







Guidelines for Sensory Havens in Autism and Sensory-Friendly Events

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Jaden is a 12-year-old on the autism spectrum and has mild developmental delays. Jaden enjoys spending time with his family and friends but is uncomfortable in community settings requiring interactions with strangers, including educators, ticket takers, bathroom attendants, and custodians. Jaden becomes especially anxious during crowded or loud experiences.

Community participation is an essential aspect of life for everyone, including people with autism spectrum disorder (ASD), sensory processing disorder, and other forms of neurodiversity (Bagatell et al., 2022; Chien et al., 2016; Dunn et al., 2016; Watts et al., 2014). Unfortunately, various barriers impact their participation and enjoyment of community experiences (Fletcher et al., 2019). Among these are social, communication, and sensory factors. Some organizations and venues offer special events with relaxed start times to offset participation barriers. Others provide extra communication, including signs featuring pictures and simple wording, and tip sheets posted before events. Some places offer sensory havens to offset increased noise, action, and crowding on many occasions (Rutherford et al., 2020).

While some argue special events segment neurodiverse visitors from their neurotypical counterparts, these experiences can offer unique opportunities for neurodiverse children to practice social skills, engage in community life, broaden their horizons, enjoy family fun, and benefit from school field trips. The planning and implementation logistics that drive these special occasions require considerable efforts by community planners, educators, and accessibility coordinators, often imposing significant burdens of time and manpower. Fortunately, with evidence-based guidelines in place, community venues can pare away activities and equipment that research evidence does not support (Bodison & Parham, 2018; Case-Smith et al., 2015; Fletcher et al., 2018; Lussenhop et al., 2016). Designing sensory havens with research evidence and practical considerations can justify the adage that *less is more*.

A Look at Sensory-Friendly Programs

For many neurodiverse people, their ability to successfully engage in



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community activities is impacted by sensory processing differences. Leichtman and colleagues (2014) explained their intervention approach for developing inclusive museum environments for children, including using Social Stories, visual schedules, and sensory guides. Similarly, Ideishi and colleagues (2019) examined access and participation for visitors with special needs at an aquarium. They found school and home strategies, such as using Social Stories and other activities, could facilitate sensory self-regulation, social participation, and emotional awareness. These strategies can adequately prepare children to experience a new environment and enable them to participate in opportunities for successful outings. For example, children themselves can create nonintrusive strategies that allow them to develop and take part in social activities as a part of community life (Meadan et al., 2011).

Because there will always be a variety of experiences among families with neurodiverse children, Leichtman and colleagues (2014) reported parents suggested planners provide a variety of supports, such as quiet rooms, noise-canceling headphones, and sensory guides, during museum explorations to aid with these challenges. Quiet rooms and noise-canceling headphones can also be tools used in sensory havens, also known as multisensory environments (MSEs). MSEs provide many types of sensory input known to induce relaxation and promote adaptive behavior (Novakovic et al., 2019). Breslin et al. (2019) conducted a scoping review of 13 articles detailing the impact of MSEs on people with intellectual and developmental disabilities (IDD). Like the positive impact MSEs have on self-regulation in people with ASD, many people with IDD and environmental sensitivities experience reduced anxiety and challenging behaviors triggered by unfriendly sensory

environments (e.g., bright lights) when they use MSEs. Thompson (2011) reported participants who used MSEs experienced more focus and engagement than those in a control group that did not use them. These findings support using sensory havens or MSEs in autism and sensory-friendly programs. **Table 1** shows various sensory-friendly events reported in the literature and supports they provided.

The Science Behind Sensory Regulation

Bandura developed the concept of sensory regulation in the mid-1970s as a component of behavioral and emotional regulation. The overarching idea of personal self-regulation refers to how individuals manage their physical and psychological states. Bandura referred to human functioning as a person-behavior-environment interaction and self-regulation as the interaction between environment and person, mediated through behavior (Bandura, as cited in Dinsmore et al., 2008). The outcome of successful self-regulation can be reduced fatigue, tension, and agitation; improved stress resistance; and heightened abilities to overcome hesitation and fear (Kalimullin et al., 2016).

The definition of sensory regulation can vary, but at its most basic level, it describes how individuals can calm their responses to disruptive sensory input. Self-regulation occurs in many ways, depending on which sensory system is affected and whether an individual is experiencing an overload or undersupply of input. How people process things results in their unique behaviors in managing these overloads or undersupplies (Galiana-Simal et al., 2020). Some individuals are *sensory seeking*, in which they look for sensory input, or *sensory avoiding*, when they develop ways

Table 1 Autism and Sensory-Friendly Events With Supports Used

Event	Multisensory environment or calming station	Environmental modifications	Sensory guides	Staff training	Preopening or relaxed environment
Aquatico Orlando Water Park	x		x	x	
Art museum	x		x		
Autism Arts Festival	x	x			x
Science center museum	x	x			
Sesame Place theme park	x	x		x	x
Six Flags	x	x		x	x

Note. Different terms with similar meanings are being used for sensory haven, including multisensory environment and calming station (Fletcher et al., 2018; Fletcher-Watson & May 2018; Leichtman et. al, 2014; “Sesame Place,” 2018; “Aquatico Orlando,” 2019; “Six Flags Park,” 2020).

to decrease the amount or intensity of sensations they experience. Children who experience self-regulation challenges are often diagnosed with a sensory processing disorder, also referred to as SPD. **Table 2** shows how a child may experience SPD and their behaviors related to specific sensory systems (Martini et al., 2016).

A critical aspect of the relationship between sensory systems and a child’s behavior is whether they can self-regulate through their primary occupation of play. When a child is engaged in active play, they participate in activities that can promote self-regulation. In particular, tactile (touch), vestibular (balance), and proprioceptive (muscle sense) sensory systems provide highly complex input that significantly impacts self-regulation. As shown in **Table 2**, these sensory systems influence and are affected by gross motor activities such as running, jumping, swinging, and roughhousing. Tactile self-regulation activities include using weighted vests, wearing compression socks, and experiencing different textures applied to the skin. Vestibular self-regulation activities include trampoline play, bike riding, walking a balance beam, and playing games such as hopscotch. Proprioceptive self-regulation activities include wall push-ups, tug-of-war, climbing on a play gym, and stretching.

The Science Behind Autism Architecture

Much of today’s thinking about spaces for people with autism to live, learn, and

work comes from foundational research by architect Mostafa (2007, 2014) and has been built on by architects and designers such as Truong (2018). According to Mostafa, a *sensory design matrix* merges sensory factors associated with autism (Hazen et al., 2014) with architectural design guidelines. As research evidence on sensory processing has evolved, so have architectural recommendations, resulting in the formalization of the seven principles of autism design, known as ASPECTSS. These principles are acoustics, spatial sequencing, escape, compartmentalization, transition spaces, sensory zoning, and safety (Mostafa, 2014). Designer Truong further recommended space designs should also include the following: (a) Acoustics should remain at the forefront of autism architecture, (b) autism-friendly lighting should integrate pops of light superimposed on unsaturated color fields, (c) spatial considerations should include decluttering and promoting understandable movement from zone to zone, and (d) furniture should be modular, easily cleaned, and changeable. According to Truong, these recommendations create enjoyable, multifunctional environments that benefit all people, not just those with autism.

Intertwining the Sciences of Architecture and Sensory Regulation to Create Havens

As occupational therapy practitioners, educators, and autism and

sensory-friendly event planners, we know auditory, visual, tactile, proprioceptive, and vestibular sensory inputs all have unique individual and combined impacts on sensory regulation. We believe autism architecture can guide the development of evidence-based sensory havens for sensory and autism-friendly events.

Many establishments routinely host events for people with autism. They either offer programs with a short time frame and supported activities and extensive assistance from helpers on designated days or have self-directed events featuring independent activities and limited support from helpers over extended time periods (Fletcher et al., 2021). These two types of events have many factors to aid in achieving their goals and create a variety of opportunities for using sensory havens. **Table 3** details common differences in short- and long-term events concerning sensory havens.

The world’s social climate for neurodiversity is changing, and as the experience of being neurodiverse becomes more mainstream, autism and sensory-friendly events will responsively change (Hoffman, 2019). Many neurotypical people also have unique sensory needs that can be met by the presence of temporary or permanent sensory havens in a variety of situations (Miller et al., 2017). Considerations include focusing on “sensory slow” as opposed to “sensory go” spaces, demedicalizing sensory havens by avoiding medical terminology or wearing scrubs when operating them, keeping things simple and replicable, and offering

Table 2 Impact of Sensory Processing Disorder on Sensory Processing Systems

Sensory system	Receptor location	Definition	Impact and behaviors seen
Tactile or touch	Skin	How one perceives the environment when engaging in giving or receiving touch; can be deep or light pressure	Hyper- or hypo-responsive to touch. May be fearful of a person's touch, avoid hugs or cuddling, have poor hand-eye coordination skills, and simultaneously crave and avoid types of light and deep pressure touch
Vestibular or movement	Inner ear	How one perceives balance and movement through their inner ear	Hyper- or hypo-responsive to movement. May excessively engage in rocking, swinging, twirling, or running or be fearful of movement
Proprioception or position in space	Joints and tendons	How one perceives body position in space through joint and tendon receptors	Hyper- or hypo-responsive to sense of position in space. May seek extra input by pushing hard, playing rough, wearing tight clothes, falling frequently, or showing postural insecurity.
Smell or olfaction	Nose	How one perceives their environment with their nose	Hyper- or hypo-sensitive to smells and strong fragrances. May have food and other object aversions or cravings related to smell.
Taste or gustatory	Mouth	How one perceives food and the sour, sweet, salty, bitter, and umami tastes	Hyper- or hypo-sensitive to taste. May have food aversions or cravings and avoid or seek certain foods
Vision or sight	Eyes	How one perceives the environment with their eye(s)	Hyper- or hypo-sensitivity to types and intensities of light. May have difficulty discriminating letters from backgrounds, have poor hand-eye coordination and visual-spatial skills.
Hearing or auditory	Ears	How one perceives the environment through their ear(s)	Hyper- or hypo-sensitivity to loud, high-pitched, or erratic sounds. May simultaneously avoid and generate a variety of sounds.

Note. This table describes the sensory systems, where each is located, what it does, and how it may be impacted when a person has sensory processing disorder. In particular, the tactile, proprioceptive and vestibular systems play a powerful role in sensory self-regulation and resultant observed behaviors.



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different configurations of havens ranging from simple dark spaces to those with multiple features.

Guidelines for Sensory Havens Based on Principles of Autism Architecture

Educators and event programmers in Jaden's region began developing and hosting

Table 3 Comparison of Different Events Styles With Sensory Havens

Type of event	Leadership method	Type of activities	Sensory haven supervision	Sensory haven pragmatics
Short event measured in hours	Directed by leaders and volunteers	Hands-on, experiential, sensory, and intellectual Supplies provided at activity stations	Space is supervised.	Space tends to be portable or semipermanent. Space offers multiple sensory regulation opportunities.
Long event measured in days	Directed by self	Hands-off and intellectual Supplies provided via take-home sensory/activity bags	Space is not supervised.	Space tends to be partitioned from a larger space or is semipermanent. Space offers limited sensory regulation opportunities.

Note. This table describes common factors determined by event pragmatics, volunteer and paid manpower designated for events, and visitor safety.

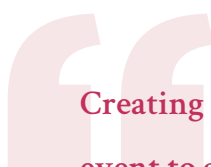
autism and sensory-friendly events 15 years ago. At first, the local museum and outdoor venues, such as the zoo, created sensory havens as a component of 2-hour events. Events evolved to include many formats as educators and planners learned more about creating participation-friendly experiences, communicating with stakeholders, and accessing research evidence.

Using ASPECTSS as a guide, we provide the following autism-friendly principles in the form of sensory haven guidelines. To illustrate them, we share Jaden and his mother's experiences at a museum and a zoo. **Figure 1** shows a sensory haven made from a four-person ice fishing house.

The local museum and zoo planned to host two upcoming sensory day events. The museum anticipated glass and concrete interior spaces might create sensory challenges related to sounds, crowds, and unfiltered light. The zoo expressed concerns regarding crowding at baby animal exhibits and ambient noise they could not anticipate or control, such as traffic helicopters and road construction. Before each event, educators and an occupational therapist teamed up for a venue walkthrough from the parking lot to exhibits, restrooms, cafe, and gift shop to identify potential sensory challenges. The educators and occupational therapist then planned for sensory haven placement and use.

Guideline 1: Manage Acoustics and Noise

Manage acoustics and noise generated by crowding and movement in special event



Creating consistent sensory havens from one event to another is also particularly helpful in easing transitions within and across events.

spaces. Intersperse open areas with acoustical tiles or sound-absorbing surfaces like tapestries and rugs. Sensory havens can be furnished throughout the location or grouped in areas where heavy acoustic input may lead to some event visitors needing self-regulation support.

Museum educators determined limiting hourly numbers of visitors could minimize crowding and providing a soft opening time 2 hours before posted hours would eliminate logistics of waiting, turn taking, and interacting with others. They determined the parking garage's noise level was over 85 decibels, the sound level equivalent to noisy city traffic. Based on this, they tucked two sensory havens into a relatively quiet reception area near the building entrance to offer support to any visitors who felt frazzled after navigating their trip downtown and walk through the museum parking lot.

Guideline 2: Promote Focus and Concentration

Promote focus and concentration by pairing predictable arrangements of sensory haven equipment with visual cues such as

photographs of children using them. Creating consistent sensory havens from one event to another is also particularly helpful in easing transitions within and across events. As an example, equipment for each haven can include a rechargeable power station with USB ports and electrical outlets, a small low-noise heater or air conditioner for climate control, a variety of portable chairs, interlocking floor tiles, and sensory items such as weighted lap pads, fiber-optic light displays, sound systems, remote controls for electronic devices, and flashlights for visitor use.

While the zoo provided sensory havens with consistent inventories of items, they found it was common for the havens to feel crowded, especially if haven visitors did not know each other. To offset this, each haven had a greeter close by. The greeter minimized crowding by controlling visitor access and maintained an organization by removing chairs and other items from haven interior spaces when they were not in use. This combination of crowd control and inventory management promoted a sense of organization and structure for haven visitors. Showing visitors available items while they waited their turn to enter a

Figure 1 Sensory haven by a flight exhibit



haven also helped them anticipate and plan for their experience.

Guideline 3: Provide Escape Spaces

Provide escape spaces by equipping sensory havens with more than one entrance or exit point, especially because many sensory havens experience visitor crowding. Many visitors will take comfort in knowing a less congested exit is available.

When Jaden and his mother were introduced to sensory havens at the zoo, educators provided safety instructions including showing Jaden the haven access points and how to exit them if he felt overwhelmed. This provided Jaden with a sense of control knowing he could determine how long he spent in the haven and could manage the zippered exits independently.

Guideline 4: Compartmentalize Spaces

Compartmentalize spaces to minimize visual distractions and support engagement. In sensory havens, nested spaces are popular and soothing. Many haven visitors like to cocoon in small spaces to watch light displays or enjoy textural objects while cuddling with a loved one. Examples of popular “spaces within spaces” include cardboard houses,

ice fishing houses, play tents, and appliance boxes housed within larger structures or rooms. In a pinch, educators can use blankets to cover card tables. Low lighting and windowless zones can reduce visual distractions. Multiple small spaces sometimes resemble a homey village when nested inside a larger room.

In a large, quiet gallery space, museum educators created one sensory haven that provided a simple darkened space with floor mats and another that provided soft rocking camping chairs, weighted lap pads, a fiber-optic light display, and music options. Visitors controlled music and lighting using remote controls attached to haven entrances with loop and pile tape. While haven visitors enjoyed sticking their heads out the door of their haven and calling to one another, they seemed uninterested in sharing a haven space with visitors they did not know. Planners placed a third sensory haven in a dimly lit hall next to exhibit areas in case a little time in a sensory haven could promote the self-regulation needed to safely visit artworks or listen to gallery talks with others.

Guideline 5: Create Transition Zones

Create transition zones to facilitate movement from one space to another using alternative flooring such as carpet

squares or foam tiles, color coding, signage, directional arrows, and other multimodal communication strategies. In darkened sensory havens, floor lights or small flashlights provided to visitors can promote transitions and wayfinding. Other techniques include stationing volunteers along the way to greet and guide visitors from one space to another or to escort them back to an event. Other popular transition standards include placing quiet activity stations such as coloring tables or inviting chairs near haven entrances. Cautious visitors can observe activities from these stations before entering havens.

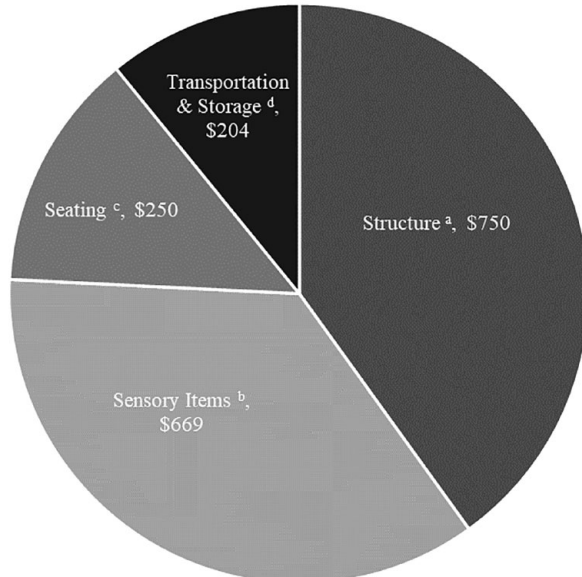
To provide a welcoming transition into sensory havens at the zoo, educators assembled animal-themed interlocking floor tiles to create a winding road leading to haven openings. Posted signage showed photographs of haven interiors being used by children. Educators augmented transition areas with tables containing animal-themed educational materials to provide visitors quiet coloring and reading time before entering the haven.

Guideline 6: Create Sensory-Based Zoning

Focus on sensory-based zoning. Configure spaces for various tactile, vestibular, proprioceptive, auditory, and visual sensory inputs. As exciting as an event might be, too much of a good thing can be overwhelming. If areas are energetic and lively, such as with a music performance, they can be paired with quiet or solitary activity zones for making art, reading, and watching activities. Simply enjoying time spent quietly coloring, drawing, or working on a puzzle can be familiar comfort to both children and family members. Sensory havens can supply supports that parallel the amount of input generated by the environment they are in.

As Jaden and his mother entered the zoo, they experienced a barrage of sensory input from all directions. Luckily, they found sensory havens throughout the zoo, providing a break from overstimulation and offering calming support for jangled nerves. Given the opportunity to explore a haven, Jaden opted to spend 5 minutes watching slow-moving projected light displays on the haven ceiling while sitting in a rocking camping chair and listening to his own music selections. This provided a unique and individualized way for Jaden to start his day at the zoo.

Figure 2 Cost breakdown of mobile sensory havens



Note. The total cost of each mobile sensory haven is \$1,873. This figure depicts the proportion of budget spent for each category.

^aThe structure includes the tent, foam floor tiling, and electrical components.

^bThe sensory items include fiber LED optic cables, starlight projector, weighted lap pads, marble fidget toys, and noise-canceling headphones.

^cThe seating includes adult-sized camping chairs, rocking chairs, and child-sized chairs.

^dTransportation and storage include a double-decker wagon and storage totes.

Guideline 7: Observe Safety

Promote safety in sensory havens. Offer communication and social support to minimize triggers for behavioral outbursts. Physical injuries decrease when planners provide easy physical access to havens. When materials are easily cleaned and equipment and supplies can be sanitized, exposure to contagions is reduced.

At the museum, two volunteers manned each sensory haven. One volunteer sanitized equipment and supplies before Jaden's visit, placed a properly sized chair in the haven for him, and quickly oriented him to remotes, furniture, fidget toys, and exits. The other volunteer was available to answer Jaden or his mother's questions. For example, Jaden's mother asked where she could obtain materials to create a similar haven at home.

Planning up front. Understanding the environmental stimuli at an event plays a vital role in identifying the most efficacious placements for sensory havens. Occupational therapists and event educators can work together to perform environmental audits

that assess locations that produce large amounts of sensory input.

After their planning walkthrough with the occupational therapist, educators strategically placed three sensory havens throughout the zoo. They placed the first sensory haven at the entrance, where noise generated by crowding from visitors, parents, strollers, service animals, and volunteers led to many visitors needing self-regulation support. They placed the second sensory haven in a jungle-like picnic alcove next to the baby elephant exhibit because zoo educators knew from previous experience this animal enclosure drew excited visitors, often creating a noise level greater than the 85 decibels measured at the parking garage. They placed the third sensory haven in a quiet area where koalas slept approximately 20 hours daily.

Conducting the event. Using Social Stories and proper signage help neurodiverse visitors navigate an event to easily locate sensory havens. With assistance provided by properly trained personnel, visitors and their families can safely use the sensory havens as needed.

Inside sensory havens, Jaden found familiar lightweight and portable items. At the zoo, he discovered educators also added interlocking foam tiles that kept mulch and wood shavings out of the haven and helped dampen sounds such as elephant trumpeting. Because bright sunlight was present, educators zipped windows closed and placed a portable low-noise air conditioner in each haven. Additionally, many service animals were present at the zoo event, so volunteers stood close by to assist with leashes and harnesses. Water bowls several feet from haven entrances provided a place for service animals to wait outside while their human companions explored haven interiors. Owing to the zoo's size, many children, even adolescents, were in strollers, which created crowding at haven entrances. To offset this, volunteers posted signs featuring photographs of strollers to indicate a preferred parking area close to the service animal water bowls.

While she was waiting for Jaden to explore the havens, Jaden's mother reviewed parent-friendly handouts about sensory havens and tips for successful outings using catchy titles such as Operation Domination: Tackling Community Outings. Like the museum, the zoo intentionally avoided terminology such as sensory integration, sensory diets, vestibular and proprioceptive input, and other rhetoric that is part of professional and medical jargon.

Assessing the event. Community partners who host sensory-friendly events recognize the importance in measuring the efficacy of sensory havens at their events. By sharing collective feedback among community partners, sensory havens use can continually adapt and improve.

The zoo developed a simple data collection method. Educators invited Jaden and his family to put stickers by their favorite things on a poster displaying inventory items of sensory havens. With this immediate feedback and information from postevent surveys, educators and planners determined the parents' most common comment was for the zoo to increase autism and sensory-friendly events and lengthen times of each. Jaden's mother also mentioned she appreciated this event did not occur during April, the designated autism acceptance month, which was usually packed with sensory-friendly events. Other months provided few events.

After considering parent and child feedback, the zoo and museum decided to pool their resources and invite other venues such as



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the public library and local transportation museum to join them, further expanding their community reach by hosting events in additional months. These actions honored parents' requests for more contact time and enabled outdoor venues to move to indoor spaces when weather was unpredictable or uncomfortable. By keeping track of expenses, venues were also able to quickly respond to financial support opportunities, such as when relevant community event grants were available. When these financial supports became available, venues collectively determined they would purchase more sensory haven supplies.

A New Favorite Space

Thanks to the development of portable rechargeable electrical power banks, planners and educators are liberated from the constraints of electrical outlet placement when using mobile sensory havens. The portability of mobile sensory havens allows for their use in various inside or outside environments, making them easily assimilated into a variety of community events or venues. The versatile nature of mobile sensory havens makes them usable in any setting, including school field trips, summer camps, family road trips, and outings. The beauty of this concept lies in their affordability and accessibility. Components of mobile sensory havens can be purchased online without using specialty items. **Figure 2** depicts the cost breakdown for a mobile sensory haven.

Collaborating with neurodiverse individuals to garner their input on their experiences with sensory havens can be an essential aspect of their success. Neurodiverse visitors provide novel perspectives that neurotypical individuals may not consider. When their opinions are heard, sensory havens can more accurately cater to their needs instead of being solely based on assumptions and observations from neurotypical individuals.

Upon leaving the museum, Jaden and his mother completed a survey regarding what they felt worked and did not work. Jaden reported that sensory havens helped him most when noise levels made him uncomfortable. He liked having control over interior lighting and found blue light colors most soothing. Jaden's mother liked the idea of a haven that Jaden could go to as needed. She felt havens could be a welcome addition to many community events. She hoped to see them as the norm and not exception because they provided a way for Jaden to attend community events with family members.

There is an emerging societal shift toward inclusivity, and sensory havens provide a solution for families with neurodiverse children to participate in community events they may have previously avoided. These havens can help neurodiverse children and their families experience what neurotypical children do without fear of judgment or embarrassment. Neurodiverse children can build independence by knowing they can use sensory havens as they become more aware of their own needs. They can help promote the self-confidence needed to fully realize their potential and self-advocate for their personal needs. By incorporating these guidelines for developing and using sensory havens into sensory event planning, educators and planners can promote environmental inclusivity and help neurodiverse individuals enjoy simple but satisfying times with their families and friends.

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