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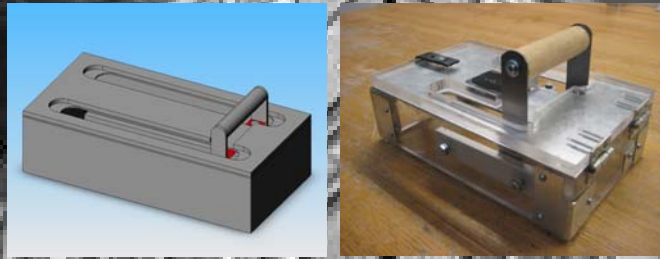
Client – Dr. Molly Carnes, MD, MS, Professor – Departments of Medicine and Industrial & Systems Engineering

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Abstract

A common trait of the elderly population is decreased hand strength and dexterity. This is a condition which advances as people age. Additionally, the elderly population takes numerous pills which come in a variety of different packages. One type of packaging is called blister packaging. Due to decreased hand strength and dexterity, these blister packages are hard for the elderly to open. The goal of this project is to create a device which makes the process of opening blister packaged pills easier for the elderly population. The device that was created is ideal for home use by the patient, and does not require assistance to use. Additionally, a safety mechanism has been engineered to prevent the user from injury due to the sharp blade which the device utilizes. The device was tested using a variety of over the counter pills. Testing has shown that the device is 100% effective in opening the packaging on the first try with only minimal damage to the pill (less than 1% pill damage).

Final Design



A comparison of design ideas at mid-semester with final prototype

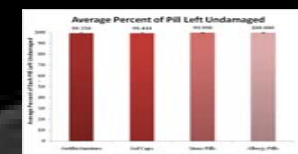
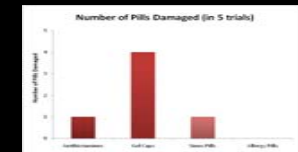
Testing

Device Testing

The device was tested using four different types of over-the-counter medication: Antihistamines, gel caps, sinus pills, and allergy pills. Each pill differed in size, shape, and composition. The efficiency of each cut was measured by weighing the pills before and after the trials. Five blister packs of each type were used, totaling 20 trials in total.

Results

The device was found to be 100% efficient in removing the pills from the packing in one try. Among the specific pill types, the device damaged the allergy pills the least, which were the smallest of the pills tested. The gel caps, also the largest pill, were damaged more frequently by the device although the damage is quite small (<1%).

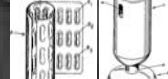
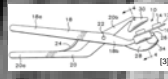
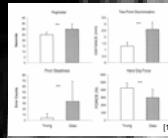


Problem Statement

Project Goal – Design a device to aid in the removal of pills from blister packaging for elderly/disabled patients with decreased hand strength.

Background Information

- Elderly patients exhibit decreased hand strength which can lead to difficulty in carrying out everyday tasks
- Decreased hand strength is a result of declining skeletal muscle mass (40% decrease between ages 50-80) and central command fatigue [1]
- 10% of elderly patients describe blister packaging as difficult to open and of them 27% live alone with no assistance [2]



Problems with Current Devices

- Require significant hand strength and dexterity to operate
- Do not open pills with peel away packaging
- Insufficient safety considerations
- Specific to pill shape and size and therefore are not versatile

Client Requirements

- Require minimal hand/grip strength and dexterity
- Pose no threat to the potential user, even during improper use
- Applicable to a variety of pill packages including both punch out and peel away packaging in a variety of shapes and sizes
- Pill must remain unharmed in the process of removal
- Allotted budget: \$1000

Blade Assembly

- Adjustable height microtome blade placed between two pieces of thin sheet metal which keep blade from significantly damaging pills
- Two low friction sliders control movement of the blade
- T-brackets connect low friction sliders to the adjustable height blade and the cylindrical control handle

Hinged Latch Mechanism

- Acrylic platform with slots that allow motion of the blade and opening and closing of device around the fixed handle
- Rubber surface compresses packaging against metal platform for close cut
- Rubber latch holds acrylic platform down against pill packaging during use

Patient Safety Mechanism

- Inhibits motion of blade unless hinged latch mechanism is securely closed
- Prevents opening of hinged latch mechanism unless blade assembly is returned to its original location



Future Work

Future Testing

- Obtain IRB approval for human subject testing
- Run usability testing with elderly patients to obtain patient feedback
- Run tests on larger variety of pill types to ensure device versatility

Prototype Improvements

- Reduce size and weight of current device for increased portability and usability
- Replace costly components to make the device more marketable

References

- Ranganathan, Vinoth K., Siemonow, Vlodek, Sahgal, Vinod, & Yue, Guan H. 2001. Effects of aging on hand function. *JAGS*, 49, 1478-1484.
- Beckman, Anna, Bernsten, Cecilia, Parker, Marti G., Thorslund, Mats, & Fastbom, Johan (2005). The difficulty of opening medicine containers in old age: A population-based study. *Pharmacy World & Science*, 27, 393-398.
- Hunts, L.D. 1997. *Tool for removing pills and the like from blister packages*. US Patent 5,722,563.
- Heath, C. 1989. *Device to remove objects from blister packs*. US Patent, 4,909,414.
- Haber, T.M., Smedley, W.H., Foster, C.B. 1995. *Blister pack pill dispenser*. US Patent, 5,405,011.