Introduction

• Stairways are fundamental determinants of physical activity and movement in public buildings, but they are often poorly designed.

• Most people do not take advantage of the stairs.

• Current practices in stairway design in the U.S. discourage their use:
  – They are frequently hidden from entrances with small signs denoting their location.
  – Often they are not convenient, legible, or appealing.

Lockwood Library, University at Buffalo
Project Goals

• This project explores stairway designs in public buildings, including interactive stairways as a safe means of physical wellness and social integration for its user.

• It seeks to promote stair use as a fundamental feature of the building design and to interpret this intervention to the building users.
Project Goals

Setting: Public buildings in the U.S. (large-scale)
Users: A wide variety of people who are able to navigate stairs
Research Questions

1. How can we promote active living through stairway design?
2. How can we support safe stair use?
3. How can we increase and sustain stair use?
Research Methods

1. Archival information, in the form of journal articles, was gathered to gain a good understanding of stairway usability.

Keywords: stair use, stair safety, stair climbing, physical activity, active design, active living

Procedure:
1. Search online databases.
2. Find useful articles and journals.
3. Export citation to EndNote.

2. Observational studies were conducted to determine the behavior of stair users in different stairway settings.

Procedure:
1. Develop a checklist of behaviors.
2. Observe stair users in different stairway settings using a video camera.
3. Analyze and compare user behaviors across different stairway settings.
Research Sources

Research Sources

Stair Safety and the Behavior of Stair Users

Benefits of Stair Use
• Lee, K. K. (2012a). Developing and implementing the Active Design Guidelines in New York City. Health & Place, 18(1), 5-7. (A)

Effectiveness of Various Design Interventions
Archival Information

Safety
• Most stair accidents are due to perceptual errors and distractions (MiyasikedaSilva & McIlroy, 2012).

Sustained Use
• Physical inactivity is a leading cause of death in the U.S. and is also associated with several additional leading causes of death, including obesity, high blood pressure and high blood glucose (Lee, 2012a).

• Stair climbing is a vigorous activity that can burn more calories than jogging (Lee, 2012a).

• It is also associated with improved cholestoral levels, cardiovascular fitness, stroke risk and blood pressure (Teh & Aziz, 2002; Meyer, Kosovsky, Sigaud, Carballo, et al., 2010; Lee, 2012a).

• Users often mistakenly feel that the elevator is faster than the stairs (Cheung, 2011).
Observational Data

• In traditional stairways, there is less interest in the stair. The surrounding environment is the focus of the visual scene.

• In interactive stairways, there is more interest in the stair. The stair itself is the focus of the visual scene rather than the surrounding.

• More users were observed returning to an interactive stairway for multiple and extended use compared to traditional stairways.
**Conceptual Model**

**Environmental Conditions**
- **Stairway Interactivity**
  (focus of the visual scene)

**Behavioral Responses**
- **Interest in/Motivation to use stairs**
- **Attention to the Stair itself**

**Major Outcomes**
- **Movement in Buildings**
- **Physical Activity**
  (Increase daily exercise and change health behaviors)
- **Conscious (safe) gait**

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Design Recommendations: **Legibility**

1. Designate a main, interactive stairway that plays an array of sounds in a highly visible public setting (e.g. a student union) for everyday use and enjoyment.

   - Stairways that are directly accessible and visible from a building’s waiting areas, atrium, and most-used public corridors are more likely to be used for everyday travel.  

   (Active Design Guidelines, 2010)
Design Recommendations: **Legibility**

2. Fire-rated glass enclosures and sprinkler water curtain to increase stairway visibility.

(Nicoll & Zimring, 2009)
Design Recommendations: **Legibility**

3. When stair entrances are not visible, place signage at elevators.
   - This is a simple, inexpensive, and effective method to moderately increase stair use.

(Grimstvedt, Kerr, Oswalt, Vargas-Tonsing, & Yin, 2010; Active Design Guidelines, 2010; Lee, Perry, et al., 2012b).
Design Recommendations: Appeal

4. Add sound/music to encourage walking stairways.
   - This can be achieved by installing pressure sensitive pads (mat switches) on stair treads that trigger sound through speakers (Fig. 1) or by using the SoundStair technology (Fig. 2).

   (Kerri, Boutelle, David, Murray, Kathryn, & Schmitz, 2001)

Fig. 1.

Fig. 2.
http://radioboston.wbur.org/2011/07/13/christopher-janney

SoundStair, Boston Museum of Science
5. Use bright, distinctive colors and incorporate artwork into the stair environment

(Kerri, Boutelle, David, Murray, Kathryn, & Schmitz, 2001; Active Design Guidelines, 2010)
6. Make stairs wide enough to accommodate travel in groups and in two directions.
   - Wide stairs are associated with increased stair use
   - Stairs that are 56 inches wide can comfortably accommodate the dimensions of two people talking and traveling together or two people traveling in opposite directions.

(Active Design Guidelines, 2010)
Design Recommendations: Safety

7. No more than 10 risers between landings

8. Add non-slip and non-glare surfaces and edges

9. Design graspable handrails
   - Round handrails (1.25 in. to 2 in.) provide a good “power grip”
   - Rectangular shaped handrails made of metal or wood in 2x4 or 2x6 flat configuration is a common example of poor, non-functional handrail design

(Templer, 1992; Bakken et al., 2007)
10. Create interest in the stair itself so that the stair is the focus of the visual scene rather than the surrounding.
Conclusion

From a research perspective, interactive stairways like Soundstair in the Boston Museum of Science and Temperamental Stairs in Pittsburgh can not only increase physical activity but improve stairway safety as well by increasing the stairway user's attention to the stairway itself and causing them to use a more deliberate gait.
Future Research

• Little is currently known about emotional responses to stairway designs and features
  – Identify features of stairways that people find attractive and therefore are more likely to use
  – Rate stairway videos and images using emoticons

• Little is currently known about people’s perceptions of stairway usability
  – Identify features of stairways that people find
  – Rate stairway videos and images using a Usability Scale