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O4. ANALYSIS OF THERAPEUTIC GARDENS FOR CHILDREN WITH AUTISM SPECTRUM DISORDERS Micah Lipscomb, ASLA, LEED AP BD+C, micah.lipscomb@perkinswill.com Alexander Stewart, ASLA, LEED AP BD+C, alexander.stewart@perkinswill.com

ABSTRACT

Current research on the impacts of landscape architecture on children with Autism Spectrum Disorder (ASD) are surprisingly lacking, considering the believed benefits of the natural environment on individuals with special needs. This study examines how outdoor design elements benefit children with ASD and specifically, how these design criteria can be implemented to inform the design of a camp that serves children with ASD. In the study, the team used the following research methodology: a review and critique of established design criteria, an observation and analysis of built projects to evaluate experiential design criteria, and an application of design guidelines to a specific project. The results of the study were a refined set of design guidelines that creates a hierarchy of importance for the criteria. This design criteria enriched the conceptual design of a camp called Camp Southern Ground, by focusing the design on elements that appear to provide therapeutic benefits to children with ASD. While the complexity of ASD does not allow for simple answers, the article provides a framework to both inform better design for outdoor spaces for this unique population and expand the conversation beyond the limited research that exists today.

KEYWORDS: landscape design guidelines, sensory environments, sensory processing disorder, special needs therapeutic landscapes, evidence-based approach, restorative outdoor spaces, healing gardens

1.0 INTRODUCTION

The percentage of individuals diagnosed with Autism Spectrum Disorders (ASD) is rising in our society. A 2010 CDC report estimated that one in every 68 children are affected by autism, which marks a dramatic increase from the rates in previous studies (a 123% increase from a 2002 study)¹.

ASD affects the way individuals understand and process their environment. It is a complex neurological disorder that affects three primary areas: sensory integration, social interaction and communication, and repetitive patterns of behavior². The word spectrum suggests the wide range of symptoms for individuals with ASD; some individuals have good language skills and high cognitive skills while others are nonverbal and have significant social, cognitive, and motor skill challenges. A wellknown phrase is "if you've met one person with autism, then you've met one person with autism" because characteristics vary greatly from individual to individual².

Engagement with nature provides an important experience for children with autism. This theory is supported by numerous scientific studies that have documented improved health outcomes from views of and engagement with nature³. Richard Louv has pointed out that children are happier, smarter and better adjusted with more time spent in the outdoors⁴. Kaplan and Kaplan have noted that the outdoors can provide restorative benefits as well as sharper mental focus⁵. The benefits are slowly being documented, but autistic children who are exposed to nature benefit from these experiences. Landscape architecture design for children with ASD has had limited exposure.

Autism characteristics are often discussed in partnership with Sensory Processing Disorder (SPD). SPD is a neurological disorder that causes difficulties with taking in, processing, and responding to sensory information about the environment and from within the own body. Individuals with ASD often have this disorder, but not all, and individuals with SPD are not all autistic. Individuals with SPD live in a spectrum of sensory experiences ranging from hypersensitive (oversensitive to stimuli) to hyposensitive (under-sensitive to stimuli). In addition to the traditional five senses, two other senses have been determined to be valuable in understanding autism: proprioceptive and vestibular senses⁶. Designing public or inclusive spaces requires accommodation of as many characteristics as possible, whereas designs for individuals can be customized, focused and honed to the individual's needs. Below is a brief description of how the role of senses impacts individuals with SPD, and Figures 1 to 7 illustrate how landscape design can be utilized to address these specific sensory factors.

A. Visual: Creating ordered, calm, and consistent language in spaces is critical for children with ASD⁷. Seeing too many elements at once can overstimulate an individual with ASD. Clear sight lines should be provided so that the individuals can take in their surroundings. Visual clues such as a clear definition of space, patterns in pavement or signage, can help put special needs children at ease. Some children with ASD are photosensitive, therefore it is important to provide shade in garden areas⁸.

B. Auditory: Children with ASD can be overly sensitive to noise while others can be hyposensitive. Cocooning spaces should be created for hypersensitive children so that they can retreat when they get overwhelmed. In building design, careful attention should be paid to how sounds bounce off walls⁹. Hyposensitive children need safety precautions to protect them from danger that mainstream individuals recognize, such as traffic.



Figure 2: Auditory senses and design elements.

C. Tactile: Spaces should be designed with the understanding that texture may be important for some children; a pebble path, a sand box, even grass. Hyposensitive children might need spaces that downplay these textures. Public spaces must then be developed with an array of surfaces that are well separated for a range of experiences.



Figure 1: Visual senses and design elements.



Figure 3: Tactile senses and design elements.

D. Smell: Strong fragrances can be an issue with some ASD children⁶. Therefore, if fragrant plants with temporal blooms are used in the landscape they should be localized so that sections of the landscape do not have strong aromas. Plants with leaves that are fragrant when crushed can be used throughout a landscape since the aroma is more controlled.

is because their vestibular system is under stimulated. On the contrary, children with hypersensitivity to movement may have their energy levels drained by activity. Providing a variety of activities from swinging to cocooning will help accommodate different users.



Figure 4: Smell and landscape design elements.

E. Taste: Similarly to smell, flavors can impact children with autism in different ways. While this has a low impact in the design of spaces, it is yet another important factor in the complex understanding process of children with ASD.



Figure 5: Taste and landscape design elements.

F. Vestibular: Balance, movement, and the sense of spatial orientation is largely regulated by the vestibular system. One of the reasons some children with ASD like spinning, rocking, pacing or running



Figure 6: Vestibular aspects and design elements.

G. Proprioceptive: Proprioceptive systems give individuals sense of awareness and movement of one's body in space. If children with ASD have a proprioceptive system that does not function normally, it may cause them to be clumsy and unable to evaluate distances between them and others. Providing spaces that are designed for safety is important because of this factor. Vibration therapy in the form of drumming decks is one method that could be integrated into a landscape to assist with ASD symptoms.



Figure 7: Proprioceptive aspects and design elements.

Understanding the wide variety of sensory inputs that affect autistic individuals gives clues to the complexity of the problem. The spectrum of characteristics suggests that there are no simple solutions or quick answers.

2.0 RESEARCH METHODOLOGY

The team used the following research methodology: a literature review and critique of established design criteria, an observation and analysis of built projects to evaluate experiential design criteria, and an application of design guidelines to a specific project. The project, Camp Southern Ground, is a summer camp designed to serve children of diverse abilities and backgrounds (including special needs and neuro-typical children) to come together and learn life skills, and encourage personal growth in a positive environment. In short, the goal of the camp is to have children with special needs and other children not only be comfortable with one another, but to build a deep trust between two groups that are often isolated from one another.

2.1 Precedent Projects

To broaden our perspective on what makes an ideal site for children with ASD, we visited six cities and numerous projects. As there are very few sites that are specifically designed for children with special needs, we expanded our visits to include children's gardens, public playgrounds, and camps for special needs children. The following is a brief description of the places we visited and the lessons learned from each of these visits.

2.1.1 Camp Glisson (Dahlonega, GA)

Camp Glisson (Figure 8) is a rustic camp located north of Atlanta successful in mingling mainstream campers with special needs children. A couple of key components make Camp Glisson a valued resource. First, it offers a clear separation of mainstream campers and special needs children in their living quarters. Through our research, it was clear that allowing special needs children their own space and place to get away is critical. At the same time, the lodging is close enough that they are still very much a part of the camp. The second component that should be noted is the lack of special activities just for the special needs campers. The activities were always integrated and universal even if it meant that there were special lifts or systems to accommodate all children. The camp appears to be comfortable pushing the boundaries of all children and letting them grow to their own needs.



Figure 8: Camp Glisson.

2.1.2 Coastal Maine Botanical Garden (Boothbay, ME) The Coastal Maine Botanical Garden demonstrates three items of significance for the notion of a therapeutic garden for children with special needs (Figure 9). First, the Garden of the Five Senses incorporates opportunities for children to explore using different senses (taste, smell, hearing, touch and vision). The garden is well built, beautiful and based on a strong concept, however, our impression was that the specific senses could have been better explored. Second, the Children's Garden allows for activities such as pumping of water, playing in the sand, a ropes tree house, or pulling up lobster buoys. All activities work on different strengths of the children and engage them in a variety of opportunities. The last item is the integration of the natural landscape with manmade objects. There are plenty of opportunities for children to walk in the woods and engage with natural materials (such as building play houses with sticks or climbing on a giant rock outcropping). A wide variety of fountains fully engage the children and allows them to touch, watch or jump over water. Using natural materials allows them to learn the complexities and simplicities of nature. While the garden is not designed for



Figure 9: Coastal Maine Botanical Garden Garden of the Five Senses.

special needs children, it offers significant opportunities for enjoyment and learning.

2.1.3 Huntington Botanical Garden and Library (Los Angeles, CA)

Huntington Botanical Garden is an amazing complex with many resources. What is special about Huntington is how it mixes play with learning. The Children's Garden is surrounded on three sides by a conservatory and greenhouse, which is more like a small children's museum. Here kids can understand root growth or how seeds travel in the wind by cranking fans. It is a very creative way to teach the children in a safe environment. The Children's Garden itself provided a few items of significance. The scale was appropriate where the kids could easily find their way around, but also not quite see what is around the corner. Devices, where children drop rocks onto metal pegs for sound, were inventive and engaging. Misting rooms cooled children while creating a safe sense of mystery. Along with opportunities to get their hands dirty, to climb, and to explore, the garden had elements that engaged both parents and children (Figure 10).



Figure 10: Huntington Botanical Garden Children's Garden.

2.1.4 Morton Arboretum Children's Garden (Garden Lisle, IL)

This four-acre garden engages children in learning about nature through outdoor play. The garden develops in complexity with an initial guiet entry sequence, which builds into an "Adventure Woods" with multiple destinations that appeal to a wide variety of abilities. Interactive water features are some of the most popular elements in this garden. Children seemed to delight in manipulating their environment through hand powered water pumps, moveable stones to create dams in a stream, or stone globes that spin in water. Colored concrete pavement patterns and leaves imprinted in the pavement provide repetition and a sense of continuity in the garden. Meandering paths provide a sense of mystery. Vine tunnels and artificial caves provide places for escape while providing clear sight lines for parents. An elevated lookout nestled in the trees provides a place for children and parents to take in the full range of play options. Parents indicated that the most popular element for their children was the Wonder Pond, an artificial shallow pond that comes to life once a year with tadpoles (Figure 11). This reminds us that the interaction with plants and animals is an essential experience in these designed landscapes.

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Figure 11: Morton Arboretum Children's Garden Wonder Pond.

2.1.5 Center for Discovery (Monticello, NY)

This vast facility serves around 450 patients with a range of special needs including ASD (Figure 12). The experience at the center is more about a holistic experience that encompasses the entire landscape, rather than a discrete contained garden. Fields of crops, greenhouses, fruit orchards, mobile chicken tractors, and sinuous paths are all integrated into the patient experience. For example, organic produce and eggs from the farms are gathered by patients, cooked by patients, and then feed the patients and staff. This reflects the center's "whole systems-whole person" approach to the disorder, which looks beyond just behavioral and neurological problems to include nutrition, exercise, music, and other areas. The challenge of maintaining such a large facility was clear and we were reminded of the need to craft durable, low-maintenance landscapes. Dry stack stone walls provided a sorely needed sense of continuity throughout the landscape. The broad scale of the center expanded our notions of what role landscape can have in the lives of children with ASD.



Figure 12: Center for Discovery.

2.1.6 Julius Kahn Playground (San Francisco, CA)

At first glance, Julius Kahn Playground is a typical neighborhood playground (beyond the view to the Golden Gate Bridge and wonderful setting in the Presidio); intimate and comfortable with swings, a sand box and a jungle gym (Figure 13). Upon closer look, it is clear that there were significant decisions made to serve an autistic audience. As described by Vince Lattanzio, ASLA, President of Carducci and Associates in San Francisco, the park provides "flexibility and opportunities for adaptation of use, visual clues and clear lines of sight, clear definition of space, predictability and non-threatening elements, clearly defined boundaries and signage"9. There is plenty of room in this park even though it is intimate. The key elements are well spaced, leaving plenty of running room within the confines of the small boundary fence.



Figure 13: Julius Kahn Playground.

2.1.7 Mission Delores Park (San Francisco, CA)

Mission Delores Park has been transformed with the addition of the new playground. While not focused on special needs specifically, it has many of the elements that have been outlined as suitable design elements including challenge opportunities, swings, open space for children to roam, multiple slides to reduce congestion and the incorporation of planting as an integral part of the design (Figure 14). Adults seem to be enjoying the park as much their younger counterparts, because the opportunities are creative and vast. The park offers a wide range of options that appeal to a spectrum of people.



Figure 14: Mission Delores Park.

2.2 Design Guideline Review

We identified two resources that outline the guidelines for landscape architecture design for children with ASD^{2,6}. Hebert and Vincenta developed these guidelines through examination of current available research, personal interviews and observations. Our approach was to compare and contrast these documents and to create a hierarchy of importance. Many of the guidelines overlapped or seemed to be less critical than others, yet were treated with equal importance. In categorizing essential guidelines, we focused on elements that provide safety, accessibility, and help children overcome sensory issues. These guidelines should be viewed as a preliminary framework that needs to be evaluated in a built work with post-occupancy evaluations to determine if the strategies are effective. In addition, as Vincenta observed "these should be considered for their appropriateness within the context of a given project and should not be considered guaranteed solutions"².

One of the most important principles outlined by Claire Cooper-Marcus and Marni Barnes in their book Healing Gardens: Therapeutic Benefits and Design Recommendations is to design for the needs of the users¹⁰. This principle is challenging to apply to a garden for ASD children, given the spectrum of symptoms for ASD. The complexity of ASD dictates that each project would need to apply the guidelines to meet the needs of the users, as every child with ASD has different needs. We have outlined a refined set of guidelines for the design of gardens for ASD children in Table 1.

Table 1: Guidelines for the design of gardens for ASD children.

Essential Guidelines

- 1. Design for safety, security, and supervision
 - a. 5' minimum height for a perimeter fence
 - b. Avoid toxic materials and plants
 - c. Clear sight lines to garden
- 2. Universal Design (Beyond ADA)
 - a. Clear edge along paths (for vision impaired)- such as texture differention
 - b. Plenty of visual aids and signage (orientation maps)c. Smooth, wide surfaces (avoid overcrowding)
- 3. Provide opportunities to overcome sensory issues
- 4. Quiet location-mask or screen unwanted noise
- 5. Provide places for retreat from sensory overload a. Cocooning places-willow tunnels, hammocks
- 6. Provide opportunities for exercise
- a. Increase motor skills, coordination, and balance
- 7. Design for maximum nature interaction
- 8. Provide shade
- 9. Design for emotional and human comfort
- 10. Design for the needs of the users

Other Guidelines

- Provide elements of consistency in the form of materials or plants
- 2. Provide transition between spaces
- 3. Sequence activities
- 4. Provide fixed and non-fixed activities
- 5. Flexible design that accommodates a variety of uses and individuals
- 6. Provide opportunities for increased socialization-social seating spaces, moveable seating
- 7. Build in challenges
- 8. Provide observation points
- 9. Provide storage (for play equipment used in therapies)

3.0 CAMP SOUTHERN GROUND

The inspiration for this research was Camp Southern Ground, a summer camp/conference center nestled in the rolling hills of Fayette County, Georgia. Perkins+Will was engaged in the master planning of the project. The design and planning was informed by the needs of its driving force, special needs children (Figure 15). Through the research, we examined factors that would provide the clearest landscape goals in the design of the camp. The following is a description of the core elements we integrated into the design of the camp as a result of this research. As this was a master plan level effort, there is an opportunity for future design efforts to better address the site-specific design considerations. As the design is advanced, careful consideration must be made to integrate positive natural distractions into the camp experience. For example, the nearby wetlands, lake, and surrounding forest are being designed to be engaged through boardwalks, docks and treehouses and the existing large clay borrow pit is being transformed into an activity adventure center. However, these elements also do not address the important operational considerations that will enrich the camp experience, such as horticulture therapy within the healing gardens, input from occupational and physical therapists, and other programming considerations. The site design only addresses part of the camp experience, for it is in the human interactions that transformative personal growth will occur for campers.



Figure 15: Camp Southern Ground site master plan.

3.1. Sequencing of Site

2. Lodging 3. Dining

5. Adventure

Vincenta describes sequencing as a critical element for special needs children as they move from space to space². This theory is supported by research on architectural design for autistic children by Mostafa⁸. In the design of the camp, we expanded the concept from a garden scale to a community scale, where each camp district has distinct characteristics that elevate in intensity as one moves through the site (Figure 16). The sequence begins from the point of arrival at the welcome

center (#1). Here the design of the space is simple, warm and inviting, providing families and campers an opportunity to settle into the space. Traveling through a tunnel along the north-south spine, the transformation into more challenging spaces begin. After this tunnel, the lodges (#2) expose campers to a bit more wild nature while maintaining a comfortable environment. Once campers are ready, they can challenge themselves with a visit to the adventure center (#5), where they learn to trust each other and their own abilities.



Figure 16: Camp Southern Ground sequencing diagram.

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3.2 Decompression Zones

Spaces for re-centering and calming were implemented throughout the campus. These spaces integrate nature as a soothing element, especially at the health center where water and reflection are focus elements within small garden "rooms" (Figure 17), and at the respite lodge where cocooning swings are incorporated into the design.



Figure 17: Health Center cross section.

3.3 Healing Gardens on a Broader Scale

Most districts have healing gardens associated with their key characteristics. While traditional camps, retreats or campuses are fortunate to have one healing garden, the design for the camp has been broadened and pushed to focus on simple senses in order not to overwhelm individuals. Within all of these gardens, there is a great opportunity to incorporate horticulture therapy into the camp experience. In her book on gardening with children with ASD, Etherington noted many benefits for ASD children in horticulture therapy, such as easing anxiety, promoting sensory integration and building social skills¹¹. The taste garden is especially well-suited to horticulture therapy, since the children would be able to eat and share the fruits of their labor with others.



Figure 18: Healing Gardens diagram.

The following gardens were incorporated into the master plan (Figure 18):

- a) Visual garden with the arts complex
- b) Sound garden with the music building
- c) Aroma garden with the health and environment building
- d) Tactile garden as part of the respite lodge courtyard
- e) Taste garden as part of the dining hall grounds and the organic farm as part of a hands on experience for the children.
- f) Vestibular and proprioceptive gardens as part of the adventure zone
- s) Staff decompression garden to allow for the staff to re-energize.

3.4 Spectrum of Experiences

The vision for this camp is to open the door for as many individuals as possible. The design follows this direction by creating opportunities for children to succeed in the ways that fit them best. This is carried out through the separate gardens as outlined above as well as an array of opportunities to learn through (but not limited to) natural play, music, art, cooking, digital arts, and environmental studies. Further, each of these can be explored in individual preferences. This model creates a wide spectrum of activities where each child can find their own path. Figure 19 shows the spectrum of experiences to be provided and how a child may find his or her own path.



Figure 19: Spectrum of experiences diagram.

3.5 Respite Lodge

The respite lodge (Special Needs Housing) (Figure 20) includes many elements specially designed for those who will use the site, although on a much smaller scale than the rest of the camp. The looped circulation system is consistent with observations that some children with ASD enjoy following circuits. The design for the courtyard started with this concept for creating

a series of closed loops for the children to exercise on and follow. As they follow the circuit, they will encounter zones for activity and a spectrum of natural material experiences on a local scale. These include the calming respite of water, the rich textures for tactile engagement of a stone garden, the challenge and climbing space of sculptural wood elements (Figure 21) and a sand garden to build and be creative in.



Figure 20: Respite lodge site plan.

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Figure 21: Respite lodge east-west section – Wood Garden.

The site is uniquely tied to the architecture with spaces that flow inside and out to provide elements for comfort. Surface safety in the garden was considered through the use of a combination of planted surfaces and rubber mat surfacing that continues into the building. An organic shaped stone wall, combined with the architecture, creates a protective nest to shield the children from wind from all directions. Further, the space is entirely shaded as the site is nestled comfortably in existing woods, and the building is oriented to the west of the garden to add shade and protect from the setting sun. A roof overhang over the water garden and covered outdoor terraces provide additional sun protection. Cocooning swings hang within the porches facing the garden and green walls incorporating nature into the interior (Figure 22). The design team has also located utilities on the roof of the building to keep noise and venting away from the children.



Figure 22: Respite lodge north-south sections.

4.0 CONCLUSION

Design of therapeutic gardens for children with special needs must consider many different aspects, as we have illustrated in this article. During the literature review and observational study of built projects, we found that there is not a single, specific design method that should be used. After reviewing research articles, books and other sources, we felt that we had a good understanding of what children with ASD need. However, we discovered that the spectrum was so wide, that it was hard to have a short answer. Rather, different criteria must be considered, and we developed a list of essential factors, and guidelines. The first principle should be to create a universal and safe design that meets everyone's needs. We also implemented these guidelines into the design of Camp Southern Ground. Further research, analysis and post-occupancy evaluations are necessary to evaluate the effectiveness of different design strategies that were used during the design.

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