**Fear of Falling and Eye Movement Behavior in Young Adults and Older Adults: A Pilot Study**

Ladda Thiamwong* PhD., Nahal Norouzi**, PhD candidate, Gregory F. Welch*** PhD.

*College of Nursing, University of Central Florida. **Computer Science, UCF College of Engineering & Computer Science; UCF Institute for Simulation & Training (IST). ***Professor, Florida Hospital Endowed Chair in Healthcare Simulation, UCF College of Nursing, UCF College of Engineering & Computer Science; UCF Institute for Simulation & Training (IST).

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**Introduction**

Older adults (OAs) with fear of falling (FOF) tend to rely more on vision during walking than young adults and older adults without fear of falling. Fear in general for all ages may change pupil diameter, increase horizontal eye velocity and eye displacement. Whereas, fear of falling in older adults may change eye movement patterns such as fixation points and their order, indicative of visual attention, and duration of fixations.

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**Methodology**

We assessed fear of falling by the short version of Fall-Efficacy Scale International and assessed eye behavior by a mobile light-weight eye tracker with world camera and eye camera that assembled from the Pupil Docs DIY headset. Two older adults who had fear of falling and three adults who had no fear of falling were recruited. The eye tracker was calibrated by a screen nine-point marker procedure. We measured four variables including the total time of pupil fixation on targets, average pupil fixation, pupil size fluctuations and horizontal pupil displacement.

**Related Work**

Young et al. (2015) explained in their articles how visual search pattern of OA with FOF and without FOF is different dealing with obstacles in their path.

OA= Older Adult, A= Adult

**Measured Variables**

- Confidence levels of the collected data, expectation: OA>A
- Total time each participant spent fixating on their surroundings. (fixations are usually more than 180 ms), expectation: OA>A
- Average duration of one fixation for each participant, expectation: OA>A
- Pupil size fluctuations, expectation: OA>A
- Horizontal pupil displacement, expectation: OA>A

**Confidence Level of the Calibration Procedure**

**Results**

The results show that older adults with fear of falling had higher pupil size fluctuation and increased variability of horizontal pupil displacement than adults without fear of falling. However, the average pupil fixations and the total fixation duration were not consistent with what we expected from older adults since the confidence level of the calibration procedure was not high (50%-85%).

**Conclusion and Recommendations**

Our pilot study revealed that older adults with FOF had higher pupil size fluctuation and increased variability of horizontal pupil displacement.

Rapidly growing improvements in instrument technologies such as eye-tracking systems may make it promisingly applicable to the FOF assessment.

Early identification of older adults at-risk of developing persistent FOF is essential to ensure appropriate and timely intervention, and reduces avoidable individuals’ social, community and healthcare-related costs.