

Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

Title of Project:Inflatable Pads
Group Name:
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1. Problem Finding

We will list some of the problems that we will be tackling in our invention. Firstly, research has shown that the ageing population of Singapore will rapidly increase to 1.8 million in 2030, making up 28% of the total population of the Republic which will be 6.34 million by then. As the ageing population increases inevitably, there will be more of elderly-related injuries. Falls are by far the leading cause of injuries among the elderly. One out of every 3 seniors aged 65 and older experiences a fall each year. Falls are the leading cause of both non-fatal and fatal injuries among seniors, and 20 to 30 percent suffer moderate to severe injuries that can cause disability or increase the risk of death. Falls can result in a wide range of injuries, including lacerations, sprains, hip fractures, head trauma, and even traumatic brain injuries. Based on MOH, injuries related to falls are common among older persons with approximately 28-35 percent of those 65 years and older falling each year. Falls can cause pain, disability, loss of independence and premature death. In Singapore, about one-third of older persons aged 60 and above has fallen more than once. Studies have shown that falls are a major cause of hip fractures. More than 20 percent of patients die in the first year after suffering from a hip fracture, while another 25 percent of older persons require a higher level of long-term care after a fracture. Therefore, we felt that there was a need for invention to prevent the damage caused when an elderly falls.

Here is a table which weighs out our considerations based on the ideas which we want to invent, with points 1 (least significant) to 4 (most significant):

Note: For cost, 3 will be least expensive, 1 will be most expensive.

Considerations for Selection	Problems			Safety	Total
	Realism	Originality	Cost		
Importance	2	3	1	4	
Wheelchair	$2 \times 2 = 4$	$3 \times 1 = 3$	$1 \times 1 = 1$	$4 \times 3 = 12$	$4 + 3 + 1 + 12 = 20$
Walking Sticks	$2 \times 1 = 2$	$3 \times 1 = 3$	$1 \times 1 = 1$	$4 \times 1 = 4$	$2 + 3 + 1 + 4 = 10$
Inflatable pads	$2 \times 3 = 6$	$3 \times 3 = 9$	$1 \times 1 = 1$	$4 \times 2 = 8$	$6 + 9 + 1 + 8 = 24$

Based on the table, we can deduce that the invention we are going to make is the inflatable pads, as it has the highest score in the decision making matrix.

2. Define the problem

Extent of problem:

A slip on the bathroom floor or a missed step going downstairs may mean a scratch or a bruise for most of us. But for the elderly, a fall can mean more serious implications. In Singapore's Emergency Departments (ED), 85% of all trauma in elderly are falls. It is a leading cause of death and disability in the elderly, and studies have also shown that half of elderly who experience a fall will have a recurrent fall in the following year. In Singapore, falls are a leading cause of injury among older adults. According to Health Promotion Board Singapore, about one-third of elderly Singaporeans aged 60 and above have recurring falls. Every 32 minutes, an elderly person turns up at a public hospital emergency department because of an injury from a fall. Each month, about 100 seniors find themselves in hospital, staying a week or more because of such injuries.

Problem Statement:

Elderly falls are becoming a more serious problem for faced by almost every elderly. Every 32 minutes, an elderly person turns up at a public hospital emergency department because of an injury from a fall. The way that we will be solving this problem is by inventing inflatable pads on pants. By doing so, this will decrease the percentage of the impact of the fall so that they would not need to go to the hospital so often because of the falls.

3. Your Big Idea

Our Proposed invention:

Our big idea is inflatable pads in pants. It is a special type of tight-fitting pants with pads at the hips and knees areas of the pants. In addition, there will be two cylinders filled with carbon dioxide in it, which will help inflate the pads before the fall. The materials used for the pants are gas canisters to contain compressed carbon dioxide, nylon fabric and a motion sensor.

Purpose of our invention:

Upon the elderly detecting a fall, they will have to press the motion sensor, causing the airbags to rapidly expand such that the knees and hips of the elderly will be safe from harm.

Some problems that we might expect in the course of our proposed invention:

This design however will only minimise damage and injuries cause and would not be able to protect the elderly entirely from impact.

Some of the major milestones in our project timeline:

Proposal Writing-1 month

Discussion on materials to buy-2 weeks

Working on the model and actual prototype-Around 4 to 5 months

Working on the written report-1 month to 2 months

Working on slides-2 weeks

Modification(if required)-2 weeks

Total time-Around 8 months

4.Construction Process

Explain how and why the materials were chosen for the prototype/ product of your invention.

For our product, we didn't really need to find materials as we built it based off a pair of pants. However, we did ensure that the pants were strong and not too loose, such that it would be able to support the weight of the gas canister. Another consideration is also the comfort the elderly had when they had the pants on, to attract them to even continue using the pants.

Components of product:

- gas canister
- pants
- Tubing
- Pads to inflate

Explore these considerations that may guide the construction of your prototype/ product.

Our main goal was to make it cheap, comfortable and reliable thus we took into consideration the speed of inflation, durability of the pants and the cost of the product. Therefore, the tubing and the pads were all used before to avoid any extra cost needed to construct the final product. However, the gas canisters had to be bought from the bicycle shop as we had no such resources.

Document the prototype/ product development stages. You may use drawings, photographs or videos.

Originally, our idea was to have 2 gas canisters, however, we researched and realised that:

1. It might be too heavy and thus uncomfortable to the elderly
2. The gas canisters were too expensive and our idea was to make the cheapest yet most efficient product.

Thus, we then cut down to only 1 gas canister that leads to both sides to inflate.

5.Modification and Evaluation

5 A Write down your prototype/ product test criteria and check against it if it works. Identify areas of weakness for modification. Indicate the test iteration and date of test.

Test Iteration:	Tick			Remarks
	Pass	Fail	Potential Failure	
Test Date: 10/8/18				
Test Criteria 1 Fast inflation	✓			Inflation was fast and sudden
Test Criteria 2 Strong material			✓	The material was able to hold up to the force of the expansion but we suspect that it might not in the future. However, we had already used one gas canister on the test and could not afford to test it twice.
Test Criteria 3				

*Add more rows for more criteria

** Repeat table for next test iteration

6.References

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