

Reaction to a Balance

Disturbance in College and

Middle Aged Women

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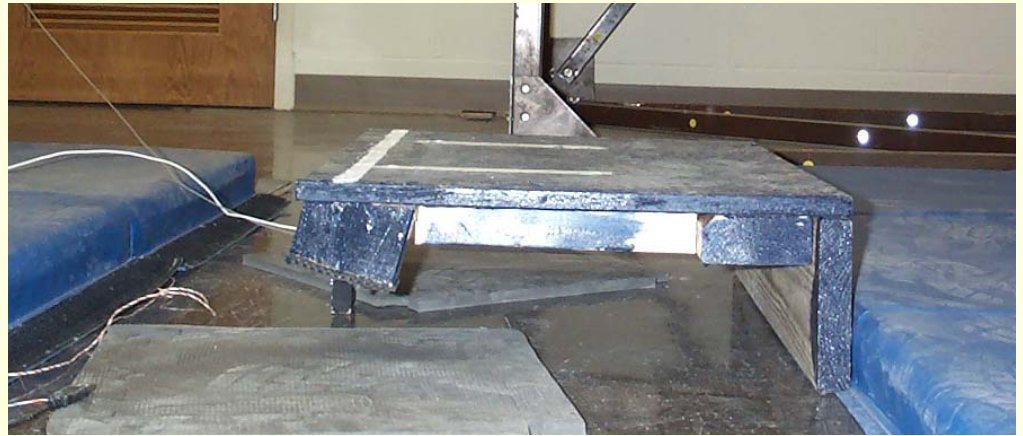
Purpose of Study

- One Third of Persons over age 65 will Experience a Fall
- Rate of falls is 2.7:1 in females to males [1]
- Total cost of such falls in 2020 is estimated to be \$41.4 Billion in 1994 dollars [2]
- Wrist and Colles fractures in females increase non linearly with age, with a large increase around the time on menopause [3],[4],[5],[6]

Project Background

- Reaction times and extent of reaction to be determined
- Test Run on 5 College aged subjects (20 +/- 2 years) and 5 Middle Aged subjects (47 +/- 2 years)
- Wrist motions tracked using SIMI motion software along with 2 accelerometers
- A continuation of the study run by Wisner, DeGoede (2005)

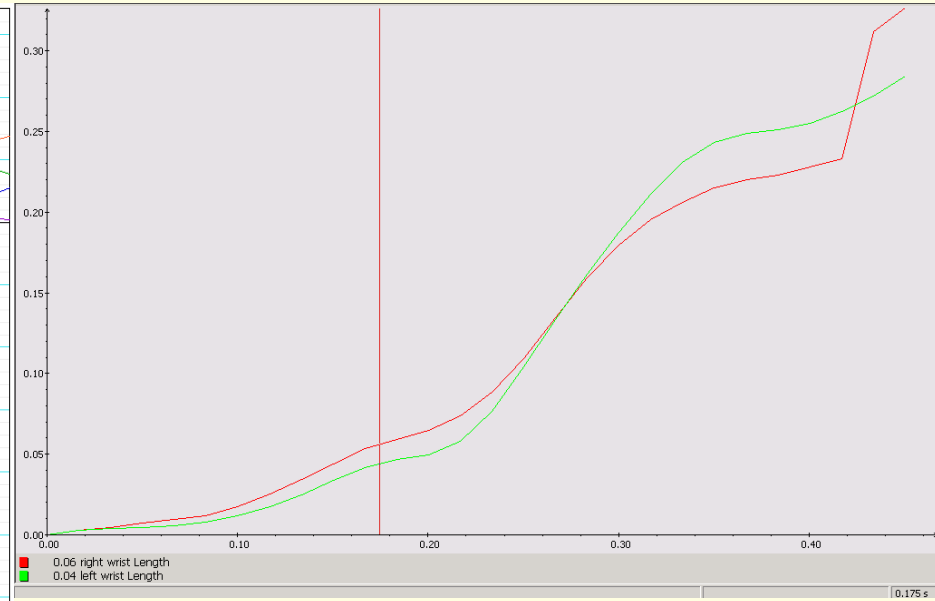
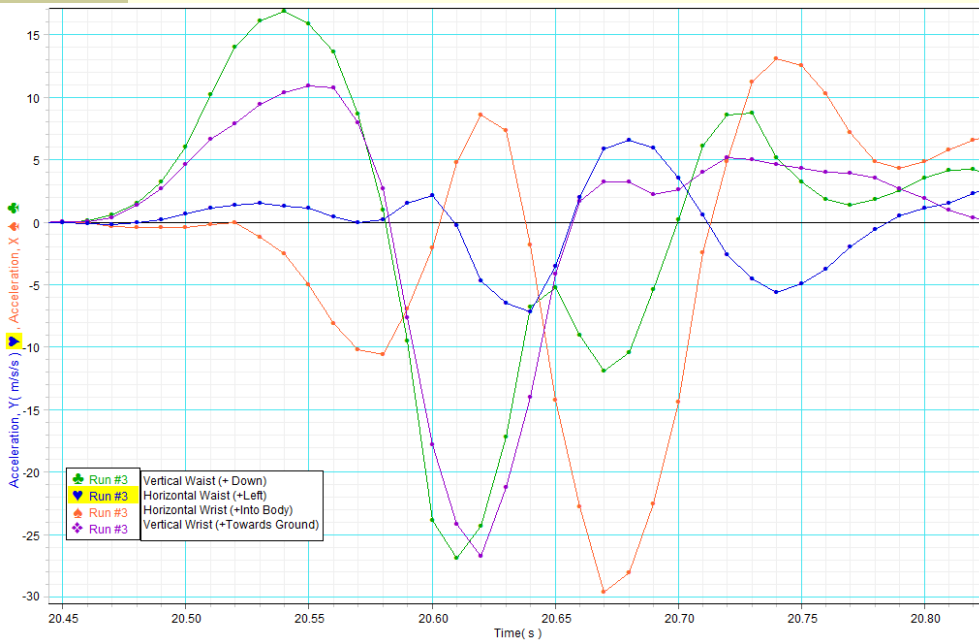
Experimental Setup



Markers placed on: Shoulders, Elbows, Knees, Heels, Wrists and Waist

Accelerometer data was recorded using a Passport GLX and Pasco Data Studio

Defining Motion

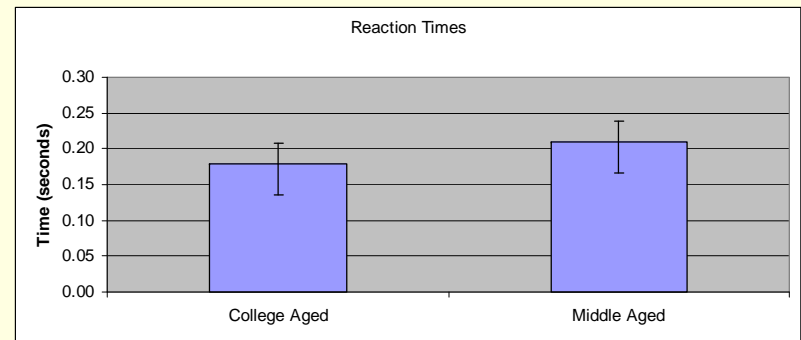


The Reaction Time for the Trial was Found to be 180 milliseconds.

Reaction Time

- The subjects data was omitted if there was significant variation in the accelerometer data that an exact reaction time could not be determined with certainty
- No subject had any statistical outliers in their data set or in the data as a whole (95% confidence interval)
- The expected data trend is followed with college aged subjects having a smaller reaction time than middle aged subjects

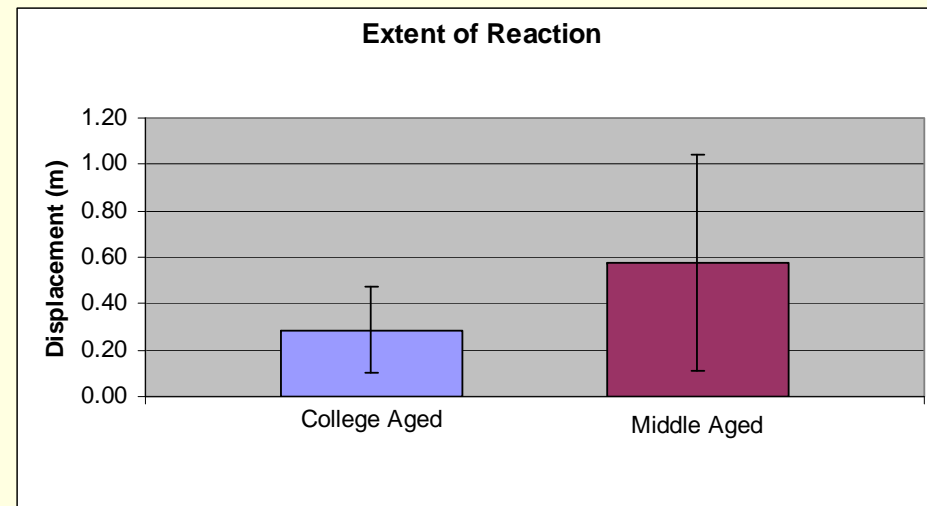
	Average	Standard Deviation
College Aged	0.18	0.01
Middle Aged	0.21	0.02



Extent of Reaction

- There were no subjects that were omitted due to statistically significant outlier data
- Data was computed using the right wrist as long as it was visible for the entire motion
- If the wrist was not visible for the entire motion then the left wrist was used as long as it seemed comparable by the video data
- If the difference was sizeable the run was excluded

	Average	Standard Deviation
College Aged	0.29	0.09
Middle Aged	0.57	0.23



Other Observations

- It was found that there was not trend between the trial number and either the reaction time or reaction extent
- Subjects who reported greater fitness levels seemed to have smaller reaction extents and times of reaction
- It was found that 25% of college aged subjects needed to take a step to regain balance compared to over 70% of middle aged

Conclusions

- The data supported the hypothesis given
- A larger reaction time would increase the likelihood of a fall occurring and may explain the increase in fall rates
- The reaction time data follows the trend found by Wisner, DeGoede (2005) however the times are quicker
- The reaction extent data does not follow the trend found by Wisner DeGoede (2005)

Conclusions (Contd.)

- The larger reaction extent could have a few different implications:
 - The subjects needed more motion to regain balance
 - Should the subject actually have experienced a fall it is likely that they would have stuck the ground with greater force rather than bracing themselves for the fall
 - The subjects may have been overreacting to the balance disturbance

Further Research

- Running more subjects for a greater statistical group would strengthen results
- Comparing fitness level to the reaction time and reaction extent
- Determining the stepping rate of subjects during testing along with stepping extent

Thank You – Any Questions?

- Acknowledgements:
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 - All subjects for helping in the study

References

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- 2. Englander, F. et al. "Economic dimensions of slip and fall injuries." *J Forensic Sci*. 1996;41(5):733-46.
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