

Do Older Adults Prefer "Smart" Lighting Cues in a Darkened Home Environment?

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Abstract

Background

Falls are a major issue for the aging population, often causing fractures and frequently leading to placement in a long-term care facility.¹⁻³

Navigating in the dark may heighten the chance of falls.⁴

The TAFETA Project for Older Adults Research Team has installed two smart lighting technologies in its living laboratory called the TAFETA Smart Apartment. These technologies are: (1) a lited pathway consisting of illuminated strips and (2) a fading light system. Both systems work with a pressure sensor and motion detector to provide visual cues to individuals traveling from the bedroom-to-bathroom area in the dark. These high-traffic areas within the home are known to be a common location of indoor falls.⁵

Our pilot study evaluates user preference of both smart lighting technologies as options to assist older adults navigate in the dark. Specifically, this study gives participants an opportunity to provide feedback on these systems, rate them against a standard home lighting system, and communicate their preference.

Method

Fifty consenting rehabilitation patients (≥ 50 years) will test three lighting scenarios in the darkened bedroom of the TAFETA Smart Apartment. Each participant will be assigned to one of six randomly-determined groups to establish the test pattern, which includes (1) the lited pathway, (2) fading light system, and (3) typical room lights.

Pre- and post- trial interviews will be used to gather basic health information and record user preference of each visual aid tested.

Upon completion of the trial, chi-squared tests will be used to analyze categorical data and to compare frequencies using different rating scales. Descriptive statistics and open-ended comments will also be used to verify the value attributed to these visual aids.

Preliminary Results and Discussion

Preliminary results as of September 20, 2007 from 6 participants demonstrates an initial preference for lighting cues versus standard room lighting. The participant pool will be expanded to complete the study by December 30, 2007.

Introduction

Adults over the age of 65 are the most rapidly growing sub-group of the population and will constitute an estimated 25% of the entire population by 2030.^{1,2}

Within this demographic, approximately 30% of these individuals suffer from falls annually, with 10-15% of these falls resulting in major injuries, such as fractures.^{1,2}

Most falls occur in the home and more than one third of in-home falls occur in the bathroom and bedroom.³

Approximately 40% of long-term care facility admissions are falls-related, and are associated with considerable loss of independence and diminished quality of life.^{2,4}

While studies have shown that older adults fall more often during times of maximal daily activity, many older adults have decreased visual acuity, decreased mobility and increased walking aid use, which significantly impacts their ability to balance and walk safely in the dark.⁴

Smart lighting technologies, which are triggered by activities of daily living, may show promise in helping to prevent falls by directing a person from the bed-to-bathroom area in a darkened environment.

The TAFETA Research Team has installed two sensor-triggered visual lighting cues – (1) lited pathway illuminated strips and (2) a fading light system – in its smart apartment.

This pilot study evaluates user preference of both of these systems as compared to standard lighting.

The team hypothesizes that:

- (1) Participants will find orientation and navigation with path-finding cues easier than without them.
- (2) Fading bathroom and bedside lights will be preferable to lited pathway illuminated strips.

Methods

Location

- TAFETA Smart Apartment
- Élisabeth Bruyère Health Centre, SCO Health Service
- Ottawa, Canada



TAFETA Smart Apartment: Designed to test unobtrusive technologies and help older adults age in place.

Subjects

- 50 patients from the stroke, geriatric, and neuromuskeletal programs and the geriatric Day Hospital
- 50 years of age and older
- Able to provide consent in English or French
- Ambulatory with a functional independence measure score ≥ 5 on bed transfer or equivalent
- Legally-blind participants excluded

Patient Assignment and Study Protocol

- Three lighting scenarios: (1) lited pathway illuminated strips, (2) fading lights, and (3) standard room lights
- Consenting participants assigned to one of six randomly determined groups to establish the sequence of the scenarios
- 60-minute visit in the smart apartment
- Night simulation through closed doors and covered windows
- Replication of night-time trips to the bathroom by participants

Technology

- Illuminated strips and fading lights that work in conjunction with sensors



Lited Pathway Illuminated Strips

Fading Light System



Bed-Based Occupancy Sensor (Mat)

Motion Sensor

Sample Scenario: Fading Light

The lited pathway and fading lights work in conjunction with the bed-based occupancy sensor (mat) and motion sensor. The mat, shown in the photo to the lower left, is placed under the mattress.

When the older adult gets out of bed, a signal is sent to the lited pathway and the strips on the bedroom door and in the bathroom light up. A separate bathroom ceiling light is also activated.

The patient follows the visual cues to the bathroom and upon return, the motion sensor activates the fading lights, which illuminate the bedroom.

When the patient lies down on the bed, the pressure on the mat deactivates the fading lights, which gradually dim. The pressure also turns off the lited pathway illuminated strips and the bathroom light.

Methods Cont'd

Data Collection

- Pre-scenario interviews to obtain health information and discuss home lighting and bathroom visits
- Post-scenario interviews to acquire participants' preference of lighting system

Data Analysis

- Categorical (e.g. yes/no) data using chi-squared tests
- Ordinal data (e.g. 5-point rating scale)
- Open-ended responses

Ethics

- Approved by SCO Health Service Ethics Board

Preliminary Results

- 6 participants recruited and interviewed
- 5 of 6 participants prefer smart lighting technology to standard lights
- 4 of 6 participants prefer fading light technology to lited pathway illuminated strips

Discussion

- Early results indicate older adults facing physical challenges when navigating from the bedroom-to-bathroom area prefer lighting technology to assist them.
- By completing this study, we expect to confirm participants prefer the fading light system over the lited pathway illuminated strips.
- Future studies would be of value to determine how much older adults would be willing to pay to introduce smart lighting technology into their homes.

References

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