ALERT DEVICE FOR WALKER (WARNS)

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Abstract

47,000 older adults are injured annually from falls related to walkers and canes [1]. Use of assistive walking devices can lead to loss of independence or even embarrassment. Walker designs on the market are primitive, lacking comfort and proper safety features. Current lock technology uses pressure-based designs, however there are several factors that undermine the effectiveness of the locks, such as uneven terrain or physical impediments [2]. **Designing a more effective lock and alert is integral for improving safety and decreasing injury.**

Background and Motivation

-Most walker users have less inclination to use the safety aspects of a walker [3]

-Elderly adults may not have enough strength or control to stop the walker by themselves [2]

-Competing design found was a self locking mechanism

Figure 1. Dolomite Legacy 600 Walker [9]

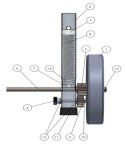

Figure 2. Self locking brake mechanism [2]

Design Specifications

	Design 1: Button Brakes		Design 2: Noise Alert for Brakes		Design 3: Pressure Sensing Brakes	
Criteria (weight)	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Feasibility (20)	3/5	12/20	4/5	16/20	3/5	6/20
Ease of Use (30)	4/5	24/30	5/5	30/30	4/5	24/30
Safety(30)	4/5	24/30	4/5	24/30	3/5	18/30
Cost (10)	4/5	8/10	5/5	10/10	3/5	6/10
Durability (10)	5/5	10/10	5/5	10/10	5/5	10/10
	Sum	78/100	Sum	90/100	Sum	66/100

Figure 3. Design Matrix

Figure 4. Final Design Sketch

- Device cannot be restrictive, heavy or require large force to operate[4]
- Adults aged 74-85+ will use this product [5]
- Must comply with FDA [6] and ADA [7] restrictions
- $300 budget

Final Design

Figure 5. Walker front view

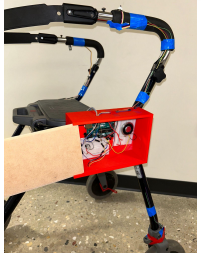

Figure 6. Alert system on walker

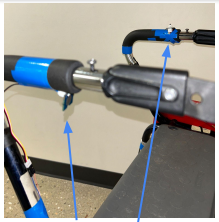

Figure 7. Sensor/button placement

Materials:

- Arduino Uno Rev3
- SP-3605 Speaker
- Adafruit Solenoid
- Grove → Touch Sensor
- Grove → Button
- Breadboards (2)
- Walker
- PLA (circuit box)
- Wires, resistors, transistors, diodes

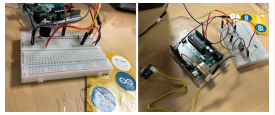

Figure 8. Button to solenoid circuit layout

Testing

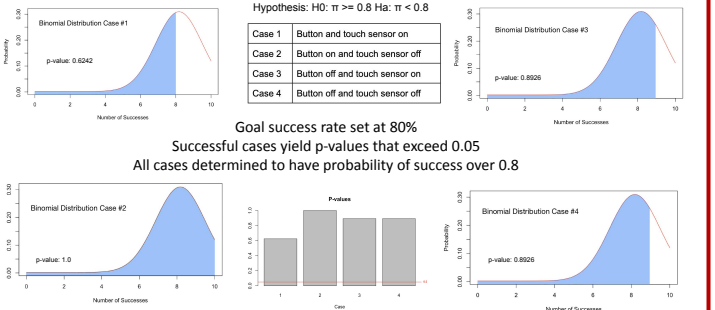

Figure 9/10. Case 1 & 2 Distribution

Figure 11. Each case P-values

Figure 12/13. Case 3 & 4 Distribution

Limitations

- The Arduino is limited to 5 V of power, and 12 V maximum, therefore a more powerful microcontroller or a new interface may be needed in future iterations
- The code, despite having a 15 second delay, causes an instant response from the speaker and solenoid in case 4, therefore a different Arduino library may need to be added to the code for the correct response to occur

Future Work and Conclusion

Future Work

- Convert from solenoid to a linear actuator [9]
- Minimize size of circuit box and use a more secure fastener
- Conduct a focus group to see if potential users think the device would be useful
- Research and implement portable battery for power source

Figure 14. L9110 Linear Actuator [8]

Conclusion

The team observed that each condition exceeded the goal success rate of 80% for the semester, therefore it was deemed that the design has potential for continuation at a later date. The team also noted further advancements that could be made in several areas of the project that would have been achieved with an extended timeline.

Acknowledgements

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References

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