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Med-Ease: Facilitating the Occupation of Opening Medicine Bottles (University of Toronto)

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Med-Ease with cover

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ABSTRACT

To occupational therapists (OTs), enabling our clients to be independent in their self-care is vital for their participation in

everyday life. For many older adults, medication plays a large role in their day-to-day activities including the opening of child-resistant containers/medicine bottles. However, more studies are posing that motor control and aging are directly linked to age-related structural, biochemical effects, which may impact functional performance of older adults. Older adults have more difficulty opening child resistant bottles due to age related conditions such as Parkinson's disease, rheumatoid arthritis, impaired vision and decreased fine motor abilities. As part of our design course within our occupational therapy program, we collaboratively designed a modified medicine bottle opener, the "Med-Ease" that aims to reduce the biomechanical fine motor demands of opening a typical medicine bottle by allowing the use of the hand or more stable proximal joints of the body enabling older adults to independently open child-safe medicine bottles.

BACKGROUND

The proportion of older adults is increasing within North America, with this trend expected to rise within the 21st century. According to the US Bureau of the Census, by 2030, an estimated 70 million older adults will make up the U.S. population—doubling in percentage from 1996. Occupational therapists are well suited in partnering with older adults to help them maintain their independence in everyday activities [4]. Opening medicine bottles is a common activity that older adults participate in where they experience difficulty due to age-related conditions, decreased fine motor abilities, and hand injuries [2]. In a study conducted by Keram & Williams (1988), 50 non-institutionalized older adults over the age of 60 were timed while opening 15 medicine bottle containers [1]. Although all participants were able to open the non child-resistant containers, none of the participants could open the child-resistant medicine bottles and many of the participants stated this to be a major inconvenience in their everyday life. The creation of the Med-Ease device came after our team conducted an environmental scan of adaptive aids and current medicine bottle openers. We found that all medicine bottle openers currently on the market such as the Multi Grip Twist Cap Opener, the Safety Cap Medicine Bottle Opener and the EnriTwist Off Medicine Bottle Cap Opener still required dynamic palmar force and torque hand and/or wrist motion. In addition, all of these devices were designed specifically for the average orange medicine bottle not taking into account liquid containers and varying medicine bottle heights and circumferences. Currently, there are no existing medicine bottle openers that are able to open varying heights and circumferences while significantly reducing the amount of hand force and torque required for users. As OTs, we used our clinical expertise and knowledge of energy conservation, joint protection and biomechanical principles in designing the Med-Ease. In testing our product, we were able to witness how older adults with decreased fine motor abilities and/or Parkinson's and younger individuals with hand injuries were able to open varying medicine bottles with the assistance from the Med-Ease.

DESIGN OBJECTIVE

As individuals begin to age, they may start to face motor decline that can compromise their performance of activities of daily living and instrumental activities of daily living [3]. Older adults with conditions such as Parkinson's disease or arthritis are at an even greater risk of decreasing their overall fine motor skills. The general hand weakness encountered by these aging seniors, and in particular their decreased grip and strength make it increasingly difficult to engage in the occupation of taking medication on a daily basis. The child-resistant medicine bottles are challenging for most individuals to maneuver, let alone those with aging conditions or poor grip strength. To allow older adults to maintain their independence, we have designed a medicine bottle opener that facilitates the process of opening child-resistant medicine bottles, thus enabling these individuals to take their medication independently. Various sub-goals for our design include:

- Portability: it is essential that the medicine bottle opener be small and light enough to transport around with its users.
- Cost-efficiency: the less expensive the product, the more affordable it can be for its users.
- Decreased torsion/force: child-resistant medicine bottles require a significant amount of torsion and force to open, which is likely difficult for older users or those with hand conditions to maneuver. Thus, it is critical for the medicine bottle opener to require a significantly smaller amount of torsion and force to facilitate opening.
- Large surface area: the larger the surface area of the medicine bottle, use of more stable, proximal joints allows for decreased hand strength when opening a medicine bottle



Using hand to operate Med-Ease

METHODS/APPROACH

To create Med-Ease, we designed a fairly small cylindrical container with different inserts and covers that can be utilized, depending on the individual user. We glued dycem to the bottom of the container for anti-slip purposes, to ensure stability while maneuvering the medicine bottle opener. We then created another insert for smaller medicine bottles, to once again ensure stability of the bottle. Med-Ease encompasses a series of design features that are intended to ease the process of opening child-resistant medicine bottles. The main features are listed below:

- Increased Surface Area

In contrast to a medicine bottle with a small cap size, the Med-Ease top is large, thus making it easier to open the cover. For instance, a larger surface translates into less pressure that needs to be exerted on the user's hand while pushing down on the cover. Additionally, a larger surface area allows for a better grip during the twisting action needed to maneuver the cover.

- Various Attachments- Can open bottles with one arm or with limb

In addition to the larger surface area, the Med-Ease cover can be interchanged with different tops. For instance, one top provides a smooth surface with which an individual may use their forearm or elbow to open medicine bottles. This may be ideal for some individuals who have the use of only one side of their body, or with significantly impaired hand weakness or impairment. The other attachment for Med-Ease allows for use with the hand, for those who prefer and are able to use their gross motor skills.

- Can fit different sizes of medicine bottles

The size of Med-Ease ensures that most push and twist medicine bottles can be opened with minimal effort. Med-Ease has been tested with a range of medicine bottle sizes with varying heights and widths. In all cases, Med-Ease was able to open the bottles with comfort and ease.



RESULTS/EVALUATION

To evaluate the efficacy of our product, we tested it on three clients with varying diagnoses. An elderly individual living with Parkinson's Disease, an 82-year-old male with decreased fine motor abilities, and a female aged 34 with a radial nerve injury participated in our pilot project. All clients were able to use Med-Ease safely and efficiently, and commented on the simplicity and ease of the product. Clients had no difficulty placing the varying sizes of medicine bottles within the Med-Ease container. The individual with Parkinson's disease noted the importance of being able to use his more stable proximal joint, such as the forearm to open medicine bottles. All participants claimed to have higher satisfaction with the activity of opening medicine bottles independently, and showed interest in purchasing the Med-Ease product for daily use of taking medication.

DISCUSSION

Medications serve as diagnostic tools, treatments, and as preventative health measures. When taken appropriately, medication can be very beneficial and necessary. However, when taken incorrectly, medication can cause serious damage. As a result, medications are often packaged in child-resistant medicine bottles to prevent accidental use by minors. While serving as a safety precaution, this packaging can also serve as a barrier to individuals who are afflicted with a range of limitations and restrictions in their hands. Fortunately, Med-Ease can allow these individuals access to their medications by facilitating the process of opening medicine bottles. Common illnesses where Med-Ease may serve a beneficial role include arthritis, hand injuries, stroke, etc. Due to the versatility of Med-Ease, it can be used by individuals with a host of limitations.

FUTURE DIRECTIONS

Med-Ease can be modified to incorporate a motor powered by battery or an AC adapter. By introducing this component, the need for the user to exert a torsion force to open medicine bottles would be eliminated. This would conserve the users' energy and make for easier access to their medications.

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