Neighborhood Design and Physical Activity

The goal of this study is a greater understanding of the impact of neighborhood design features on physical activity of residents. It takes advantage of a rare real-world intervention involving the relocation of approximately one hundred families to new neighborhoods. The intervention permits a longitudinal examination as families relocate to different types of communities.

The study examines levels of physical activity among a group of low-income, primarily African American women before and after they move from their primarily urban neighborhoods to one of two newly-constructed communities, either:

- a "neotraditional" neighborhood with small lots, modest setback distances from the street, sidewalks, a central part or recreation area, and rear automobile parking, or
- a conventional suburban neighborhood with large lots, substantial setback distances, long driveways, no sidewalks, and no shared social recreation area.

This research proposes to answer the following questions.

1. Is there an effect of neighborhood physical design on the physical activity patterns of residents?
2. If physical neighborhood design does affect physical activity, which aspects of neighborhood design are most salient?
3. If neighborhood design does impact physical activity, through what mechanisms?

There are two other themes that are part of this research on housing, neighborhoods, and well-being. One looks at how changes in housing quality affect mental health among the female heads of household. The second examines the relation between the nearby food environment (i.e. the availability and affordability of healthy foods) and residents' diets.

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Stimulating Recall of Positive Memories in People with Alzheimer's

Demographic projections indicate that dementia care is a growing challenge and providing appropriately designed dementia-care facilities is a priority. This study seeks to contribute to understanding of how changes in sensory perception for people with Alzheimer's disease influence facility design to support personally meaningful sensory stimulation.

The research examines interior design for stimulating recall of positive memories in people with Alzheimer's or related dementias. The objectives are to:

- prepare guidelines for design of resident rooms with emphasis on personalization—a source of personally meaningful sensory stimulation
- formulate interior design strategies based on these guidelines
- construct prototypes to illustrate and use in evaluating personalization
- evaluate application of strategies in actual use within resident rooms in a dementia-care facility.

The research has revealed the therapeutic benefit that can be realized through appropriate support of personalization, providing valuable direction in defining testable outcomes of designs generated in the course of the research.

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Biomaterials for Tissue Regeneration and Repair

Multidisciplinary research is being conducted on biomaterials, particularly the design and synthesis of novel biodegradable polymers/fibers/fabrics for human body repair like tissue regeneration. The polymers are used for surgical repair of injured, diseased, or aged tissues. The study addresses their impact on wound infection and healing.

Additional research includes biodegradable materials for:
- immunotherapy of cancer patients
- reducing restenosis of vascular stents
- engineering cell preservation and tissue for vascular and bone tissues
- vascular grafts
- carriers for gene therapy
- stem cell-induced healing of vascular grafts

The overall goal is to integrate and advance the knowledge of biomaterial science and engineering with medicine, and to bring new therapeutic options to save human lives or/and to improve the quality of life. Such integration and advancement could bring academic research findings closer to clinical reality.

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Inner City Toxicants, Childhood Growth and Development

Studies are being conducted to assess the impact of exposure to pervasive environmental neurotoxins on children's health and development. The goal is to understand how toxic exposures alter children's cognitive and behavioral development and to use this knowledge to guide public policy and to improve children's health, well-being, and developmental potential.

It is known that acute high-dose exposure to heavy metals, such as lead (Pb) and methyl mercury (MeHg) can alter prenatal and postnatal development. These alterations include abnormal brain development and can cause impaired cognitive development and school failure. Current studies are focused on the effects of prolonged low-dose exposure to Pb and MeHg. Results from a recent investigation show that children chronically exposed to even low levels of Pb will suffer subtle cognitive deficits. These deficits include reduced IQ scores and problems with attention and problem solving. The levels of lead in the blood that are associated with these subtle deficits were shown to be much lower than what regulatory agencies and most pediatricians consider a threat to children's health.

Discoveries in the area of neurobehavioral impairments in lead-exposed children continue to impact U.S. policy-related discussions within both the national and regional offices of the Environmental Protection Agency and the Centers for Disease Control and Prevention. A practical goal of this research is to move regulatory agencies to lower the acceptable limit for lead in children's blood and thereby remove one obstacle to children reaching their full potential.

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