

The Stickler (University of Toronto)

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Abstract

Arthritis is a growing issue for the Canadian healthcare system. Currently, over 4.6 million Canadian adults (Canadian population: 34.9 million) are living with arthritis. This number is expected to balloon to 7.5 million by the year 2036. Arthritis predominately affects women, as they represent two of every three Canadians living with arthritis. The economic impact of this chronic condition cannot be understated; the cost of healthcare and lost productivity is estimated to be \$33 billion each year [1].

Arthritis is comprised of over 100 distinct conditions. Common symptoms of arthritis include pain, achiness, stiffness, and swelling in and around joints. These symptoms have a profound effect on quality of life, function, and independence [1]. Occupational therapy strives to promote and enable an inclusive society so that all of its members may participate to their full potential in all of life's occupations (i.e. activities of daily living, productivity, and leisure). The goal of creating the Stickler was to enable individuals

with arthritis to independently access public washrooms by providing a way to secure public washroom stall doors, regardless of the type of built-in lock.

Background

On February 10th, 2014 individuals from the Patient Partners of the Arthritis Society were invited to speak to our occupational therapy class about their lived experiences with arthritis. They spoke of the challenges they encountered in carrying out their activities of daily living and how arthritis impacted their independence and sense of self. Informal interviews with the Patient Partner members revealed that they found activities of daily living requiring fine motor skills particularly difficult. The members further described the challenges and anxieties about accessing public washrooms. The difficulty in accessing public washrooms resulted in decreased confidence. Upon further exploration of the task, it was determined that the fine motor manipulation required to lock and unlock washroom stall doors posed the greatest challenge. Compounding the issue is the variety in locking mechanisms used, which provide differing challenges to dexterity. Currently, public washroom locks do not have specific accessibility requirements in the Ontario Building Code [2] and as a consequence are not readily accessible to all users.



Figure 1: Several common bathroom locks

Problem Statement

Our goal was to design and build a device that would minimize the hand dexterity needed to use locks on public washroom stall doors. We strived to develop a simple tool to ensure a better fit between a person and the environment. This tool will enable individuals with arthritis to independently access public washrooms, thereby reducing anxiety and improving quality of life.

Design and Development

Our design goals were as follows:

- Enable individuals with arthritis to independently secure washroom stall doors

- Accommodate different door and lock designs
- Portable device for ease of use

Ideally, the tool should require minimal hand dexterity and strength to operate to accommodate users with arthritis. To maximize compatibility with a variety of doors and locks, we wanted a design that attaches to the door and doorframe to securely hold the door closed. We wanted to create a tool that is lightweight for portability, inexpensive, easy to operate, and usable on a variety of washroom stalls to prevent the door from opening.



Figure 2: The Stickler and de-Stickler

Materials

Mini suction cups: A number of mechanisms were prototyped to attach our tool to different door and doorframe materials. The most versatile method of adhering our tool proved to be miniature suction cups, as they were compatible with metal, wood, and plastic doors. We chose to use miniature suction cups to meet our design criteria of portability. This component is readily available at local hardware stores and is inexpensive.

Wooden dowel: We explored different methods of securing the suction cups together. Testing showed that increased rigidity improved the performance of the tool. A thin wooden dowel was able to serve this purpose and was both lightweight and strong.

Plastic lace: Testing of the suction cups alone showed that the base would benefit from increased rigidity; the weight of the door caused the suction cups to stretch and a small gap formed between the door and doorframe. To overcome this issue, plastic lace was wrapped around the base of the suction cups to increase rigidity.

Neoprene: The symptoms of arthritis include stiffness and inflammation of joints, resulting in difficulty grasping small and thin handles. To address this issue, it was important to increase the diameter of the handle. Neoprene was utilized as it allowed us control over the diameter of the handle and provided a soft grip surface.

Tennis overgrip tape: Overgrip tape was used to secure the neoprene and provide comfortable grip with extra traction

<http://youtu.be/MsmE-f8q5Lk>

The de-Stickler

After creating the Stickler prototype, we found that the suction cups attached so securely that it required a substantial amount of strength to remove. Thus, we had to create an apparatus that would easily detach the Stickler – dubbed the de-Stickler.

Cardboard paddle: We found that a thin piece of cardboard was sufficient in releasing the suction easily. This was ideal as it portable and easy to operate.

Handle: A handle was added to the paddle to eliminate use of a fine motor pinch to utilize the de-Stickler. The handle was created following the same principles as the Stickler. The materials included a wooden dowel, neoprene to increase the grip diameter, and overgrip tape for a comfortable, tacky grip surface.

Evaluation

To evaluate the Stickler and de-Stickler, the following design criteria were used:

1. Effectiveness of tool
2. Portability and weight
3. Ease of use
4. Accommodating of different door and lock designs (i.e. able to use on different door materials, doors that swing in or out)

5. Minimize grasp, fine motor skills, strength, reaching/bending, and hand dexterity required

The tool was able to successfully meet all of the above design requirements. Following our testing, we sought feedback and input from members of Patient Partners. The members determined that grasping the handle was still too effortful. To remedy this, we further increased the diameter of the handle with neoprene and wrapped it in overgrip tape for a tacky and comfortable grip.

Discussion and Conclusions

The ability to independently access public spaces is an important component of emotional and social well-being. A seemingly trivial action like securing a bathroom stall can have a significant impact on independence, well-being and quality of life.

Individuals with arthritis face challenges in the built environment on a daily basis and the development of this tool may remove a barrier to this important activity of daily living. The final prototype successfully met all of the proposed design goals:

- Enable individuals with arthritis to independently secure washroom stall doors
- Accommodate different door and lock designs
- Portable device for ease of use

The simplicity of this tool allows it to be used by other populations that present with similar hand dexterity challenges, such as individuals with spasticity and hemiplegia. Simple weighting modifications would allow for this tool to also be beneficial for individuals with tremors. The bright colours allow individuals with low contrast sensitivity or low visual acuity to easily make use of this tool. The versatile design of this tool makes it easily adaptable for alternate uses to manipulate various items around the home. For example, the Stickler can attach to flat surfaces of drawers and cabinets to modify the means of access. This negates the need to pull a drawer with a few fingers, effectively decreasing the stress on the small joints and muscles of the hand.

The final prototype was well-received by the Patient Partners. The Patient Partners found the tool was able to adequately address an area of need, and expressed an interest in utilizing this tool if it was made commercially available. This is a simple tool was able to successfully meet our goal in designing a product that enables individuals to independently access public washrooms.

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