Taking the Stairs

Spatial Measures that Influence Stair Use

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Create a theoretical & methodological framework for exploring the physical environmental influences of stair use

Develop tools and measures for stair use in the physical environment

Examine the influence of identified variables on natural patterns of stair use in buildings-in-use

Identify strategies for stair use in the design of buildings
Behavioral Change or Lifestyle Modification

Motivational, educational or enforced behavioral interventions

Personal factors
Psychological, cognitive & emotional attributes, behavior attributes and skills, social and cultural factors

Increased physical activity

Raise your fitness level, one step at a time.
Previous Stair Use Research

Environmental Enhancement and Restructuring

Environmental enhancement

Personal factors
Demographic and biological factors, psychological, cognitive & emotional attributes, behavior attributes, and skills, social and cultural factors

Increased physical activity

BEFORE

AFTER
Social Ecological Approach

Examine the relationship between stair use and building design

10 Academic Program Buildings
38 stairs
Optimize variance in building design and layout
Theoretic Framework

Personal Factors
- Demographic & Biological Factors
- Psychological, Cognitive & Emotional Factors
- Behavior Attributes
- Social & Cultural Factors

Social/Organizational Factors
- Organizational Structure
- Functional factors
- Operational factors
- Organizational Attitudes & Policies

Voluntary Stair Use

Physical Environmental factors

Aesthetics
- Quality of interior finishes
- Presence of visually pleasing features
- Architectural articulation of stair/elevator

Comfort
- Tread/riser dimensions & ratios
- Number of steps between landings
- Stair width/occupancy load
- Stair/Elevator vibration and operational stability

Convenience
- Visual/Physical accessibility
- Connectivity of stairs/elevator to destinations within building
- Angular orientation of stair/elevator to path of travel
- Motivational/Directional signage

Legibility
- Stair imageability
- Visual accessibility
- Identification signage

Safety
- Uniformity & intensity of lighting levels
- Visibility of tread edge
- Slip-resistant treads
- Maintenance level
- Presence of hazards/graffiti

Spatial Levels of Decision-making

Local
- Views from & to stair/elevator
- Shelter/Access to outdoors
- History of elevator operations disruption

Relational
- Relative distance & time of travel between walking routes using stair or elevator
- Elevator speed & capacity

Global
- Location of stair relative to most integrated paths
- Integration value of stair
- Intelligibility of building’s circulation paths
- Conformance to building codes
Constructs of Voluntary Stair Use

- **Appeal**
  - Stair Appeal
  - Setting Appeal

- **Comfort**
  - Gait Compatibility
  - Exertion Compatibility
  - Social Operational Compatibility

- **Convenience**
  - Proximity
  - Distribution
  - Accessibility

- **Legibility**
  - Visibility
  - Intelligibility

- **Safety**
  - Natural Surveillance
  - Maintenance
Proximity

Distance between Stair and Building Entrance

- Stair A: 58 ft.
- Stair B: 146 ft.
- Elevator: 90 ft.
Proximity

Distance between Stair and Elevator

- Stair A: 152 ft
- Stair B: 59 ft
Distribution

Effective Area of each Stair

- Stair A: 58.9%
- Stair B: 41.1%
Distribution

Occupant Load within Effective Area of each Stair

Stair A: 78.3%
Stair B: 21.7%
Elevator
Visibility

Area of Isovist

- Stair A: 467 sf
- Stair B: 178 sf
- Elevator: 250 sf
Intelligibility – Space Syntax

Integration Plan

- Stair A
- Stair B
- Elevator
Intelligibility

Most Integrated Path (MIP) (Red line)
Intelligibility

Number of Turns from the MIP

- Stair A: 0 turns
- Stair B: 2 turns
- Elevator: 1 turn
Intelligibility

Number of Turns from the Entrance

- **Stair A**: 1 turn
- **Stair B**: 2 turns
- **Elevator**: 1 turn
High Stair Use Concentrated on One Stair

**Stair 1A**
- Effective Area: 58.9%
- Occupant Load: 78.3%
- Vertical Travel: 65.6%

**Stair 1B**
- Effective Area: 41.1%
- Occupant Load: 21.7%
- Vertical Travel: 8.7%

**Elevator**
- Vertical Travel: 24.7%

2nd Floor Plan:
- Axial Line representing Most Integrated path
- Border of Stair Effective
- *Isovists*
  - Stair 1A
  - Stair 1B
  - Elevator

1st Floor Plan:
- Building Entrance
High Stair Use Concentrated on One Stair

Stair 3B
Effective Area 35.7%
Occupant Load 25.2%
Stair Use 5.0%

Axial Line representing Most Integrated Path
Building Entrance
Border of Stair Effective Areas

Isovists
- 3A
- 3B
- 3C

Stair 3A
Effective Area 34.7%
Occupant Load 46.9%
Stair Use 77.6%

Elevator
Elevator Use 14.8%

Stair 3C
Effective Area 32.5%
Occupant Load 27.9%
Stair Use 2.5%

2nd Floor Plan
High Stair Use Distributed amongst many Stairs

- Building Entrance
- Axial Line representing Most Integrated Path
- Border of Stair Effective Areas

Isovists
- 4A
- 4B
- 4C
- 4D
- 4E
- 4ELV

**Stair 4B**
- Effective Area: 17.9%
- Occupant Load: 12.4%
- Stair Use: 11.8%

**Stair 4C**
- Effective Area: 19.5%
- Occupant Load: 13.8%
- Stair Use: 5.7%

**Elevator**
- Elevator Use: 12.5%

**Stair 4A**
- Effective Area: 8.7%
- Occupant Load: 10.0%
- Stair Use: 18.7%

**Stair 4D**
- Effective Area: 19.5%
- Occupant Load: 40.1%
- Stair Use: 35.5%

**Stair 4E**
- Effective Area: 25.1%
- Occupant Load: 23.7%
- Stair Use: 15.6%
High Elevator Use

- Elevator Use: 60.2%
- Stair 5A:
  - Effective Area: 49.2%
  - Occupant Load: 36.0%
  - Stair Use: 27.0%
- Stair 5B:
  - Effective Area: 50.8%
  - Occupant Load: 64.0%
  - Stair Use: 12.8%

Axial Line representing Most Integrated Path
Border of Stair Effective Areas

Isovists:
- 5A
- 5B
- Elevator

1st Floor Plan
Future Direction in Research

Large Sample

• increase validity

• use multi-level analysis techniques

Other Domains

• government office workplaces

• Examine the relevance of all variables of the 5 thematic concepts of stair use in older, less active populations

Refine the Spatial Variables

• Determine relative influences, refine variables

• understand the interrelationship between variables