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Sensory Stimulation and Autistic Children

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Design practitioners around the world have always paid attention to the way human factors affect designed spaces. Issues such as ergonomics, age, gender, and physical disabilities are studied during the programming process and designs that support these factors are integrated into solutions. However, recent news headlines reveal a growing public concern about a critical set of human factors that now must be considered when designing built environments—the effects of sensory stimulation on people who use the environment.

Dramatic increases in neurological and chronic illnesses have been observed. A chronic illness is a disease that is long-lasting or recurrent. Asthma, allergies, and diabetes are examples of chronic illnesses that are rarely improved or cured.

Neurological disorders focus on the nervous system (e.g., autism, ADHD, obsessive compulsive disorder, brain injuries or Alzheimer's disease) and vary depending on the age of the individual and the treatment plan. Typically, children may show improvement while older individuals may continue to regress. Neurological changes or deficiencies can notably change how individuals perceive and interact with their environments. Designers must now learn to create environments for people with neurological disorders that will support individuals' success, productivity, and health.

Sensory Issues

An individual suffering from sensory defensiveness may have an adverse reaction to ordinary sensory stimuli (e.g., lighting, sound, or smell). These individuals may experience a negative sensation (e.g., fingernails on a chalkboard) when viewing striped wallpaper in primary colors or hearing the hum of a fluorescent lamp. In contrast, a neurotypical individual would have no problem with such stimuli and may not even be aware of them.

Individuals suffering from problems with sensory integration or sensory defensiveness do not typically fall in the "normal" or "average" range of sensory values that are experienced (i.e., sight, sound, touch, taste, and smell). For example, children with autism frequently have difficulties with sensory integration. These children depend on their visual senses to tell them what is happening since they often cannot decode verbal cues.

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Researchers have found that autistic children's rods and cones (components of the eye) have changed due to chemical imbalances or neural deficiencies. Of the autistic children tested, 85% saw colors with greater intensity than neurotypical children. For these children, red appears nearly fluorescent, vibrating with intensity. A small proportion of the children (10%) saw the color as neurotypical children do and 5% saw muted colors. The children that would have seen muted tones would also seek out primary and other vibrant colors because they perceived everything as grey.

Environmental Stimuli and Cues for Children

Neurologically challenged individuals often have difficulty following enviromental cues. Many cannot distinguish normal visual cues such as exit or restroom signage. Yet careful attention to wayfinding and places of transition is crucial to their successful use of environments.

Photo A

A child's attention span and safe navigation can be greatly impaired by their ability to distinguish between important and unimportant stimuli. For example, a developmentally delayed child walking into a classroom may be unable to recognize the space because all the chairs are pulled out from their desks.

Classrooms, that have too much stimulus on the walls, doors, and desks can create havoc in a neurologically delayed individual's mind. It becomes difficult for the individual to pay attention to verbal instruction when there are many things occupying their sight. Therefore, in areas where learning is essential, modifications should be made to simplify the environment and reduce the amount of stimuli. This goal is illustrated through the conversion of a child's play room into a therapy room by simplifying the space. (see photos A and B). The striped, yellow wallpaper with a primary color border (photo A) was changed to a muted pink (photo B), which has been shown to be a favorable color for people with learning disabilities. Additionally, all wall hangings and visual stimuli have been removed or placed out of the view of the child while sitting at the table. The carpeting was removed due to allergies and a pre-finished hardwood floor was installed. A 100% wool carpet with a jute back for play therapy and floor activities was chosen for its low toxic, off-gassing (allergy related) attributes.

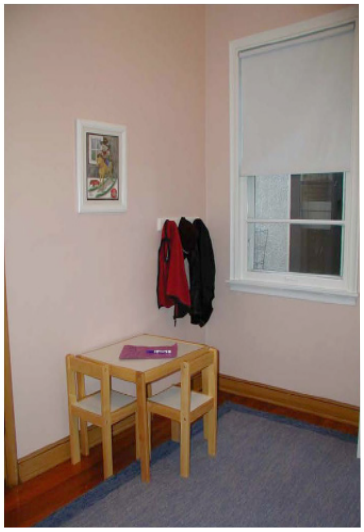

Photo B

Also, most toys and play equipment were placed out of reach to stimulate verbal requests from the child. However, items that fostered independence (i.e., a place to hang coats and hats) remained accessible to help the child learn those skills. Due to the occupant's savant skill of memorizing complex environments (i.e., all lines and shapes in an environment), existing shutters and drapery treatment were over-stimulating. Painting the window frame and using the same color shade created a intentionally uniform design.

Simplifying the environment may be the most difficult, yet the most important goal to achieve in environments used for treating neurological disorders in children. Use non-defined patterns and less stimulating colors to minimize distractions. Implementing this recommendation can be a challenge since many

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furnishings and products designed for children come in primary colors. Limit the use of primary colors to toys or products that can be removed from the space, if necessary.

Working to change the home learning environment can be overwhelming for parents as they think about how their child interacts in the entire home. Concentrating on spaces that have the greatest affect on the child's learning and therapy (e.g., therapy room, eating area, a bedroom) are most beneficial. Other areas where homework or other instruction is done are also important.

Toxic Environments

Toxic environments are increasingly important in explaining the possible causes of neurological disorders. New evidence suggests a link between heavy metal exposure (e.g., lead, mercury) and chemical exposure (e.g., dioxins) and mental health issues.

Designers can help protect susceptible individuals from increased or prolonged exposure to harmful substances by specifying the following types of products:

- Natural products with simple ingredients and limited chemical exposures
- Recycled products that have low toxic off-gassing or fewer chemical components
- Low- volatile organic compounds (VOCs) or no VOCs
- Compartmentalization of toxic chemical exposure such as printers, toners, and cleaning materials
- Limiting off-gassing VOC combinations in the environment (Sometimes even low exposure to a VOC's can be extremely dangerous when combined with other chemical exposures)

Lighting can have a dramatic effect on people with neurological disorders, and special attention should be paid to glare, noise control, and flicker as these may be negative visual and audio stimuli. Electronic ballasts greatly reduce flicker from fluorescent lamps. Locate ballasts high in the ceiling for better sound control. Uplighting or diffused lighting are effective in reducing glare.

Identifying Priorities

It is impossible to change all environments to accommodate the growing number of children with neurological disorders. However, reducing sensory stimuli in areas where learning is done, skills are attained, or important functions occur can help children master necessary skills in a controlled environment. This could lead to application of the learned skills in more complicated settings (i.e., the "real world").

It is important to remember that children may experience a sensory deficit associated with one of their senses and experience no problems with their other senses. Consequently, it is essential to discern from discussions or observations which senses could be problematic for each child. In settings, where several children with neurological disorders learn and play, it is best to design for the worst case scenario. It is easier to reduce the primary colors used in an environment at the start and add them back into the space on a case-by-case basis rather than to add and then remove them after an adverse reaction has occured.

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Since it is difficult for neurologically challenged children to verbally express how they see the world, it can be hard to understand what they experience. One of the best tools to facilitate understanding is to observe behavioral reactions to the environment to identify which situations, visual cues, or sensory experiences are reducing attention, learning or productivity.

Conclusion

When designing children's environments, it is important to consider the needs of children with neurological disorders and to think through the space as an experience. What will the children possibly see, hear, smell, and feel? Are there things that could be designed differently in critical areas so as not to interfere with a child's ability to perform? Consider visiting similar spaces and observe your own sensory responses to the environment. Some researchers believe that designing environments that meet the needs of people for people with neurological disorders, everyone can perceive an improved experience.

Waiting Room- Interactive Board

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About the Author

For the past 15 years, A.J. Paron-Wildes, LEED AP, Allied Member ASID, has developed design criteria for environments for children with autism, and pioneered various charitable programs for their benefit.

Presently, Paron-Wildes is an architectural and design specialist for Allsteel. In her current role, she is researching how the work environment can be designed to accommodate individuals with neurological or chronic illnesses to increase their productivity and ensure their health.

Related Research Summaries

InformeDesign has many Research Summaries about developmental abilities, cognition, and other, pertinent, related topics. This knowledge will be valuable to you as you consider your next design solution and is worth sharing with your clients and collaborators.

"Reintergrating Special Needs Students" —*Journal of Learning Disabilities*

"Space and Color Affects Cooperation Among Children"—*Environment and Behavior*

"Designing Usable Products for Everyone" —*Applied Ergonomics*

"Building Materials Affect Indoor Air Quality" —*Indoor Air*

"How Children Understand Space" —*Child Development*

"Multiple Chemical Sensitivity and Interior Materials"—*Journal of Interior Design*

"Children's Assessment of Restorative Environments" —*Children, Youth and Environments*

"Children and Visual Distractions" —*Journal of Learning Disabilities*

"Ventilation and Student Performance in Classrooms"—*Indoor Air*

"Natural Settings Influence Children with ADD" —*Environment and Behavior*

"Spatial Abilities of Visually Impaired Children" —*Journal of Visual Impairment and Blindness*

"Environmental Interventions for Students with Disabilties"—*Journal of Learning Disabilities*

"Including Children's Perspective on Design" —*Children, Youth and Environments*

"Color Aids Wayfinding for Young Children" —*Early Childhood Education Journal*

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A.J. Paron-Wildes

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