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Designing an Impactful Sensory Garden for Children and Youth with Autism Spectrum Disorder

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Abstract

Interacting with nature is understood to improve physical, sensory, social, and emotional wellbeing. With a significant rise in diagnosis of autism spectrum disorder, now more than ever it is important to provide these children and youth with carefully designed outdoor environments that meet their unique needs and increase the meaningfulness of their daily lives. This report describes the development and features of a newly installed sensory garden at The Els Center of Excellence in Florida.

Keywords: autism spectrum disorder, sensation, garden, learning, autonomy

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Introduction

Autism spectrum disorder (ASD) represents a range of developmental disabilities that may manifest as significant deficits in social communication; restrictive, repetitive, or stereotypical behaviors; atypical responses to sensory input; and behavioral challenges (American Psychiatric Association, 2013). These challenges may lead to difficulties with social relationships, academic proficiency, and/or occupational performance (American Psychiatric Association, 2013). While it is understood that the disorder has a biological component and genetics plays a role in its familial prevalence, there is no marker or test for diagnosis. Instead, a diagnosis of ASD is made on the basis of parent report and clinical observation (Norbury & Sparks, 2013).

Autism spectrum disorder impacts all socioeconomic, racial, and ethnic groups (Baio et al., 2018). There has been a significant increase in the frequency of ASD diagnosis. In 2000, the ASD prevalence rate in the U.S. was 1 in 150 (about 6.7 per 1000), while the current rate is 1 in 40 (Kogan et al., 2018). Boys are over four times more likely to be diagnosed than girls, a rate of 1 in 42 compared to 1 in 189 for girls (Baio, 2014). In regions such as Europe, Asia, and North America, studies have found the prevalence of ASD to be between 1 and 2 percent of the general population (Centers for Disease Control and Prevention, 2016). Autism spectrum disorder is the fastest-growing serious developmental disability in the U.S. (Autism Speaks, 2012).

Understanding the Concerns

Within the autism community it is generally understood that if you meet one person with autism, you have met one person with autism. That is, while many common characteristics are shared, how many and the severity of each characteristic varies within each individual. Individuals typically experience challenges with communication and social interactions. Some with ASD have a limited spoken vocabulary, others have none, and yet others speak prolifically. Cognitive limitations are common and motor skills may also be impaired.

Many individuals with ASD experience sensory integration challenges. Sensation refers to incoming information from the environment such as the smell of roses or the sound of a drone. Integration is the interpretation of and use of sensory information. For most people, roses smell good while listening to the sound of a lawn mower is a minor distraction that is noted then ignored. Intact sensory integration enables humans to more or less effortlessly go about their daily lives with little interruption. Serious and persistent problems with sensory integration may lead to a diagnosis of sensory processing disorder, which may be thought of as a disorganized nervous system. It may be challenging to process sensory cues from the environment, including sound, sight, smell, taste, touch, balance, and movement while simultaneously maintaining emotional regulation (Tomchek, Little, & Dunn, 2015). This means that remaining composed and focused on tasks may be very hard because the sensory systems are not processing in a typical manner. Some individuals with ASD may avoid certain sensory experiences, while some may seek them out. They may react negatively to certain sound frequencies, to noise, lighting, movement, or touch, or may perseveratively engage in obtaining them.

A garden may be a buffer to the varied challenges that individuals with ASD experience (Sachs & Vincenta, 2011). Gardens can provide children with important productive and holistic opportunities to be outside and exercise, socialize, learn, nurture their sensory systems, and improve their health. All children, regardless of skill or ability, deserve and need to participate in outdoor activities. In this field report we identify how challenges for children with ASD were addressed through design and installation of a sensory garden and the children's response to it.

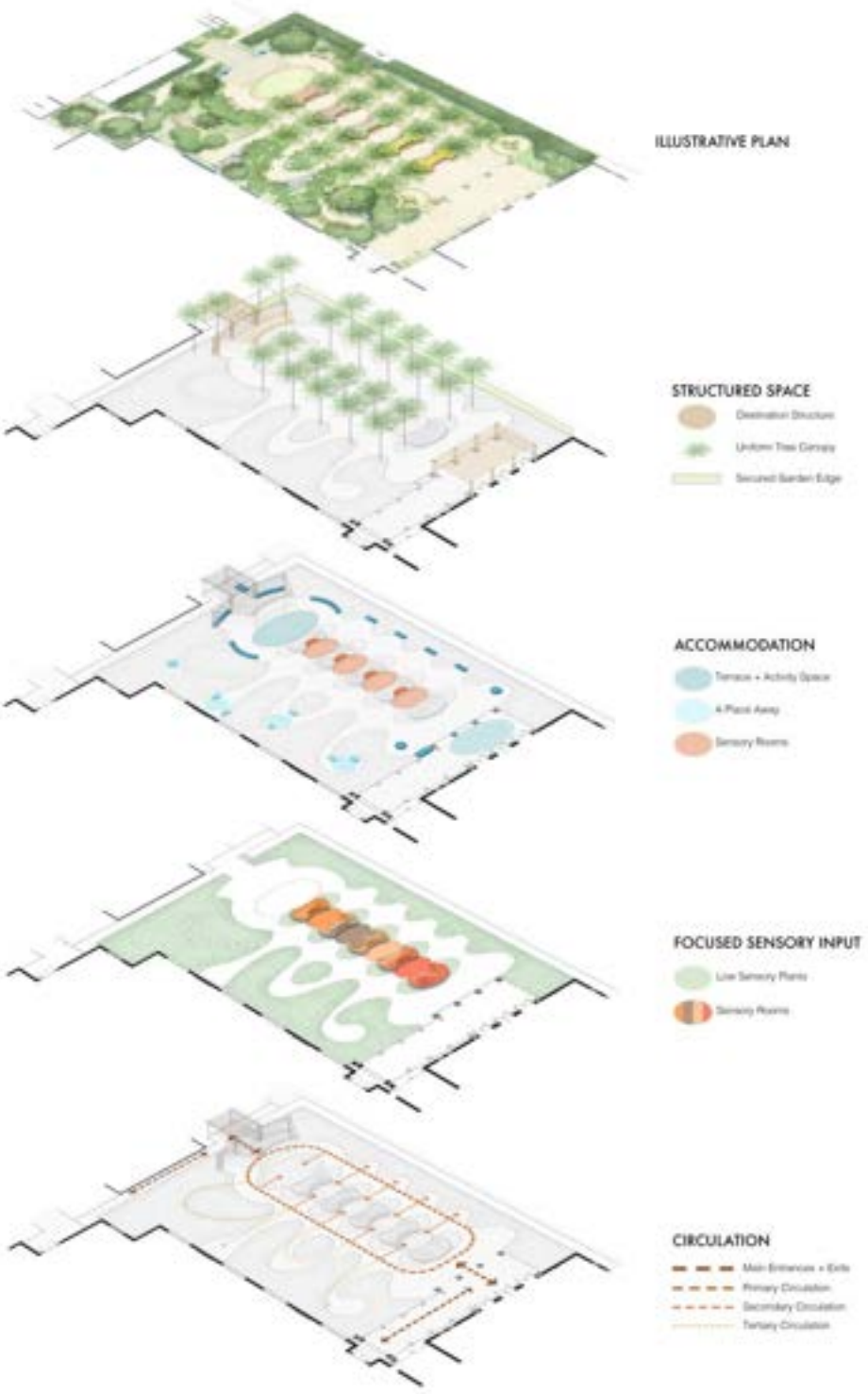
The Sensory Arts Garden at The Els Center of Excellence

The Sensory Arts Garden at The Els Center of Excellence is purposely designed for individuals with ASD and the community of parents, educators, therapists, and caretakers that support and enrich their lives. The Center, located in Jupiter, Florida, is committed to helping individuals with ASD realize their full potential to lead positive, productive, and rewarding lives though world-class educational, recreational, and therapeutic programming. The new garden opened in late 2017 and was designed by a collaboration between landscape architect David Kamp, President of Dirtworks, PC and his design team; Marlene Sotelo, a music therapist, special educator, and the Chief Operating Officer (COO) for the Els for Autism Foundation at The Els Center of Excellence; and Amy Wagenfeld, an occupational therapist, educator, and researcher with expertise in therapeutic outdoor space design. Grounded in interdisciplinary research and collaboration, the garden expands The Center's program into a vibrant outdoor setting, celebrating individual strengths and preferences, and positioning nature as an essential partner in health and wellness. This unique collaboration also helped balance meeting the special needs of individuals with ASD while simultaneously welcoming the larger community.

Figure 1. Enclosed by a verdant planted perimeter, the overall layout offers clear circulation, distinct settings, and well-defined destinations.

Source: all images are credited to Dirtworks, PC

Figure 2. Diverse sensory experiences, clear circulation and form, and accommodation for a range of abilities makes for a garden that honors individual strengths and preferences, reduces stress and anxiety, and encourages social engagement.



With meticulous attention to detail and thoughtful arrangement of plants, materials, furnishings, and spaces, the garden balances a range of stimulating and calming sensory experiences intended to allay stress and anxiety and gently elevate the senses—sight, smell, touch, taste, sound, as well as sense of balance (vestibular) and position and movement in space (proprioception). The 13,000-square foot garden refuge offers a nurturing, sensory-rich, environmentally sensitive therapeutic setting that supports children and youth with ASD by providing opportunity to work, play, socialize, and learn in the space. Serenity, security, and restoration are the foundation of the design, thus honoring individual strengths and preferences, addressing the realities of hypo- and hypersensitivities, fostering curiosity and meaningful interactions, and most importantly, welcoming all regardless of ability.

This is reinforced by our users. A parent shared, "My son, Andrew, loves the swing in the one of the Places Away so much, we bought one for him to enjoy at home as well. One of his rewards for working in his classroom is to go out into the Sensory Garden for a break – he always makes a beeline for the swing!" A staff member said, "The garden is a place of peace and tranquility. It is space that I go to in moments when I need to stop, think, breathe and reset my intention for the day. It is truly a gift." Although unable to express himself with words, it is evident from student Colin's body language and affect that he loves to be on campus and in the garden, particularly when doing yoga.

Figure 3. Reduced and integrated sensory spaces provide refuge when experiencing sensory overload. Each space features seating options to acknowledge personal choice.

Figure 4. A grid of foxtail palms offers repetitive visual structure and brings comfort and clarity of expectations.

Figure 5. A spacious curved trellis serves as a welcoming transition from the lower school building, campus courtyard, and the front of the campus. The activity space, an oval "lawn" of artificial turf, features a variety of fixed and movable seating.

Figure 6. Safety and security are reflected in the overall design, details, and material selections.

Designing any environment, inside or out, is enhanced when a team of highly specialized interventionists work together (Wagenfeld & Winterbottom, 2015). For this garden design to successfully address the breadth and complexity of ASD, the project necessitated a particularly close collaboration between the landscape architect, the Center's COO, and an occupational therapist. The outcome of this interdisciplinary partnership reflects a nuanced response to the varied experiences of those with ASD while balancing the programming needs of a vibrant and growing teaching and therapeutic facility. This partnership began with a series of tours.

Multiple walks around The Center's campus, accompanied by the COO, engendered a deeper understanding of the needs of this special population for the landscape architect. These immersive experiences enabled ideas to flow on how to create a garden that could meet the unique needs of its varying visitors. For instance, during one tour, the COO provided an anecdote regarding the need for hula-hoops on The Center's golf course during golf group instruction to help the children know where to wait and stand until it was their turn. From this emerged the concept of garden rings as boundaries or markers, which is also reinforced in the classrooms where instructors use small carpet squares for children to sit on.

Considerations for routine, pattern, sightlines, and wayfinding inform the overall garden form; the garden also preserves a degree of openness that promotes continued discovery, autonomy, and flexible use. Easy transitions, clear circulation patterns and destinations, and deceptively simple geometries make for a comprehensible and inviting space for the children and youth. By offering a place to pause before entering and take in unobstructed views of the space in its entirety,

the garden's entry portals allay potential fears of the unknown or anxiety about what to expect of a garden visit. A verdant, planted perimeter encloses the space and focuses attention within the garden. Overhead, a uniform canopy of foxtail palms offers a structural rhythm, calming enclosure, and relief from the sun.

The designers carefully considered every plant, material, and furnishing for its appropriateness, safety, durability, and therapeutic potential. "Sensory rooms," aligned on the garden's axis, discretely target each of the five senses and feature customized lightweight fiberglass planters—a material that reduced cost and precluded the need for heavy equipment on the small site. The planters' varying heights bring a rich variety of sensory-appropriate plants to a comfortable and easily accessed position for visitors big and small, mobile and seated. Each room is ringed by a dark band in the pavement, forming a subtle visual boundary and signaling a change in sensory experience. Small, movable, musical sculptures activate these spaces with sound. Teachers and therapists reposition the instruments at their discretion to encourage cooperative exchanges or to support an individual's creative explorations.

Figure 8. "Sensory rooms" discretely target the five senses. Each room, framed by a distinctive paving band, features curved varying-height custom planters, bringing a rich variety of sensory-appropriate plants within comfortable and easy access.

Figure 9. Metal chimes, located on opposite sides of a planter, create opportunities for a musical dialogue in one of the sensory rooms.

Figure 10. The suite of musical sculptures enriches the tactile and auditory textures of the garden.

A series of reduced and integrated sensory spaces, or "places away," along the garden perimeter provide calming counterpoints for those who may experience hypersensitivity or seek a moment of respite and refuge. To enhance feelings of serenity and tranquility, the planting palette within these spaces is purposely muted. Structured, trunk-supporting, straight-backed benches with armrests provide structure in key areas as well as opportunities to strengthen abdominal and upper body postural muscles. Pebble seats offer a playful alternative and varying levels of proprioceptive and vestibular experience. Outdoor furniture is purposely located to encourage social interactions in some areas while offering privacy and respite in others. Water spheres provide rich sensory experiences including touch, sight, sound, and proprioceptive and vestibular input. Their placement, low to the ground and tucked into planting beds, require squatting, reach, and balance to access. Smooth and rigid surfaces offer varied tactile engagement. All furnishings are secured to foundations to prevent movement or tipping, and to comply with the South Florida hurricane preparedness code. A simple ground plane unifies the space, while changes in color or material at key points signal a transition, a new experience, or bring one's focus towards the body and senses. Insertions of large pebble pavers heighten tactile engagement, proprioception, and gross motor skills in key areas. Encircling paving bands in other areas mimic the hula hoop concept of positioning children within a ring or circle. Like in the classrooms, these visual and tactile boundaries provide consistency, structure, and organization and enable greater independence, clearer expectations, and richer engagement in the environment.

Figure 11. Water spheres provide many sensory experiences.

Figure 12. A small "lawn" encircled by a paving band provide visual cues, signaling changes in sensory experience and activity. The garden's deceptively simple layout accommodates a variety of needs: solitude and socialization, calming respite and activity, focused interest, and simple distractions.

Figure 13. Structured, upper body supporting, straight-backed benches provide stability while "pebble" seats offer a playful alternative and varying levels of proprioceptive and vestibular experiences.

Figure 14. A small group gathering space within a ring is orientating and focusing. A muted planting pallet enhances feelings of serenity and tranquility.

The planting strategy was deliberately shaped through a melding of salutogenic, health-promoting design principles and a deep understanding of the unique needs of children and youth with ASD. All materials were thoroughly vetted for toxicity concerns and an environmentally sensitive coordinated maintenance program insures that chemicals are used only as a last resort. Trees, such as a gumbo limbo and a bay rum were selected for their structural qualities—limb structure, shape, and shade capacity, visual, olfactory, and tactile features, and semi-permeability for clear sight lines within the garden. Repeated patterns of planting provide the just right amount of consistency balanced with interest and mystery to which individuals with ASD tend to respond in a positive manner.

Safety and security, the thread that unites all other considerations, are reflected in the overall design, details, and material selections. Smooth and consistent surfaces, strong and durable materials, and design that eliminates awkward corners address the potential for collisions and adverse reactions. Careful selection and placement of plant materials promote safety and minimize negative sensory responses, while simultaneously allowing staff and family members to observe the children at a distance as they independently discover the garden.

Obstacles and Solutions

We encountered some unanticipated design challenges and obstacles while creating the Sensory Arts Garden, a few of which are described below, along with our solutions.

- We needed to balance ASD-specific design elements with making the garden appropriate and engaging for the general public. In addition, the varied ages of individuals accessing the garden posed challenges in planning for a design to support appropriate activities, furniture size, and purpose.
    - Solution: Multiple meetings and maintaining open communication between all team members. Good listening was essential.

- We needed to consider how enticing the water features might be for the children.
    - Solution: A green buffer of plants and river rocks wide enough to prevent full immersion, yet narrow enough to welcome touching ring the water features.

- The swing has proven to be so popular that the children wore a trench beneath it from pumping their feet to activate it.
    - Solution: Backfill the trench with soil and fasten a large rectangle of artificial turf beneath the swing. As the turf wears out, it will be a simple fix to replace.

- The lemon verbena has become such a child favorite that it literally degrades from curious fingers. We also noted frequent pulling of pieces off the potted glory bush plants and soft to the touch cacti for a bit of enjoyable tactile stimuli on the go. Similarly, one child was found to be repeatedly relocating a clump of holly fern planted nearby the swing. Maintenance staff replaced it, only to find it moved yet again.
    - Solution: Plan for replacement in the maintenance budget. As needed (all) plants get replaced, and sometimes relocated.

Implications

In establishing a vibrant outdoor living classroom, an enriching therapeutic environment, and an inclusive, welcoming space for all, the Sensory Arts Garden further advances The Center's position as a leader in the field, and broadens their influence within the ASD community. It serves to promote the value, acceptance, and inclusion of individuals with ASD as well as offer a destination for social and community events. The garden extends invitations for children to feel whole and safe on their own terms—to be part of something bigger than themselves without feeling overwhelmed. Since its opening, the children have found reprieve in the garden's "places away" and enrichment through exploration of the plants in the sensory rooms. Children have identified favorite spots within the garden and return daily to engage with these spaces, exploring their subtle changes and new growth. The garden is now an established space for outdoor instruction, providing opportunities to connect with students who may be challenging to reach inside the classroom. High school students can be found working independently on their laptops or with a teaching assistant on classroom assignments. Music and yoga classes and reading groups have all benefited from this sensory-rich, living classroom that welcomes all regardless of age, ability, or preference. Within a lush

and safe setting, the garden provides opportunity and choice for everyone to engage with nature on their own terms, in their own way, and at their own pace. From quiet and serene reflection by the water bubblers, to active sensory involvement on the swing, or smelling and tasting herbs found in the sensory rooms, the garden offers various opportunities for participation including providing a venue for vocational training for the older students and clients of the Foundation. Everyone takes from the garden what they need and want.

Research to evaluate the impact of experiencing the garden and attentional behaviors is planned. Findings may contribute to the growing body of evidence supporting the global positive impact of interaction with nature and healthy development.

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