

# Research on Healthcare Environments for Children and their Families

*Mardelle McCuskey Shepley, Ph.D.*

In 1987 Anita Olds and Patricia Daniel, under the auspices of the Association for the Care of Children's Health, published the first book on the design of healthcare facilities for children. Until that time, very little information was available on pediatric environments and designers relied heavily on trade journal photo essays for inspiration. In the 1990s, however, socially responsible healthcare architects and interior designers led the way in the profession by embracing knowledge-based design. Surveys indicate that healthcare professionals are anxious to obtain research data to support the design process.

This paper provides an overview of research on healthcare environments for children and their families by discussing the *nature and quality of research* in the field and the *type of research available*. Additionally, an argument is made for *future research* directions, with particular reference to how adult studies relate to those of children.

## Nature and Quality of Research

The most salient characteristic of the body of research on children's healthcare environments is the limited number of rigorous studies. Although lack of health design research is problematic for all subject groups, pediatrics suffers particularly from neglect.

What are the resources in the development of theories regarding pediatric health design? In a review of research demonstrating a relationship between the environment and health outcomes (Rubin, Owens, & Golden, 1998), only 84 out of 78,761 published studies were found to have adequate methodology. Four types of studies were included: 1) randomized

controlled trials, 2) experimental trials with paired data, 3) observational studies with paired data, and 4) observational studies with different groups.

Of these 84 studies, only 3 were directed at children (other than newborns). The three post-neonatal pediatric studies included: a study of negative pressure ventilation (Anderson, Bonner, Scheifele & Schneider, 1985), a study on the impact of music on children about to undergo dental cavity preparation (Parkin, 1981), and the impact of roofing systems on ventilation in an oncology unit (Abzug, Gardner, Gloce, Cymanski, Roe & Odom, 1992). Although it is useful to identify such studies, it is clear that this information is insufficient for the generation of design guidelines for architects and designers.



**Mardelle McCuskey Shepley**  
*Ph.D.*

Dr. McCuskey Shepley is an associate professor in the Department of Architecture and the associate director of the Center for Health Systems and Design at Texas A&M University. Her degrees include a B.A. and M.Arch. from Columbia University, and a M.A. in psychology and D. Arch. from the University of Michigan. Dr. Shepley is a registered architect with 18 years of professional experience in New York, San Francisco and the Republic of Panama. A frequent speaker at conferences, she has published multiple articles focusing on the design of health facilities and its co-author of "Healthcare Environments for children and Their Families."

A broader literature review (Shepley, Fournier & McDougal, 1998) was conducted to identify publications that might: 1) contribute to the development of design guidelines on healthcare environments for children and their families, and 2) provide more information on the relationship between health environments and pediatric populations. This survey was less restrictive in the selection of literature and summarizes the contents of more than 1,000 articles. The material ranged from post-occupancy evaluations to quasi-experimental studies to surveys involving staff and patient preference. The results of this review are described in *Healthcare Environments for Children and their Families*.<sup>1</sup>

In addition to the lack of pediatric health-design research, there is scant information available with regard to *grounded theory*. Grounded theory is defined as “the discovery of theory from data” (Glaser, 1967, p. 1). This is not a new idea, but the approach contrast with the more common empirical posture, which is to deductively verify theory. Grounded theory originated in the fields of sociology and anthropology and is similar to the outcomes sought by researchers using naturalistic inquiry<sup>2</sup>. In naturalistic inquiry, in-depth observations or interviews lead to the formulation of hypotheses regarding human behavior. The process of developing grounded theory is appealing to architects because it is similar to the manner in which designers process information. Design data is analyzed and synthesized until a design decision is made. Grounded theory, naturalistic inquiry, and, to some degree, the design process, all lead to the formulation of hypotheses regarding human behavior. These theories, in turn, can be tested by traditional quantitative and qualitative research.

<sup>1</sup> The authors sifted through databases and conference proceedings and reduced and documented the most significant publications (from 185 journals).

<sup>2</sup> For a description of naturalistic inquiry, please consult Lincoln, Y. & Guba, E. (1985). *Naturalistic Inquiry*. Newbury Park, CA: Sage Publications.

## Type of Research Available

One of the components of *Healthcare Environments for Children and their Families* was a statistical summary of the types of studies described by the literature. Between the 1950s and mid-1987, only 50 articles were identified that incorporated a methodological approach. The subsequent decade demonstrated an increase in research activity. Between mid-1987 and mid-1997, 59 additional articles were identified as having some rigor. The dominant settings for these studies were neonatal intensive-care units, which accounted for 50 of the 109. Recurring themes in all studies were the need for:

1. privacy and personalization of space (even infants respond adversely to intense social interaction),
2. distraction (nature, music, technology, play, mother’s voice),
3. supervision by staff (expressed by both staff and families),
4. age-appropriate environments (at least 4 categories: pre-school, elementary school, pre-teens and teens)
5. family supportive spaces (requested by children, staff and families), and
6. healing sensory dimensions (sound, light, humidity, temperature, color).

## Future Research

Clearly, quantitative and qualitative research is needed on all aspects of pediatric healthcare environments. One direction might be to develop grounded theories around the six factors mentioned above. These theories might provide the organizational structure for a series of specific studies. Other approaches would be to follow up on existing studies or generalize from studies involving adults.

Other specific recommended research topics suggested by previous research studies (Shepley, Fournier & McDougal, 1998) are:

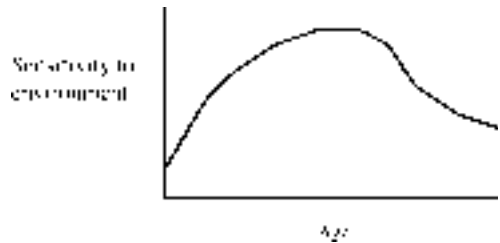
- Intergenerational waiting rooms
- Utilization of outdoor space

- Stand-alone vs. hospital-integrated ambulatory care
- Wayfinding
- Art and graphic preference
- Impact of music/aromatherapy/nature on preoperative experience
- Effectiveness of distraction simulation
- POEs
- Impact of parent spaces in inpatient and ICU settings
- Effectiveness of patient-centered care
- Comparison of unit configuration and size
- Needs of adolescents
- Impact of noise, temperature, light on families, staff, children
- Open vs. closed bay NICUs
- Appropriateness of finishes ICU pediatric psychosis
- Impact of staff respite spaces on stress reduction and performance
- Impact of access to play spaces
- Development of play equipment for special needs
- Pediatric psychiatric group size
- Open vs closed psychiatric nursing stations

The lack of theory and research regarding pediatric environments could be mitigated if we were to assume that the results of studies on adults could be generalized to pediatric populations. But is this the case? Are children sensitive to the physical environment to the same degree that adults are? Are children sensitive in the same patterns that adults are? This issue is central to answering questions about the nature of future research. If we believe that children are more sensitive to the environment, then more attention should be placed on children. If we believe that children, in addition to being more sensitive, respond to the environment differently than adults, then we will not be able to generalize the results of adult studies to pediatric populations.

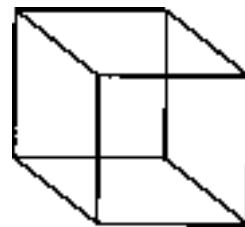
#### *Degree of sensitivity*

An argument might be made that the sensitivity of people to the physical environment is less at birth due to the underdeveloped nature of sensation and perception, and increases into late adolescent and early adulthood, at which point it tapers off as our senses become less acute (see Figure).



*Theoretical relationship based on sensation/perception.*

There is a long history of studies demonstrating parallel increases in our sensory and perceptual abilities with a peak in late adolescence or early adulthood. Sensory abilities that follow this pattern are visual acuity, color discrimination, and ability to adapt to the dark. Perceptual abilities that follow this pattern are the ability to induce foreground reversals in wire-frame cubes (see Figure) and susceptibility to illusion regarding line length (see Figure).

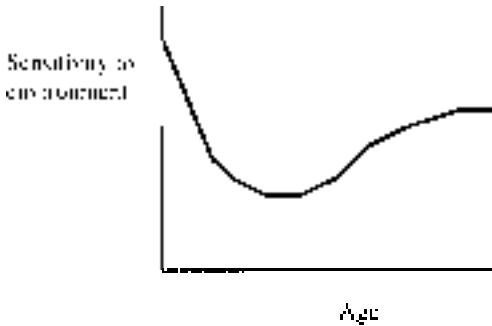


*Reversal.*



*Susceptibility to illusion.*

Conversely, it could be argued that, due to our vulnerability and curtailed ability to control our physical environment, we begin life with extreme sensitivity to the environment, become less sensitive as we move into adulthood, and then increase in sensitivity as we age (see Figure).



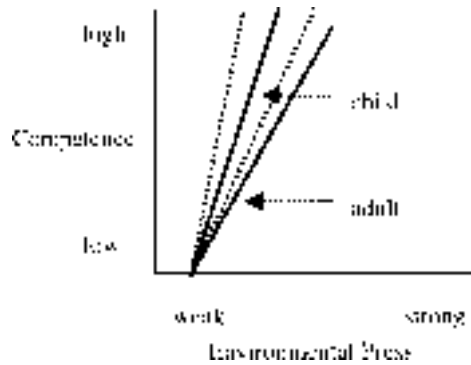
*Theoretical Relationship based on vulnerability.*

Support of this hypothesis regarding our sensitivity to the physical environment as children might come from the results of perceptual tests such as the embedded-figures test. Multiple researchers have found that the ability to discern a discrete figure embedded in a more complex figure improves into adulthood and then declines.<sup>3</sup> This perceptual embedded-ness might suggest that such an individual would find it equally difficult to cognitively separate oneself from the environment and therefore be more impacted by environmental changes. In addition to separating parts from the whole, highly interactive colors and ambiguity may also be problematic for children. Another important indicator of the sensitivity of children to environmental factors is provided by developmental psychologists who call to our attention the enormously significant role the environment plays in the social and cognitive development of children.

Of these two approaches, my inclination would be to support the hypothesis that children are exceptionally sensitive to the environment. To place this in the context of an existing theoretical framework, it is useful to Lawton and

Nahemow's (1973) Environmental Press Theory. Environmental Press Theory suggests that when individuals become more stressed (as they do when they are ill) they are less capable of coping with negative aspects of the physical environment. Based on the argument put forth here, children may be even more vulnerable to this effect (see Figure, an application of Lawton and Nahemow's (1973) theory to children).

*Patterns of sensitivity*



*Application of the environmental press theory to children.*

From the evidence provided by researchers it is clear that certain behaviors are present in all people regardless of age including: social dependence, need for control, need for privacy, territoriality, expressions of personal space, and ability to conceptualize the spatial environment. As an example, researchers have reported expressions of personal distance in children as soon as they can ambulate (Malmberg, 1984). Degrees of response, however, vary with age. Overt expressions of social dependence are strong in children than adults. Purcell (1993) suggests that the constant care of family is a child's most important need. Privacy is less articulated in young children than older children. All of these variations may account for the extensive developmental differences in coping style identified by researchers such as Band (1990), Bull & Drotar (1991), Keller & Nichols (1991), Spirito & Stark (1995), and Zangerle & Rathner, (1997). Price (1994) argues that

<sup>3</sup> For an example, see Shepley (1981).

children's needs are different primarily because their ability to cope and understand is influenced by their developmental level.

From the previous discussion we could reasonably conclude that:

1. children are more likely to be susceptible to the environment,
2. there are significant developmental differences between children of different ages that have important implications regarding the nature of the physical environment,
3. inferences regarding children cannot necessarily be made from adult studies, and
4. lack of pediatric studies may negatively impact the outcomes of children in healthcare settings.

Assuming that children are more significantly impacted by the physical environment and are impacted in different ways than adults, what are the implications? First, more researchers need to address pediatric populations in their studies. Second, as architects we must avoid jumping to conclusions by drawing on adult research and obtain as much information from children and their families as possible during the design process. And third, researchers and designers need to collaborate as much as possible to achieve appropriate pediatric healthcare environments.

## REFERENCES

- Abzug, M., Gardner, S., Glode M., Cymanski, M., Roe, M., & Odom, L. (1992). Heliport-associated nosocomial mucormycoses. *Infect Control Hospital Epidemiology*, 13(6):325-6.
- Anderson, J., Bonner, M., Sheifele, D., & Schneider, B. (1985). Lack of nosocomial spread of Varicella in a pediatric hospital with negative pressure ventilated patient rooms. *Infection Control*, 6(3):120-1.
- Band, E. (1990). Children's coping with diabetes: Understanding the role of cognitive development. *Journal of Pediatric Psychology*, 15 (1), 27-41.
- Bull, B. & Drotar, D. (1991). Coping with cancer in remission: Stressors and strategies reported by children and adolescents. *Journal of Pediatric Psychology*, 16 (6), 767-82.
- Glaser, B. & Strauss, A. (1967). *The discovery of grounded theory: strategies for qualitative research*. Chicago, ILL: Aldine Publishing Co.
- Keller, C. & Nicolis, R. (1991). Coping strategies of chronically ill adolescents and their parents. *International Disability Stud.* 13 (4), 138-40.
- Lawton, M. & Nahemow, L. (1973). Ecology and the aging process. In C. Eisdorfer and M. Lawton (Eds.), *The psychology of adult development and aging*. Washington: American Psychological Association.
- Malmberg, T. (1984). *Human territoriality: Survey of behavioral territories in man with preliminary analysis and discussion of meaning*. New York: Mouton Publishers.
- Olds, A. & Daniel, P. (1987). *Child health care facilities: Design guidelines – Literature outline*. Bethesda, MD: The Association for the Care of Children's Health.
- Parkin, S. (1981). The effect of ambient music upon the reactions of children undergoing dental treatment. *ASDC Journal of Dent Child*, 48(6):430-2.
- Price, S. (1994). The special needs of children. *Journal of Advanced Nursing*, 20, 227-232.
- Purcel, C. (1993). Holistic care of a critically ill child. *Intensive and Critical Care Nursing*, 9, 108-115.
- Rubin, H., Owens, A. & Golden, G. (1998). *Status report: An investigation to determine whether the built environment affects patient's medical outcomes*. Martinez, CA: The Center for Health Design.
- Shepley, M. (1981). *Age changes in spatial and object orientation as measured by architectural preference and EFT visual performance*. Dissertation, University of Michigan.
- Shepley, M., Fournier, M. & McDougal, K. (1998). *Healthcare environments for children and their families*. Dubuque, IO: Kendall-Ward.
- Spirito, A., Starkk, L., Gil, K., & Tyc, V. (1995). Coping with everyday and disease-related stressors by chronically ill children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34 (3), 283-290.
- Zangerle, M. & Rathner, G. (1997). Age dependence of coping strategies in children and adolescents with diabetes mellitus. *Psychother Psychosom Med Psychol*, 47 (7), 240-248.