the correct animal/insect/object. Then, they had to trace the shape of the animal/insect/object on the paper (with physical and verbal prompting from the parent).
Mirror Ball	<ul style="list-style-type: none"> Children observed the lights/patterns of the mirror ball coming from the front (facing mirror ball)/ from the back (opposite mirror ball). Each child was given one square and one round shape. Children learnt to tap on the lights/patterns from the mirror ball using the shape instructed and following the tempo of the music.
Fibre Optic Sprays	<ul style="list-style-type: none"> Facilitator placed different shapes (square and round) in between the fiber optic cables. Children threaded the different shapes using the fibre optic cables as instructed. Children took two fibre optic cables to tie a knot. Then they held the end of the fibre optic cable with each hand to interchange accordingly.

Equipment	Procedure
Aquatic Bubble Tube	<ul style="list-style-type: none"> • Children observed the fishes, sea creatures, bubbles and lights in the aquatic bubble tube. • Children raised their hands and when called by the facilitator, came out one by one to see and feel the aquatic bubble tube. • Children pointed at the fishes and sea creatures with one finger. • Children pointed at and counted the fishes and sea creatures (1-10). • The facilitator switched off the aquatic bubble tube. Children were requested to colour in the sea creatures on the paper provided by the facilitator.
Tactile Activities	<ul style="list-style-type: none"> • In the first activity, the facilitator placed varieties of shapes into a bag. The children were asked to touch and feel different shapes in the bag and take out the correct shape as requested. • In the second activity, the facilitator placed some small tactile balls (squishy and nubby texture) into the bag. Children were directed to put their hands into the bag to feel the tactile balls. • After that, the parent used a tactile ball to massage the child's body parts (e.g. face, neck, head and stomach). • In the third activity, the children focused on touching two small pillows (one is filled (delete 'up to the') full with red beans and the other one is filled with cotton wool) to differentiate between the hard/soft textures. • In the fourth activity, the children focused on touching a warm pillow and cold ice pack to differentiate between the temperatures of the objects.
CD and CD player	<ul style="list-style-type: none"> • Before every sessions ended, all the children were asked to lie down and rest for 5 minutes in the dark room with relaxation music as (no 'the') background music (volume 26-30).

Results

For the result, a qualitative analysis of the child's sensory and behavioural responses is done from the data triangulation collected from facilitator, parents (father/mother) of the children with autism, and special education teachers. Observations of the children's sensory and behavioural responses were recorded in the report at the end of every session by the parents. Furthermore, the researchers also interviewed the special education teachers to get their feedback on the children's progress after each term. All equipment was switched on during the first session, and it was noted that the majority

of the children (n=5) were highly stimulated and they displayed self-stimulatory behaviours. Five of them were active-flapping, moving and jumping about, except for one child who did not respond and remained passive. All of them did not show appropriate play with the equipments in the room. However, one participant showed creativity when he formed images of a rabbit and Mickey Mouse using the fibre optic cables. During the second session of term 1, which targeted on visual sense, all the children (n=6) were aware of the images from the projector but they gave just a few quick glances. None of the children were able to sit

still and focus on the images from the projector until the third session onwards. However, all the children were aware and responded to the images from the mirror ball during the second session. They started laughing, flapping and had increased self-talk when performing the task. When the facilitator switched on the fibre optic sprays, it attracted all the children to sit nearer and touch the cables. When they took turns to observe the aquatic bubble tube, they stayed focused on the bubbles and sea creatures with the changing light. They started to calm down. It is noted that the children started to adapt and respond to the visual sensory stimulation from the fourth to eight sessions of term 1.

During the first three sessions of term 2 which targeted on audio sense, three of the children did not respond to the different types of music, neither to the changes of the music volume. The other three children were aware of the music but did not know where the source was from. It is noted that all the children were unable to focus on the images from the projector and only started to be aware when the facilitator played fast tempo music. They started to rock, cry and displayed restlessness until the facilitator change to music with a slow speed and relaxed rhythm. However, all the children showed significant improvement in performing motor tasks with fast tempo music. For example, they were able to

swing the fibre optic cables in a circle with their hand, able to tap the lights/patterns of the mirror ball with alternate hand or leg, able to tap the lights and pattern from the mirror ball with minimum physical prompting following the tempo of the music. All the children became aware of different types of music and were able to perform structured activities with background music from session 3 of term 2 onwards. It is noted that music with fast tempo stimulated the children, while relaxation music produced calming effects on the children.

All the children (n=6) responded positively in term 3. All the sessions were targeted to train their tactile sense. The children were very sensitive to the tactile ball with squishy and nubby texture. They started laughing and became restless when touching the ball. The facilitator asked each parent to use the ball to massage their child's body for a few minutes in every session. The majority of the children (n=5) became less sensitive towards the tactile stimulant after the third sessions. The children were found to be quick in grasping basic concepts with the aid of the tactile sensory stimulation such as hot and cold; hard and soft; and different sizes and shapes. They were able to express their feeling on the temperature and texture they liked or disliked. All the observations were summarized into table 1 below.

Table 1: Observations of six children’s behaviour and learning over three terms

Sensory Issues	Child	Presenting Problems	Changes at end of 1 st Term	Changes at end of 2 nd Term	Changes at end of 3 rd Term
<p>(i) Visual Sense All the children were unable to cope with distinct changes in the lighting. They were easily distracted by visual cues.</p> <p>(ii) Audio Sensory Majority of the children (n=5) were unable to cope with variety of music tempo and loudness.</p> <p>(iii) Tactile Sense The majority of the children were hypersensitive (n=5) while one was hyposensitive to temperature and textures changes (n=1).</p>	Child A’s Behavior	<ul style="list-style-type: none"> • Poor eye contact. • Unable to focus. • Always lost in his own world and not able to track object on the screen. • Ignored calls from parents. • Does not respond to audio stimuli. • Hypersensitive to tactile stimuli and displayed non-stop giggling and laughing. 	<ul style="list-style-type: none"> • Better eye contact and able to sustain for a longer period of time (5-10 minutes). • Improved in focusing on specific objects pointed to him. 	<ul style="list-style-type: none"> • Slight improvement in response to calls from parents and facilitator. • Able to adapt to various environments with variety of music. • Able to choose the music he likes. 	<ul style="list-style-type: none"> • Able to accept and touch objects with a variety of texture (“hard/soft”, and squishy) and temperature (“warm/ cold”).
	Child’s A’s Learning	<ul style="list-style-type: none"> • Unable to recognize or differentiate between “big/ small”; “fast/slow”; “hard/soft”; and “warm/cold”. 	<ul style="list-style-type: none"> • Started to understand the concept of “small/big”. 	<ul style="list-style-type: none"> • Started to understand the concept of “big/ small” and apply to real objects. • Started to understand the concept of “fast/ slow”. 	<ul style="list-style-type: none"> • Started to understand the concept of “hard/soft” and “warm/cold”.
	Child B’s Behavior	<ul style="list-style-type: none"> • Hypersensitive to visual stimuli, audio stimuli and tactile stimuli displayed. Responded with non-stop giggling and melting down behavior. • Not able to follow through sessions which have more than one visual stimuli. 	<ul style="list-style-type: none"> • Showed significant improvement by the third session of the visual stimuli, audio stimuli and tactile stimuli in every term. There was less giggling and melting down behavior. • Able to spend longer time 	<ul style="list-style-type: none"> • Showed significant improvement after three sessions in every term. • After three sessions, he started to adapt to visual and audio stimuli. He started to enjoy the different music and could perform the 	<ul style="list-style-type: none"> • Showed improvement by responding to the tactile stimulation: less giggling and melting down behavior when parent used the tactile ball to massage his body. • Able to choose the texture he liked such as

Sensory Issues	Child	Presenting Problems	Changes at end of 1 st Term	Changes at end of 2 nd Term	Changes at end of 3 rd Term
		<ul style="list-style-type: none"> Not able to follow through sessions which have auditory stimuli, even with very soft relaxation music. Not able to perform activities related to tactile sense 	observing the lights and objects that were moving (5-8 minutes).	<ul style="list-style-type: none"> task given. Followed the tempo of the music and moved his body according to tempo. 	“warm” and “hard”.
	Child B’s Learning	<ul style="list-style-type: none"> Unable to understand the concept of “big/small”, “hard/soft” and “fast/slow”. 	<ul style="list-style-type: none"> Started to understand the concept of “big/small”. 	<ul style="list-style-type: none"> Started to apply the concept of “big/small” to some objects. Started to understand the concept of “fast/slow”. 	<ul style="list-style-type: none"> Able to understand and apply concepts that he has learnt (“big/small”, “hard/soft” and “fast/slow”) to other settings.
	Child C’s Behavior	<ul style="list-style-type: none"> Liked to observe lights at very close proximity and stare for a long period of time without blinking his eyes. Obsessive in observing the moving lights/patterns. Enjoyed the music and wanted all music to be (delete ‘switch on’) at very loud volume. Tactile sensitivity: avoided touching sticky and starchy things such as glue. 	<ul style="list-style-type: none"> Started to observe lights/patterns from a distance. Able to switch his attention from one object to another. 	<ul style="list-style-type: none"> Able to listen to music with different volumes (soft or loud). Reduced in temper tantrum when facilitator played the music that he did not like. 	<ul style="list-style-type: none"> Able to touch objects with different textures (hard/soft, warm/cold, squishy/nubby). Can use glue in doing his task.

Sensory Issues	Child	Presenting Problems	Changes at end of 1 st Term	Changes at end of 2 nd Term	Changes at end of 3 rd Term
	Child C's Learning	<ul style="list-style-type: none"> • Could only recognize shapes and colors using familiar set of teaching aids. • Unable to understand the concept of "big/small". 	<ul style="list-style-type: none"> • Started to understand the concept of "big/small". • Started to recognize various sea creatures. 	<ul style="list-style-type: none"> • Understood the concept of shapes, colours and "big/small" and applied to real objects. • Able to construct three words short sentences using concepts that he learnt (e.g., big yellow butterfly). 	<ul style="list-style-type: none"> • Understood the concept of "big/small" and applied to real objects. • Able to construct three words short sentences using concepts that he learnt (e.g., round blue ball).
	Child D's Behavior	<ul style="list-style-type: none"> • Insecure and too confused to follow instructions when she first entered the room. • Afraid and avoided looking at any of the visual stimuli. • Hypersensitive to audio stimuli, and displayed self-talking and self-singing behaviors when music was on. • Showed temper tantrum when the background music was on for a prolonged period of time (>10 minutes) • Insisted on covering both ears with her hands when she couldn't stand the music. 	<ul style="list-style-type: none"> • Began to adapt to the various environments with a variety of visual stimuli presented. • Calm and relaxed after a few sessions. 	<ul style="list-style-type: none"> • Accepted audio stimuli in the room and began to enjoy a particular relaxation music. • Able to accept music without covering her ears with her hands. • Able to dance following the tempo of the music. 	<ul style="list-style-type: none"> • More sensitive to tactile stimulation and aware of different types of surfaces that she touched.

Sensory Issues	Child	Presenting Problems	Changes at end of 1 st Term	Changes at end of 2 nd Term	Changes at end of 3 rd Term
		<ul style="list-style-type: none"> • Hyposensitive to tactile stimuli. Not aware of objects that she was holding or touching. 			
	Child D's Learning	<ul style="list-style-type: none"> • Poor in understanding all the concepts. • No idea of how to do the activities or tasks and did not understand what she was doing. 	<ul style="list-style-type: none"> • Showed significant improvement in recognizing and identifying new words. • Able to identify "big/small" and count fish independently. 	<ul style="list-style-type: none"> • Able to identify "big/small" and "fast/slow" independently. 	<ul style="list-style-type: none"> • Able to identify "hard/soft", "warm/cold" and "fast/slow" independently. • Able to apply weight ("heavy" and "light") to hard and soft objects.
	Child E's Behavior	<ul style="list-style-type: none"> • Poor eye contact. • Tended to look upward to avoid eye level contact with people. • Not interested and unresponsive to any visual stimuli. • Acted as if deaf to parent's calling and instructions. • Unresponsive to any kind of auditory stimuli. • Hypersensitive to tactile stimuli: avoided touching fluffy and nubby objects. • Didn't like walking bare foot on sandy beach and grassy ground. 	<ul style="list-style-type: none"> • Able to maintain eye contact with parents and other adults that he was familiar with. • Able to locate objects that were pointed to him. 	<ul style="list-style-type: none"> • Able to respond to instructions. • Responded to music and songs. • Began to hum along to his favourite music. • Able to listen to instructions given by adults. 	<ul style="list-style-type: none"> • Able to accept different types of textures on objects/ surfaces. • Started to explore things by touching with curiosity.

Sensory Issues	Child	Presenting Problems	Changes at end of 1 st Term	Changes at end of 2 nd Term	Changes at end of 3 rd Term
	Child E's Learning	<ul style="list-style-type: none"> Poor in understanding concept of size and colors. 	<ul style="list-style-type: none"> Able to identify "big/small" and colors. 	<ul style="list-style-type: none"> Able to identify "big/small" and "fast/slow" independently. 	<ul style="list-style-type: none"> Able to identify "hard/soft", "warm/cold" and "fast/slow" independently
	Child F's Behavior	<ul style="list-style-type: none"> No eye contact. Not interested in looking at moving objects. Unaware of background music or relaxation music. Loved soft and smooth surfaces and objects but avoided hard objects and rough surfaces. 	<ul style="list-style-type: none"> Slight improvement in eye contact with people. Showed significant improvement in focusing and locating moving objects. 	<ul style="list-style-type: none"> Began to adapt to environment with auditory stimulus. Began to enjoy listening to rhythmic music and was able to perform task given. 	<ul style="list-style-type: none"> Able to accept different objects ("hard/soft", "warm/cold"). Allowed parent to massage his hands and legs using tactile balls.
	Child F's Learning	<ul style="list-style-type: none"> Inconsistent in applying concepts that he learnt to daily routine and table task activities. 	<ul style="list-style-type: none"> Started to understand the concept of "big/small". 	<ul style="list-style-type: none"> Started to understand colors and shapes. 	<ul style="list-style-type: none"> Able to apply the concept of "big/small", colors and shapes to real objects.

After 24 sessions over three terms were completed in 12 months, the children (n=6) who were previously hypersensitive to the visual, auditory and tactile inputs were desensitized. They were more relaxed and calmer in adapting to the multisensory environment (visual, auditory and tactile stimuli). All the children's concentration levels and awareness of the environment improved over time and this was generalized in their day to day living. They were more willing to follow structured activities and also able to accept and follow specific instructions given to them.

Implication of this study

When the multisensory program started, the facilitator followed the supplier's recommendation to conduct the multisensory program in a free and easy manner. According to the findings of other research, the multisensory program is supposed to provide sensory experiences for the participants and not meant to focus on intellectual activities. However, during the trial sessions, the children were unable to engage with the equipments in the multisensory room. A decision was then made after the trial sessions to alter the curriculum of the program to be structured. Instead of switching

on all the equipments during the session, one type of equipment was introduced per activity with a maximum of three to four types used per session. Each type of equipment was switched on for about 10 to 20 minutes. The sessions were then transformed from semi-structured training leading to a fully structured training session.

After conducting the program with structured activities for eight sessions, we found that the children adapted and behaved well (reduced restless behavior, able to sit still and wait for their turn) and began to show sensory improvement with a reduction in hypersensitivity to visual, auditory and tactile stimuli. These initial findings supported the decision to continue the program in a planned and structured manner. The systematic structured multisensory program was carried out over three terms with a total of 24 sessions. The structured multisensory program is relevant for children with autism. During unstructured sessions, the children continued to stay engrossed in their own world. All of them did not respond to the equipments. However, when the sessions were conducted with structured activities, the children responded to sensory stimulation. Over the three terms, the children were able to process and accept the sensory stimulation, as well as learn other skills such as (to) following instructions, staying on task, taking turns and performing tasks given. The majority of the participants could calm down with the sensory relaxation activity at the end of the session.

Discussion and Conclusions

This study shows that children with autism improve in their visual, auditory and tactile sensory functioning after undergoing the structured

multisensory program which supports Ayres' theory of sensory integration (Ayres, 2005) which posits that sensory integration assists special needs children to regulate their sensory problems and improve their concentration level during learning. In addition, children with autism learn to follow instructions in structured activities, improve in understanding of basic concepts, and shows awareness of their surroundings. The study of Collier and Truman (2008) which concluded that a multisensory program affected the children's adaptive behaviors, as well as encouraged positive relationships between the facilitator and the children, is also supported in this study. The improvements from the above mentioned areas were noticed in all the six participants by the teacher, parents and special education teachers. This preliminary study supports the notion that a multisensory program is beneficial for children with autism when conducted in a structured manner. It is supported by Hume (2011), structured strategies capitalize on the strengths of students with ASD. These include providing predictable and meaningful routines through the use of structure, adding visual/structural supports to classroom instruction and activities to increase engagement and independence. Furthermore, structured strategies address challenging behaviors in a proactive manner by creating appropriate and meaningful environments that reduce the stress, anxiety and frustration which may be experienced by children with autism (Stokes, n.d.). However, it is important to highlight that the equipments is only a tools, but a structured multisensory curriculum is needed to ensure its effectiveness for children with autism. Further research on this must be done to establish more conclusive evidence.

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