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Nature as a Healer for Autistic Children

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Abstract

According to estimates from the Centre for Disease Control (CDC's) in 2008 and the Autism and Developmental Disabilities Monitoring (ADDM) Network in 2010, about 1 in 88 children had Autism Spectrum Disorder (ASD) in 2008 and about 1 in 68 children had Autism Spectrum Disorder (ASD) in (2010). The eighth Scientific Conference for Autism held by the College of Education in conjunction with the Egyptian Society for Hydration Capacities of Children with Special Needs revealed that 1 out of every 80 children in Egypt are suffering from autism and this number in Egypt was expected to rise from 2.3 million in 2001 to 2.9 million in 2017.

The reason for many of autistic children's symptoms is sensory integration, it is the power to understand, organize and feel sensory data from the environment and body. The issues surrounding sensory integration are presented in hyposensitive and hypersensitive reactions by children with autism to the vestibular, proprioception, tactile, audio, visual, and olfactory senses.

A great deal of research has been conducted on gardens and their effect on health outcomes and how a garden may provide benefit:

1. Relief from physical symptoms or awareness of those symptoms.
2. Stress reduction.
3. Improvement in the overall sense of well-being.

The aim of this paper is to establish a group of guidelines for designing a therapeutic garden for children with Autism Spectrum Disorder to treat the sensory integration problems of children with ASD by designing a sensory garden which should focus on therapeutic interference. By using the elements and principles of design, the guidelines for this garden are focused on producing calming effects for hyper reactive children with ASD and stimulating effects for hypo reactions.

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Keywords

Autistic children; healing gardens; sensory integration; hyper-reactive children with Autism Spectrum Disorder; hypo-reactive children with Autism Spectrum Disorder

1. Introduction

A lot of studies show the effect of environments and buildings on human health and how factors as circulation, temperature, noise and cost serve the environmental perception and human health. All these factors must apply to the design of outdoor space.

There is about 1 in 88 children that have been diagnosed with an Autism Spectrum Disorder. Sensory integration problems may be the reason why many children have Autism Spectrum Disorder symptoms. Sensory integration is the power to feel and understand sensory data from the environment and body (*ADDM*).

This study calls for finding links between sensory needs of children with ASD and principles of design. Design modulation will be used to create guidelines for landscape architects to use in creating spaces declaiming the sensory problems of children with Autism Spectrum Disorder.

Fig.1 shows that the study intends to empirically study a sensory garden for autistic children by creating multi-level spaces and using a wide variety of landscape features. Designing the sensory garden has helped to test the guidelines that have been established in this study. The literature review is divided into three sections. The first section discusses the behavior and profoundness of ASD on afflicted children and the problem that may accompany ASD and types of treatment methodologies. The second section discusses how nature is important in stress reduction and the health benefits resulting from contact with the outdoor and nature. The third section discusses a set of guidelines for designing a sensory garden for autistic children.

2. Nature of Autism

Autism spectrum disorder is known as a behavioral and neurological disorder that affects the performance of the brain in areas of communication skills and social interaction (Gillberg & Coleman, 2000).

There are current facts about autism as it affects 1:150 children throughout a whole nation (American Psychiatric Association, 1994). It also does not discriminate based on race, education of parents, socioeconomic status, or other demographic variables (Wong, Lee, Howlin, & Asgharian, 1999). It is three to four times higher in boys than in girls and for the time being, experts still have not been able to determine the reason for its occurrence (Autism Resource Foundation, n.d.).

Children with ASD exhibit specific behaviors such as:

- **Interaction impairment in social activities:** Failure to use eye contact, facial expressions and weakness in social interaction
- **Weakness in Communication:** Deficit in sustaining or initiating a conversation
- **Repetitive and restricted behaviors and interests:** Intense absorption with one activity or subject and persistence on rituals or routines without a goal (Autism Resource Foundation, n.d.).

2.1. Problems that May Accompany ASD

Many problems may accompany Autism Spectrum Disorder including seizures, mental retardation, and sensory problems.

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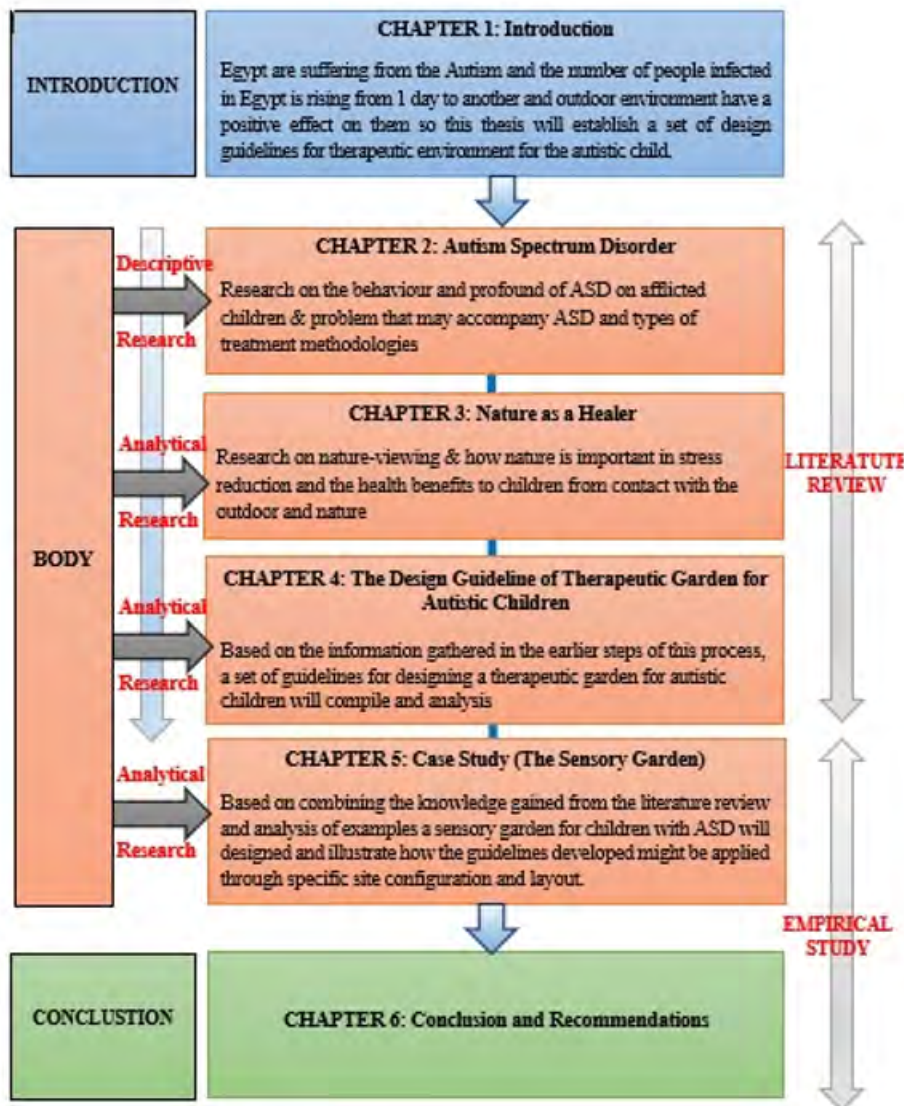


Figure 1. Paper structure diagram

3.1.1. Sensory Problems

“Sensory Integration Theory was developed to explain an observed relationship between deficits in interpreting sensory information from the body and the environment, and deficits in academic or neuro-motor learning in some individuals who demonstrate learning disabilities” (Wilson, 2006). The sensory systems can be divided into two main areas hyper and hypo sensitivity including taste, smell, vision, hearing, touch, vestibular and proprioception as shown in figure 2. For instance, some children may be hypersensitive to the texture. On the other side, children may be hypo-sensitive to pain and unable to protect themselves from hurting themselves (Fisher, Murray, & Bundy, 1991).

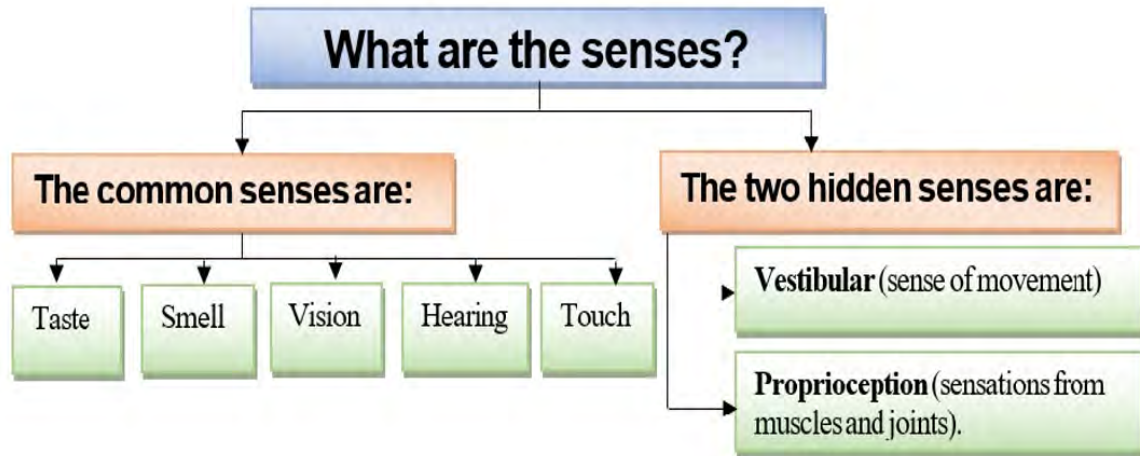


Figure 2. shows what are the senses (Falk & Gross, 2011)

3.1.2. Problems in Playful Experiences

Because children with ASD have many problems emotionally and socially, there is a problem in playful experiences. Wolfberg and Schuler note that “qualitative impairments in reciprocal social interaction and symbolic play are hallmarks of autism spectrum disorder”. These children have difficulty in starting and supporting their playful activities and displaying delayed patterns of social interaction. Inability to relate to others is one of the clearest signs of ASD (Wilkes, 2005). Susanna Miller states “Play is the child’s method of exploring and coming to terms with the world and of learning physical coordination; the use of symbols and fantasy” (Mastrangelo, 2009).

4. Nature as a Healer

Moore found that the sound of running water, wildflower meadows and the feel of the entire neighborhood have great effects on social and psychological behaviors of the students. There is a sense of positive effect on children where birds and butterflies filled the air with their beautiful sound and colors (Miller, 1968). It is very important to children with ASD to be in constant contact with nature to maintain their cognitive, mental, and physical health and benefit socially and emotionally from nature.

4.1. Cognitive Benefits After Interacting With Nature

- **Time in nature helps in observation and to be more creative:** timely interactions with the outdoor environment help children to develop the great powers of creativity and observation (Moore, 1996).
- **Playing in natural environments reinforces collaborative skills and language development:** playing in nature helps children to be more imaginative and creates components that reinforce collaborative skills

language (Crain, 2001).

- **Outdoor skills education helps children’s health, lifestyle and learning:** Cottrell, S., & Raadik-Cottrell discuss the benefits of outdoor skills education as improving intrapersonal skills and the ability to learn and concentrate (Fjortoft & Sageie, 2000).
- **Connecting to nature increases children’s skills:** nature develops imagination and the sense of wonder which are very important in life-long learning (Cottrell & Raadik-Cottrell, 2010).

4.2. Mental Benefits After Connecting With Nature

- **Nature helps in reducing stress:** nature decreases the stress of life on children and helps them become stronger. There are great benefits after being exposed to nature (Louv, 1991; Wilson, 1997).
- **Nature reinforces positive feelings:** when children play with each other in nature they have positive feelings about each other (Wells & Evans, 2003).
- **Children with insufficient Vitamin D are more likely to become fatty over time:** after exposure to sunlight Vitamin D is primarily produced. Vitamin D deficiency is the main factor for childhood fatness (Moore, 1996).
- **Children with attention deficit/hyperactivity disorder (ADHD) after walking in outdoor space:**

Frances Kuo and Andrea Faber Taylor explore the influence of three different outdoor environments on the attention of seventeen children diagnosed with ADHD from 7- to 12-year-old after 20 minutes of walking in different outdoor spaces (a downtown area, a residential area and an urban park). The children also answered several questions about their walking experience and completed a concentration test. After walking in the park, the children were able to concentrate more and this narrowed the gap between children with ADHD and those without (Huh & Gordon, 2008).

4.3. Physical Health Benefits After Interacting With Nature

- **Social development:** Henniger found that playing outdoors encourages children to exercise parallel play but playing indoors only encourages individual activity. Similar levels of collaborative play occurred in both environments (Henniger, 1993).
- **Emotional development:** outdoor experiences lead to fewer bonds of children’s behaviors and enables them to find solitude away from adults and other children, engage in solitary activity or be in small, intimate groups. Such private experiences are necessary for young children (Greenman, 1988).

5. The Design Guideline for a Therapeutic Garden for Autistic Children

In creating therapeutic gardens for children with ASD the elements of design, visual principles, landscape features, and other considerations as therapeutic animals, play structures, safety and security were integrated into the guidelines. These guidelines were used in the design of a sensory garden which helps in calming hyper reactive children and stimulating hypo reactive children with ASD.

5.1. Visual Principle as a Therapeutic Tool

In landscape design, visual principles are used to design meaningful and functional outdoor spaces. Visual principles include unity, balance/order, scale/proportion, rhythm/sequence and emphasis. The following tables show how visual principles can be used to create specific influence (Johnson, 2006).

Table 1. How to use Unity and Harmony in creating a specific influence (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
-Repetition of elements.- Proximity of elements.- Using predicable continuity of line (path-plant beds).	- Variety in height, volume, etc.- Using unity of three (odd number).- Using unity by emphasis depends on contrast with adjacent objects.

Table 2. How to use balance and order in creating specific influence (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Create a 'savannah' type landscape by using gap plans and plants with clumps.-Use of perspective balance.	- Use of mass collection by organizing plant material according to masses around an open circular lawn space. - Use radial and symmetrical balance.

Table 3. How to use scale or proportion in creating specific influence (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Similar plant size and proportion of open space and planted space.- Create small space for the child as patio and terraces.	- Different plant size.- Create large open space for the child.

Table 4. How to use rhythm and sequence in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
-Use colour sequences which give natural flow.- Use walkways with fluid lines - Use patterns in the planting beds.	- Use colour contrast.- Provide changes in topography.- Change colours in grounds.-Use unpredictable and spontaneous planting beds.

Table 5. How to use emphasis in creating a specific influence

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of natural objects for focal points.- Use dominant tree and shrub grouping.	- Provide features to promote action for focal points like a bounce house.- Use focal point with different texture and shape

5.2. Design Elements as a Therapeutic Tool

The elements of design include color, texture, line, form/volume and planes. The design elements are the visual qualities which affect the feelings and emotions of people, their responses after viewing a space and how people enjoy and use a space. The following tables show how design elements can be used to create a specific influence.

Table 6. How to use colour in creating a specific influence (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
-Use pastels -green, blue, white and purple. -Use monochromatic scheme and analogous scheme.	- Use vivid – yellow, pink red and orange. -Use complementary scheme (high contrast between colours).

Table 7. How to use texture in creating a specific influence (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use fine-textured plants (smooth leaves, bark and flowers) and hardscape (smooth finished walls and walkways) - Plants with monochrome colours	- Use coarse-textured plants (rough leaves, bark and flowers) and hardscape (rough finished walls and walkways) - plants with varied colours.

Table 8. How to use lines in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of meandering lines as organic and fragmented edges. - Use of (horizontal -spreading- vase shaped) plant and shrub forms.- No variation in ground cover forms.- Use confining spaces.	- Use of geometric forms (circular- square- irregular).- Use of (pyramid-weeping- rounded) plant and shrub forms.- Use of multiple ground cover forms.- Create large open space for the child.

Table 9. How to use form and volume in creating a specific influence (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of straight, curved and horizontal lines with symmetrical design, which give natural relaxed character. - Use of low line, which create a feeling of calmness.	- Use of vertical and diagonal lines, which encourage activities and exerting effort (skiing and running) and make spaces look larger.

Table 10. How to use planes in creating specific influences (Wilson, 2006)

How to calm over-sensitive Children with ASD?	How to stimulate under-sensitive Children with ASD?
-Use of flat ground plan. - Use of one head plane.	- Use of different topography on ground plan with different textures. - Use of vertical planes.

5.3. Physical Landscape Feature as a Therapeutic Tool

Landscape features include microclimate, landform/slope, plant materials, views and circulation. To design a therapeutic garden for children with ASD, these physical features and resources might apply. The following tables show how Physical landscape features can be used to create specific influence.

Table 11. How to use microclimate in creating specific influences (Wilson, 2006)

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How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
-Use of plants and buildings to provide a dense, shady area. - Use of design elements to relieve radiation - Provide tall walls to prevent wind effects for tactile sensations.	- Use of tree leaf out to provide sunny areas for tactile stimulation. - create open spaces to allow wind movement for tactile stimulation.

Table 12. How to use circulation in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Create open spaces at the end of pathways. -Create opportunities for repose in the circulatory pattern	- Create heights and topography. - Transfer from shady area to sunny area.

Table 13. How to use views in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of pastel colours in plants and flowerbeds. - Use of small sized dense shady views.	- Use of vivid colours in plants and flowerbeds. - Use of large bright sunny views.

Table 14. How to use landform in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of small slope which provides a challenge to help them.	- Create grassy hills to roll down and gradually sloping areas.

Table 15. How to use plant material in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use fragrant plants downwind of some seating areas. -Provide soft textured plant materials. -Use of pastel coloured palette flowerbeds.	-Provide aromatic plants. -Use plants with different textures for tactile stimulation. -Use of vivid coloured palette flowerbeds.

5.4. Landscape Resources and Materials as a Therapeutic Tool

Other important considerations are water features, ground covers, therapeutic animals and site furniture. To design a therapeutic garden for children with ASD, these features and resources might apply. The following tables show how landscape resources and materials can be used to create specific influence.

Table 16. How to use water features in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Create a trickling stream in water features which relaxes by the simple act of viewing - Create water fountain. - Provide swimming pools	- Create waterfalls that slope down to a pool filled with small river rocks - Create embedded nozzles in a running zone

Table 17. How to use therapeutic animals in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Provide white dove cote -Provide plant material which attracts butterflies, birds and domestic animals. - Provide trained dogs.	- Provide a fish tank to stimulate daily activity. - Provide trained dogs. - Dogs to play fetch and cats to brush and pet. - create colourful bird feeders

Table 18. How to use site furniture in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of hide light system. -Use of bean bag chairs or ball pens tents for restorative time outs.	-Use of observed and clearly defined light system. -Use of tactile signs at height 120 cm. -Use of rocking chairs or hammocks.

Table 19. How to use site furniture in creating specific influences (Wilson, 2006)

How to calm over-sensitive children with ASD?	How to stimulate under-sensitive children with ASD?
- Use of fine-textured ground cover material. - Provide non-glare surfaces. - Use symmetry in colour and texture. -pastel coloured ground covers.	- Use of coarse-textured ground cover material. - Create Small turf areas. -Variety of textures. -Vivid coloured ground covers. -design of space using materials which retain cold and heat.

5.5. Design Guideline

To achieve the ideal healing garden design, there are some considerations to think about.

- **Select a tranquil and quiet location:** Select a location with the least amount of distractions possible. High-pitched, humming noise, adjacent traffic and noise from air conditioning compressors can be overwhelming. Children should be able to hear calming sounds such as flowing water, birdsong and wind chimes (Sachs & Vinceta, 2011).
- **Design for security and safety:** Children with ASD may become confused or curious and wander through a nearby doorway. The design of the outdoor environment should enable administrators to ensure that strangers are not allowed inside (Hebert, 2003; Sachs & Vinceta, 2011; Yücel, 2013).
- **Design for choice & control and create a variety of specialized spaces:** Choice and control helps the child make the decision of when to leave this space, where he or she can sit alone or when he or she wants to sit within a group. This can facilitate a sense of control (Wilson, 2006) (Cooper Marcus, 2005).
- **Design with special lighting conditions in mind:** As people with ASD are often photosensitive because of the nature of their sensory, they should be cautious to achieve visual comfort from the glare of the sun. Besides, methods could be used to create spaces with dappled shade and filtered sun to decrease the effect of the shining rays of the sun (Hebert, 2003; Sachs & Vinceta, 2011).
- **Accommodate needs for both challenges and resting:** Provide a range of social/physical settings so that each individual can discover and explore his or her own level of challenge. An autistic child may be challenged by the idea of going outside. Another will need to overcome shame in playing with other children (Cosco, Moore, & Robin, 2005).
- **Provide calming areas: use of calming activities to feel relaxed to share** such as a fence panel with viewing holes, bamboo tunnel or a low growing tree to hide under (Sachs & Vinceta, 2011).
- **Child-nature interaction:** The child with ASD benefits a lot from auditory descriptions of nature, seasons and earth processes which gives the child a chance to live in nature to provide habitats for wildlife, provide places to experience natural resources as the wind, sun, rain and shade and provide chances for planting and harvesting. One of the most significant activities for a child in a stressful situation is to be able to intermediate in the cycle of life (Hebert, 2003; Cosco et al., 2005).
- **Provide opportunities for increasing coordination, motor skills, exercise and balance:** provide a special area with different physical activities with various playing equipment along with spaces with quiet zones (Hebert, 2003; Sachs & Vinceta, 2011).
- **Design for ease of maintenance:** Design the therapeutic garden so that it is a low maintenance, easy care environment so that the caregiver, therapists and special educators aren't expected to maintain the therapeutic garden. Choose plants that don't require attention. Install sprinkler systems during the building phase. Choose materials, structures, paving patterns, and furnishings for ease of care and strength (Hebert, 2003).
- **Design for future spatial flexibility:** Because the needs of the therapist change as new therapies and ideas are discovered, and because the needs of the children change as they learn and grow, the therapeutic garden should allow for flexibility. The space should allow for some change without time-consuming or costly renovations by providing non-fixed elements (Hebert, 2003; Sachs & Vinceta, 2011).
- **Provide visual cues for orientation:** To aid the communication of children with ASD with their teachers and family, the children use a picture exchange system (PICT) in designing outdoor space. We should use incorporating signage with clear pictures to communicate ideas or intentional use of certain play and using elements is an important as sign language skill building to help in communication between nonverbal and verbal children (Sachs & Vinceta, 2011).

6. Case Study (Sensory Garden)

After studying the nature of autism and problems accompanying Autism Spectrum Disorder & cognitive, it's evident that there are physical and mental benefits to connecting with nature, and we can use design principles as therapeutic tools to calm hyper reactive children with autism and stimulate hypo reactive children with autism. This sensory garden is designed to show how the guidelines concluded studies might be applied through specific site arrangement. Figure 3 shows the used therapies and how each design of space therapy provides a specific method of therapy.

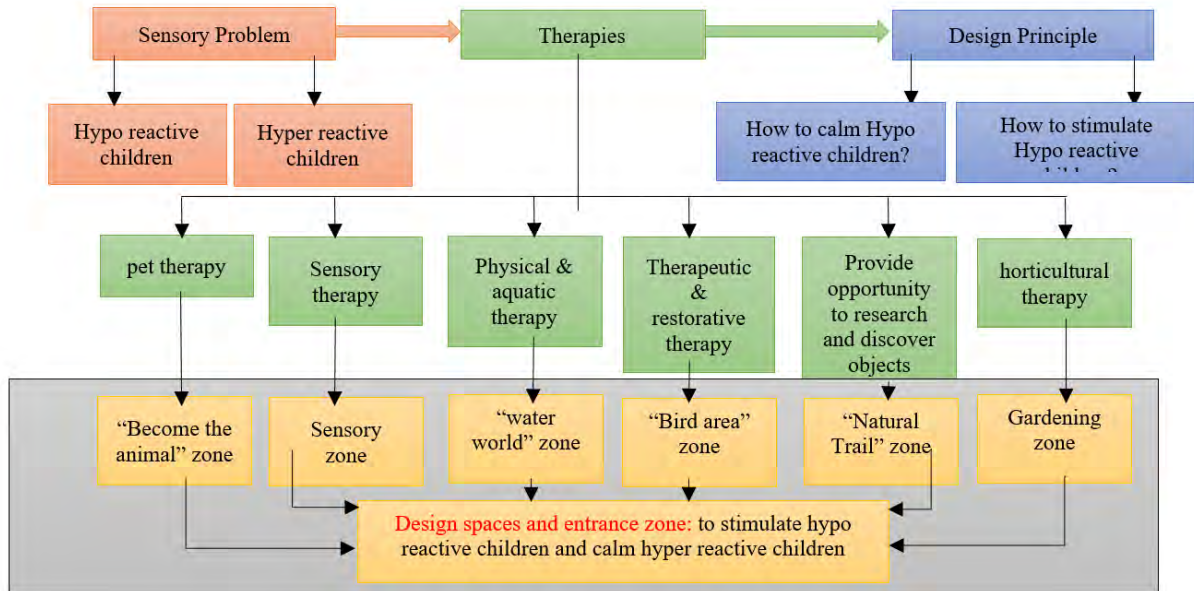


Figure 3. Diagram shows the design spaces

6.1. Location

King Mariout zone is in the west of Alexandria Governorate beside Amiriyah and the city of Borg el Arab. Figure 4 shows the chosen site plan.

Properties of the chosen location:

- Tranquil, quiet and far from crowds
- The weather is dry and humid
- There are natural water sources like King Mariout Lake and there are fish farms in the lake.



Figure 4. Site plan for the chosen site

6.2. The Site Plan

The garden is a sequence of 7 outdoor spaces designed to help the children with Autism Spectrum Disorder and their families as shown in figure 5.



Figure 5. The site plan of sensory garden

6.2.1. Entrance Zone

Entry with three shaded symmetric circular patios included in the orientation maps. Creating fluid lines for walkways, rounded edges, large open space, vivid colors and providing sunlight as shown in figure 7.

6.2.2. “Become the Animal” Zone

A unique kind of pet therapy by providing visiting animals (fish tank, therapy, cat, and trained dog), plants to collect butterflies, birds and domestic animals and by introducing animals step by step to overcome sensory integration issues as emotional awareness and regulation, behavioral improvements and management skills and engagement, reinforce task acquisition and completion, stimulate social interaction and conversation and provide opportunities for sensory integration as shown in figure 9.

6.2.3. Sensory Zone

The sensory zone is divided into 3 zones: Sensory play zone, vestibular and proprioception skills zone and fine and gross motor skills as shown in figure 11.

6.2.3.1. Sensory Play Zone

The sensory play zone is divided into 4 areas: Aroma and acoustic zone, tactile zone, relaxation zone, and light and colour zone. The sensory play zone is an exciting area full of vibrant colours, scents and sounds are often requested to increase an area’s educational benefits and to further stimulate their senses by using sensory features as shown in figure 13.



Figure 6. The location of entrance zone

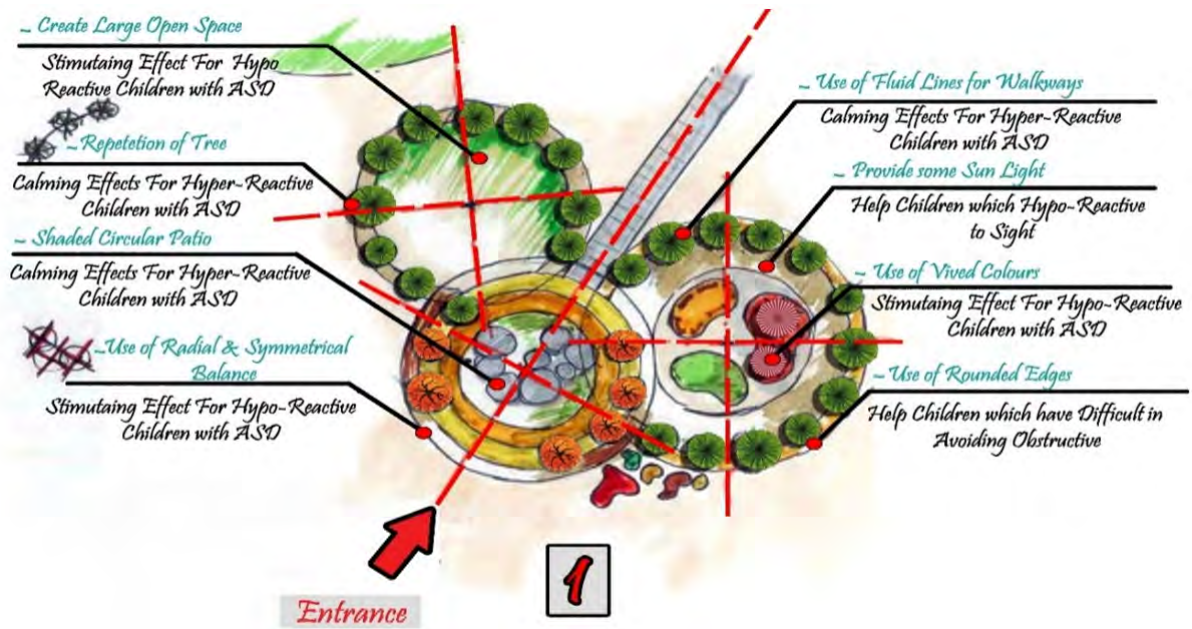


Figure 7. Shows the design consideration for the entrance zone

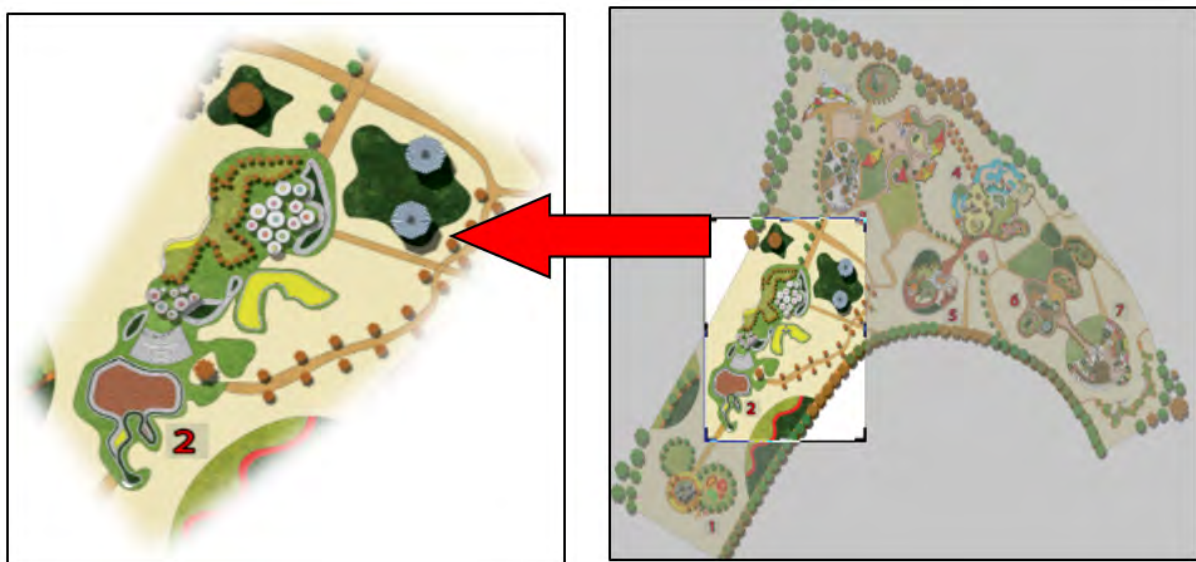


Figure 8. The location of "become the animal" zone

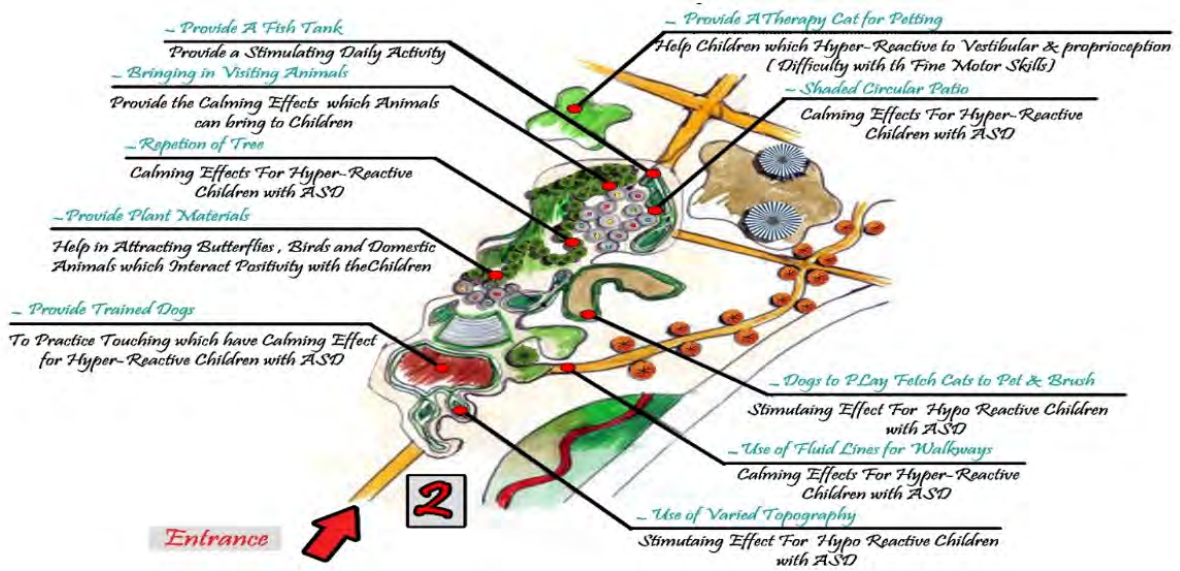


Figure 9. Shows the design consideration for the “Become the Animal” zone



Figure 10. The location of the sensory zone



Figure 11. Zoning diagram for the sensory zone

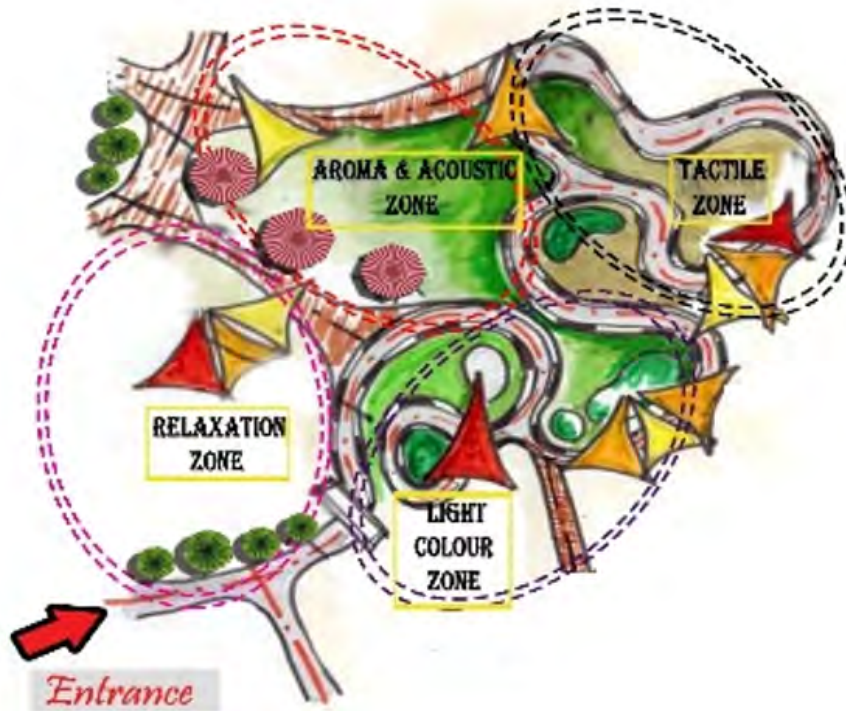


Figure 12. Zoning diagram for the sensory play zone

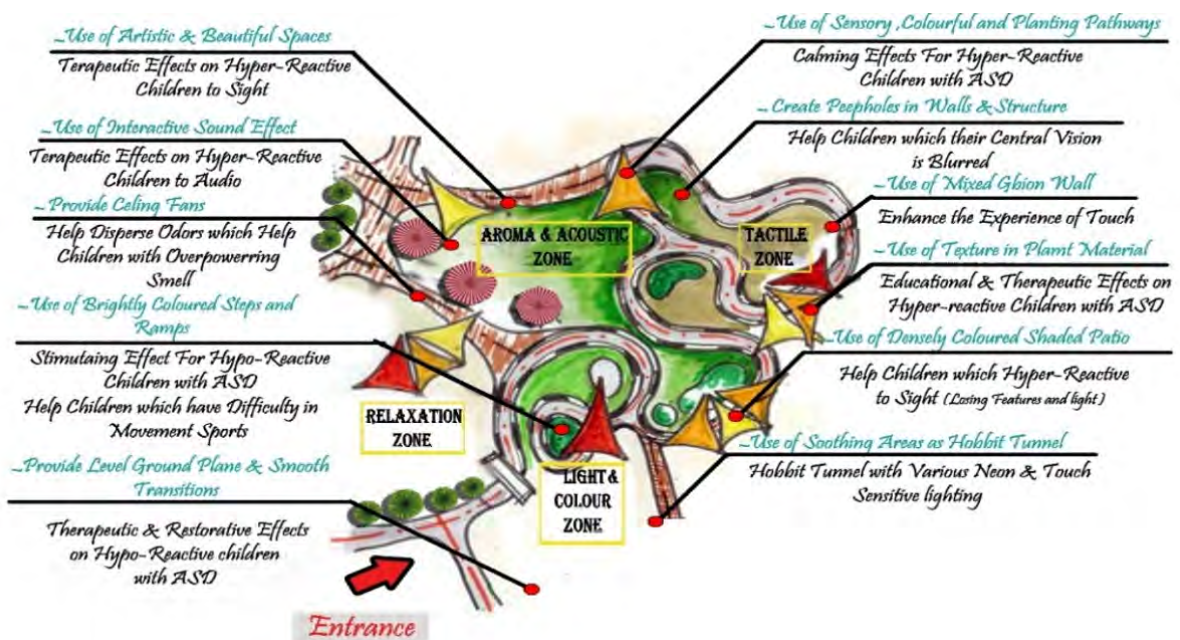


Figure 13. Shows the design consideration for the sensory play zone

6.2.3.2. Fine and Gross Motor Skills Zone

Introducing a motor skills area with climbing and balancing elements and integrating creative movement activities, including hammock swings as shown in figure 15.

6.2.3.3. Vestibular and Proprioception Zone

By using specific equipment to foster sensory development as swinging, spinning, sliding, climbing, rocking, crawling and balancing equipment as shown in figure 17.



Figure 14. The location of fine and gross motor skills zone

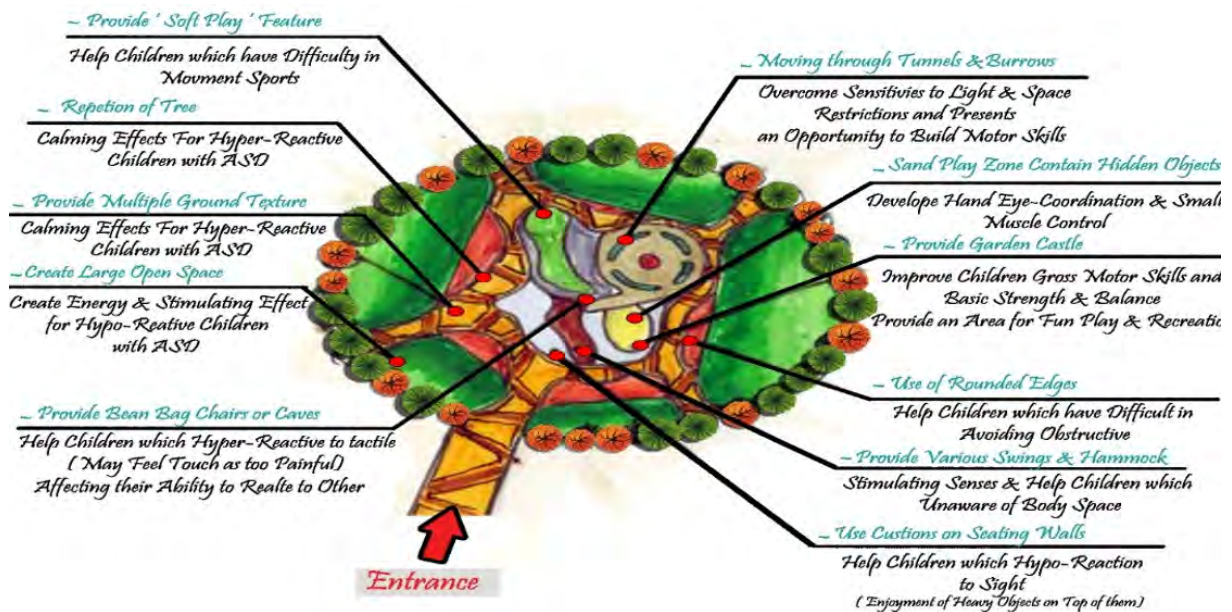


Figure 15. Shows the design consideration for the fine and gross motor skills zone

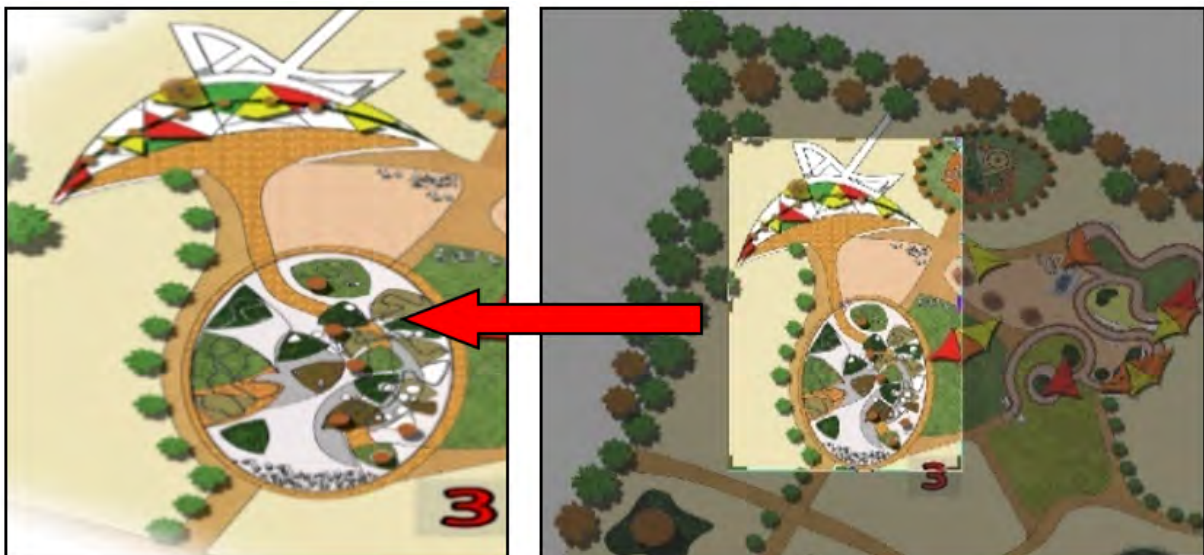


Figure 16. The location of vestibular (balance) and proprioception (muscle and joint) zone

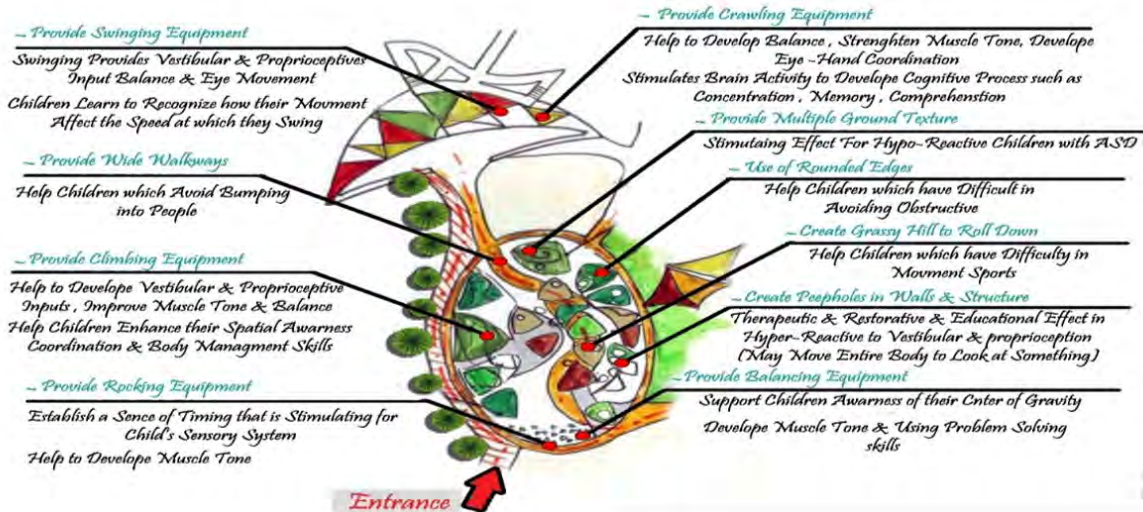


Figure 17. Shows the design consideration for the vestibular (balance) and proprioception (muscle and joint) zone

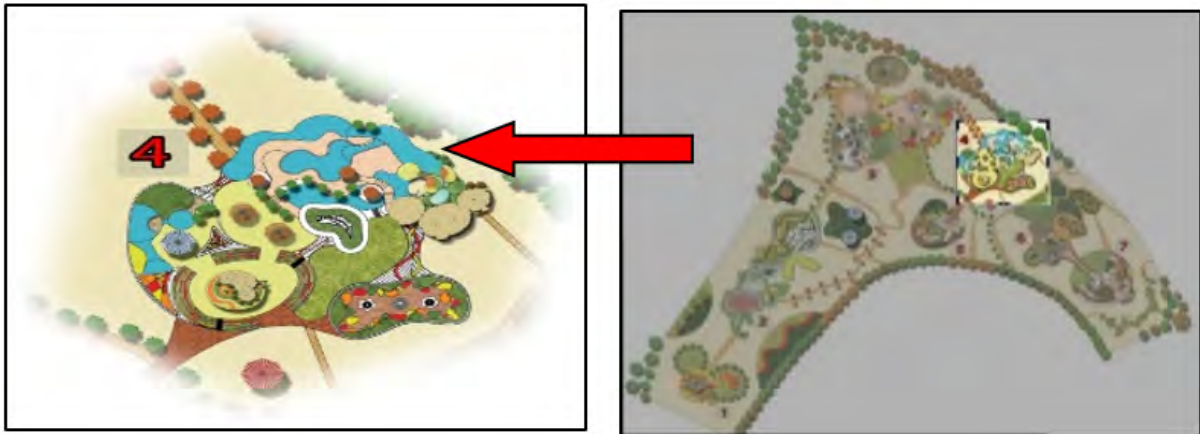


Figure 18. The location of "water world" zone

6.2.4. "Water World" Zone

Another form of physical therapy exercise used in treating autism is aquatic therapy by using different water features including waterfalls, water fountains, swimming pools and embedded nozzles running zone as shown in figure 19.

6.2.5. "Bird Area" Zone

Another form of therapeutic and restorative therapy is carried out by providing a dove cote surrounded by flower beds, white dove cote and colorful birds' feeder houses as shown in figure 21.

6.2.6. "Natural Trail" Zone

Provide integrated spaces that encompass all elements in nature which help in balancing, climbing, elevating using rocks, red gum logs, dolomite boulders, stump, loose parts play and providing the opportunity to make a cubby, collect rocks and sticks, and research and discover as shown in figure 23.

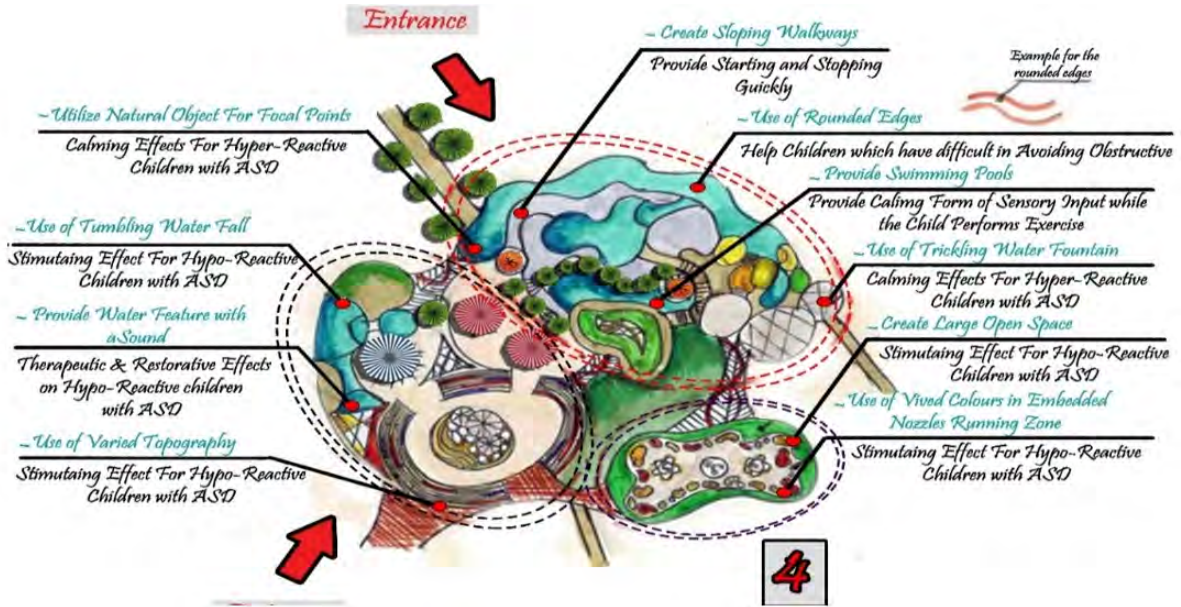


Figure 19. Shows the design consideration for the “water world” zone

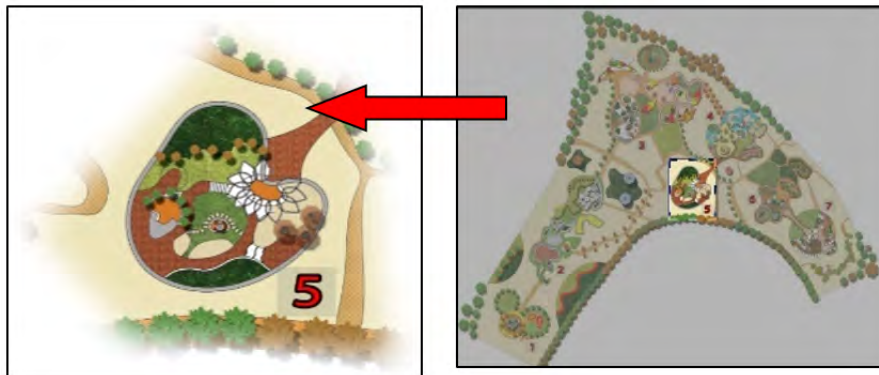


Figure 20. The location of “Bird Area” zone

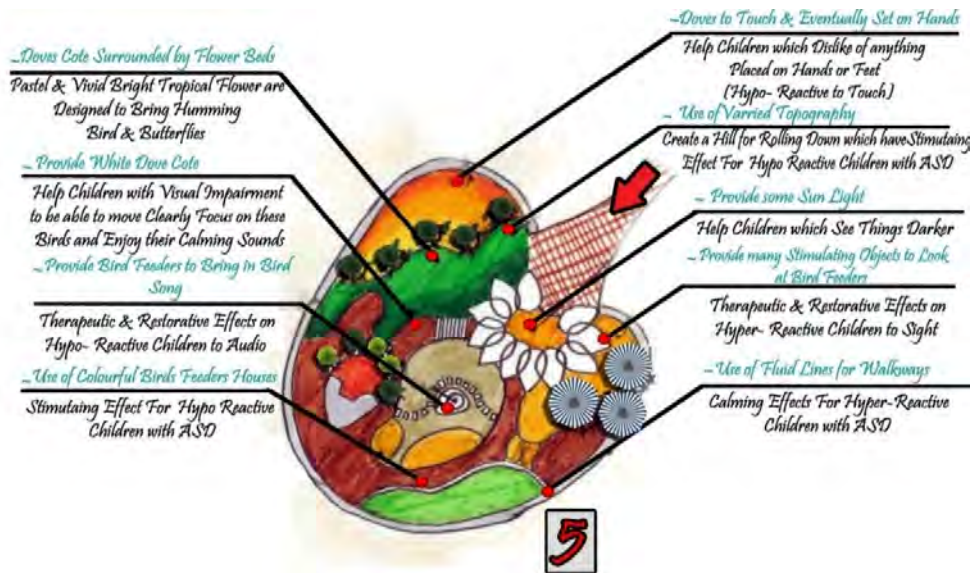


Figure 21. Shows the design consideration for the “Bird Area” Zone

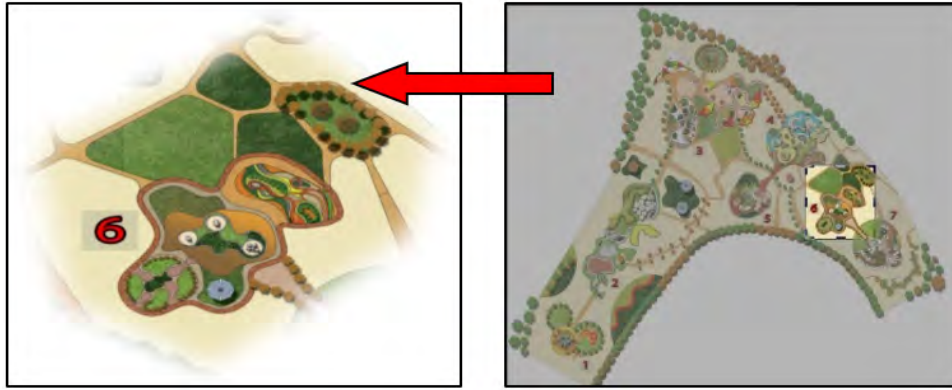


Figure 22. The location of “Natural Trail” zone

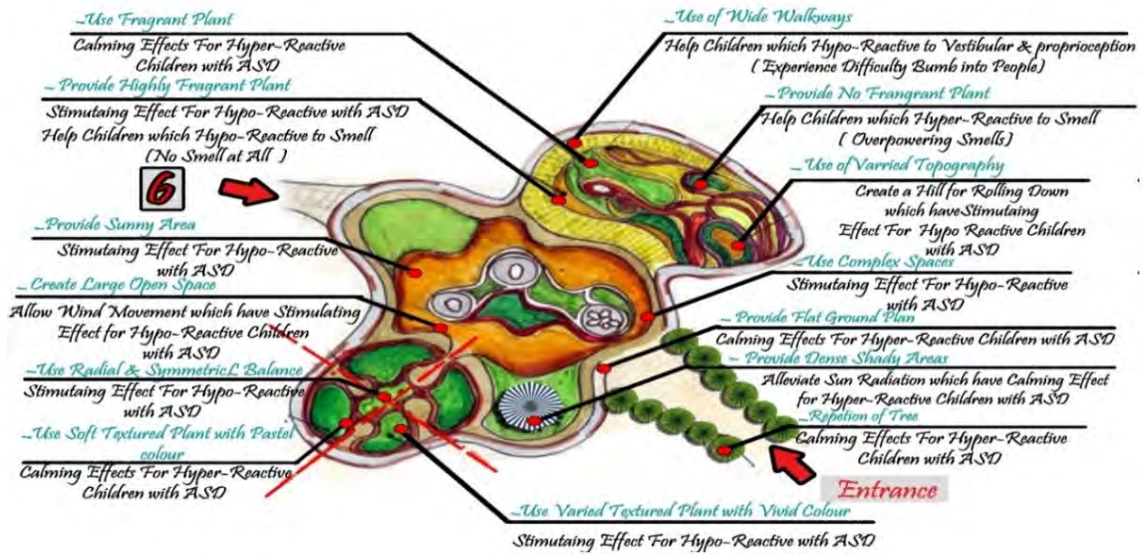


Figure 23. Show the design consideration for the “Natural Trail” zone C

6.2.7. Gardening Zone

Horticultural therapy provides gardening activities which increases opportunities for children to connect with each other and their world as shown in figure 25.

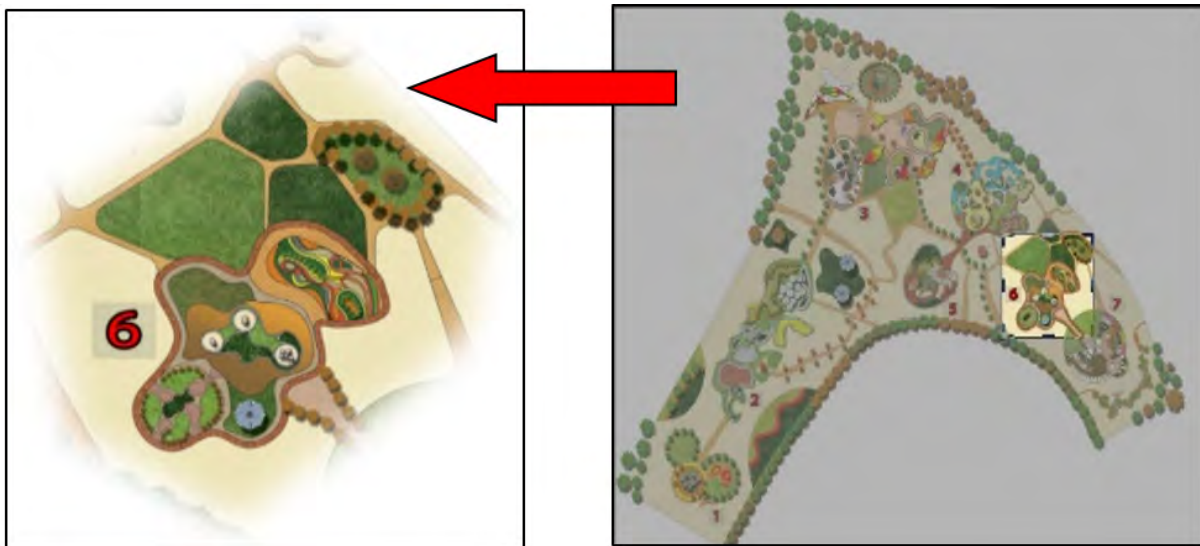


Figure 24. The location of “Natural Trail” zone

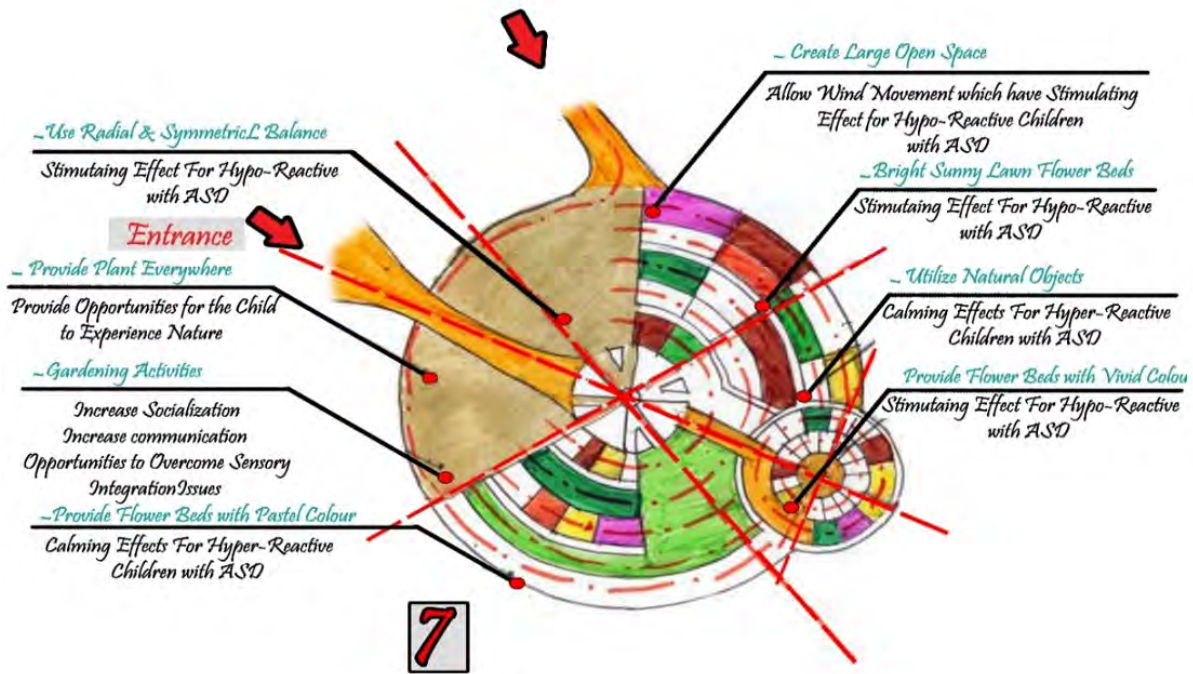


Figure 25. Shows the design consideration for the gardening zone

7. Conclusion

It would be very important to design a sensory garden for children with ASD to test the guidelines that have been confirmed in this study. Moreover, it is important that a post-occupancy study be completed on the project to determine its success in meeting the needs of parents, students, teachers, staff and therapists. From this post occupancy evaluation, further recommendations could be made related to the design of future sensory gardens for children with ASD.

The concepts of the sensory garden should be appropriate to any place in any environment and weather. The creation of the wide variety of landscape features and multi-level spaces help the design to be more manipulative. The design is based on information from a variety of multi-disciplinary sources and is intended to provide a basis for forming theory regarding how the outdoor environment can be used in therapeutic ways and the effects of the outdoor spaces on children with ASD. Therefore, the sensory garden was created as a solution to supplement and utilize the outdoor space of any center, hospital or just a therapeutic garden.

Finally, the large number of diagnoses in our world today relate to how to deal with children's' needs. Future studies should classify the effect of nature on children with ASD and how exercises help in changing the attitude of children with ASD. It is wise to recognize that tomorrow, these children will be adults. The needs of adults with ASD will move far beyond the outdoor space of hospitals, care centers or schools.

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