



KEMENTERIAN PENGAJIAN TINGGI



ADJUSTABLE CRUTCH

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ABSTRACT

Crutch is a stick that fits under the arm, that you lean on for support if you have difficulty in walking because of leg injury. Normally, crutch used by seniors, sportsmen who injured and people with broken feet. With crutch a little bit can help them walk easily. Sometimes, the original crutch have a problem such as the crutch takes a lot of spaces and uncomfortable. In our adjustable crutch project, we want to innovate this crutches more usable everywhere. Firstly, we want to make this adjustable crutch comfortable to the patient. To make this adjustable crutch comfortable we try to make this crutch more lighter than original. Furthermore, we want to make this adjustable crutch save spaces. To make this crutch save spaces we divide the crutch into three parts that can fit into one part. Most patients face the common problem which is to place the crutches whenever they are not using them. It would be difficult for the patients to place their crutches everywhere. Patients have different height and need an adjustable crutch with a new mechanism to make them easier to use it. Existed crutch is not practical to use in tight places with limited space. Objective to build the adjustable crutch is to design more efficient crutch better than the current now. This project is to make it less difficult for the patients to bring the crutches anywhere since they do not occupy much of space. The crutches could be adjusted to shorter length. Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principle associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm theoretical model, phases and quantities or qualitative techniques. A survey has been done to identify the problems about the existed crutch and the things that need to be upgrade on the crutch so that it is easier for everyone to use it. From the survey, we can determine the important parts that need to be upgrade on the crutch with people demand. This can help us to produce a good product that can help others that having difficulty to walk. Our future recommendation is to design an automatic adjustable crutch with pneumatic system. The upper and lower part can be adjusted just by using a switch or push button.

Keyword : The smaller the better

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INTRODUCTION

1.1 RESEARCH BACKGROUND

First of all crutch is a stick with a piece that fits under the arm, that you lean on for support if you have difficulty in walking because of a foot or leg injury. Actually, crutch used by seniors, sportsmen who injures and people with broken feet. With crutch a little bit can help them walk easily. Sometimes, the original crutch have a problem such as the crutch takes a lot of spaces, too big and the crutch uncomfortable.

In our project adjustable crutch, we want to innovate to make this crutches more usable everywhere. Firstly, we want to make this adjustable crutch comfortable to the patient. To make this adjustable crutch comfortable we try to make this crutch more lighter than original. So with this innovation patient easy to carry everywhere. Furthermore, we want to make this adjustable crutch save spaces. To make this crutch not takes a lot of spaces we innovate stick with a piece that fits under the arm can be divide into three parts, where the iron above can enter the iron below it. While the bottom of the stick the iron can be folded. So with this innovation the adjustable crutch easily stored in a narrow place.

1.2 PROBLEM STATEMENT

Most patients face the common problem in which to place the crutches whenever they are not using them as example when they are sitting especially in the car. It would be difficult for the patients to place their crutches everywhere. Patients have different height and need an adjustable crutch with a new mechanism to make them easier to use it. Existed crutch is quite difficult and not practical to use in tight places with limited space. Another problem is we must get hot to make our product function with the mechanical part because it will be use some electrical part and mechanical part to make it function.

1.3 OBJECTIVE

Objective to build the adjustable crutch is to design the more efficiency crutch better than the current now. The adjustable crutch must can use by the patient. This project is to make it less difficult for the patients to bring the crutches anywhere since they do not occupy much of space. The crutches could be adjusted to shorter length so this functional will more efficiency for the patient. We also want to know how to combine the mechanical and electrical part in this product.

1.4 SCOPE OF RESEARCH

This project is produce inside and outside the Sultan Salahuddin Abdul Aziz Shah Polytechnic. The scope of the research will involve the process of collecting data and information related about the crutch. The research will also in online form to obtain more detailed data to obtain interesting ideas for adjustable crutch production .Among the information that needs to be emphasized is the average weight of the patient and also the height of the patient.

1.5 SIGNIFICANCE OF PROJECT

Although, the crutch that are currently used in Malaysia could perform well and it is very useful to the general public who are having foot problems. However, some people find it difficult to carry the crutch from one place to another place because of its relatively large size and weight especially if tight place. Thus, the finding of this study will bring a lot of benefits to people who are having foot problems such as it will help patient to carry out their daily routine easily. Plus, it can make easy to carry because the material that we use is light. Moreover, it will absolutely benefit for industry of crutch since we are try to created a new technology for crutch.

1.6 SUMMARY

In this chapter, the studies was explained about its origin of ideas and inspirations. All the objectives were made out of all the problem statements. The objective for this project along with the importance will that will be comfortable and light causing it to be more convenient for and even the scope of this project only. Thus, this new crutch could be used for daily routine with a really good care for a longer lifetime.

LITERATURE REVIEW

2.1 INTRODUCTION

Literature review is a study conducted based on large theories and used in fields related to research such as journals, articles, books and newspaper studies. Therefore, in this chapter some theories related to this study will be presented such as the history of sticks and systems adjustment.

2.2 TYPES OF CRUTCH

There are several basic types of crutches: axillary (underarm), forearm (Lofstrand), platform, strutter, and leg support. All should be custom fitted properly to help reduce movement problems. Crutches are made in all sizes, for adults and children.

Underarm or axilla

Axillary crutches are used by placing the pad against the ribcage beneath the armpit and holding the grip, which is below and parallel to the pad. They are usually used to provide support for patients who have temporary restriction on ambulation. With underarm crutches, sometimes a towel or some kind of soft cover is needed to prevent or reduce armpit injury. The underarm pad is a curved design that is open in the front with the grips for the hands shaped for maximum comfort and to reduce the prevalence of overuse injuries. These crutches also contain a spring mechanism at the bottom to allow the user to propel themselves further, resulting in quicker movement from place to place. This type are most commonly used by young or athletic populations.

Forearm

A forearm crutch (also commonly known as an elbow crutch, Canadian crutch or "Lofstrand" crutch due to a brand by this name) has a cuff at the top that goes around the forearm. It is used by inserting the arm into a cuff and holding the grip. The hinged cuff, most frequently made of plastic or metal, can be a half-circle or a full circle with a V-type opening in the front allowing the forearm to slip out in case of a fall.

Forearm crutches are the dominant type used in Europe, whether for short or long term use. Outside of Europe forearm crutches are more likely to be used by users with long term disabilities, with axillary crutches more common for short term use.

Leg support

These non-traditional crutches are useful for users with an injury or disability affecting one lower leg only. They function by strapping the affected leg into a support frame that simultaneously holds the lower leg clear of the ground while transferring the load from the ground to the user's knee or thigh. This style of crutch has the advantage of not using the hands or arms while walking. A claimed benefit is

that upper thigh atrophy is also reduced because the affected leg remains in use. Unlike other crutch designs these designs are unusable for pelvic, hip or thigh injuries and in some cases for knee injuries also.

Walking sticks or canes serve an identical purpose to crutches, but are held only in the hand and have a limited load bearing capability because of this.

Platform

These are less common and used by those with poor hand or grip strength due to arthritis, cerebral palsy, or other conditions. The forearm rests on a horizontal platform and is usually strapped in place with velcro-type straps that allow the platform or trough to release in case of a fall. The hand holds an angled grip which, in addition, should allow adjustment of length from trough to grip and side-to-side sway depending on the user's disability

2.3 SYSTEM FOR CRUTCH

The use of the adjusting method is one of the effective alternatives to produce a product that is more able to provide convenience to the patient. The adjustment rod is a system to be used to change the height and can be closed to facilitate the patient when not in use. Function of that system is:

- Change or adjust the height of the stick according to the patient's suitability.
- To make more easier for the patient if not in use.
- Save the space especially when to keep it.

2.4 MAINTAINANCE

Maintainance for this adjustable crutch are relevant to keep use it.Its only just check the adjustable part can lock or not.After that,check the hinge are still can close and open the crutch is still functional or not.And then keep check the rod crutch have a damage or not to avoid the rod of adjustable broke.

2.5 ESTIMATE WEIGHT

The estimated load of this crutch is very important in designing a crutch that can accommodate the weight or burden of the patient. The crutch that can handle a patient's heavy load is considered successful because it actually works to help and provide convenience to the user.

2.6 CHAPTER SUMMARY

Overall, the results obtained from this chapter are experiments that will be made to refer to the sources of previous studies to complete the work done. In addition, some information from the history of the manufacture and production of crutch and also the adjustment system identified its function. This implementation can provide various benefits to patients or users.

METHADODOLOGY

3.1 INTRODUCTION

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principle associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm theoretical model, phases and quantities or qualitative techniques.

3.2 METHADODOLOGY FLOW CHART

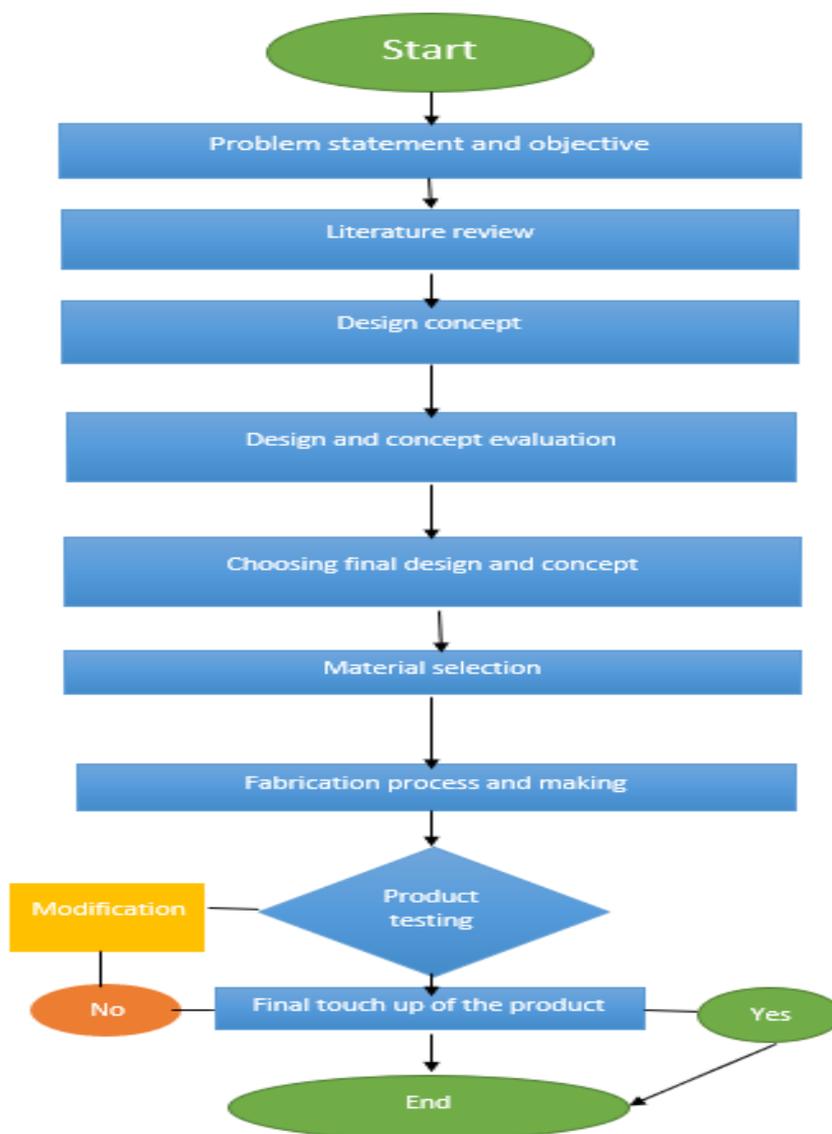


Figure 3.1:Flow chart project

3.2.1 IDENTIFY PROBLEM

Firstly, we must identify the problem about the crutch for the patient to use it. So, we must get the planning to solve that problem by making a product to make it easier for the patient. We identify what the patient wants something new to make it easier to use that crutch like a tall can be short and easy to keep the crutch if not wanted to use it.

3.2.2 ANALYSIS DATA

Combine and analyze data that we get from journals, books, newspapers, and online research to get a next progress how to get a best product like our objective.

3.2.3 DESIGN CONCEPT

We started with resolving the problem statement by designing the product by using AUTODESK INVENTOR software. And then, we think how to innovate the product to make it more light and easy to use to give the patient a more easier crutch better than the currently crutch. The main purpose of this project is to make the crutch adjustable based on the height of the patient and flip when not used to minimize the space to store that crutch. This product is more conducted at a welding workshop because it involves the process of cutting and welding the material.

Our product consists of 3 parts of crutch which are the leg, tight, and armpit. The armpit part can be adjusted based on the height of the user. For the leg part, it can flip when not used so it will help the patient to store that crutch.

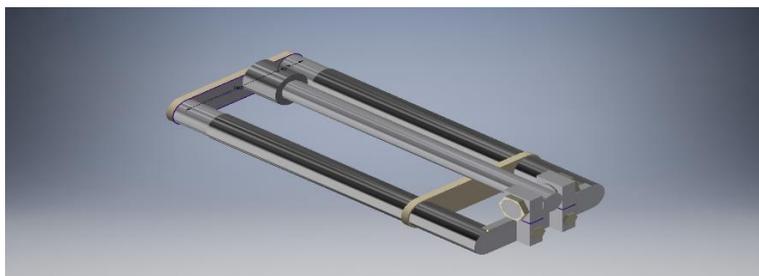


Figure 3.2.1: Crutch closed and flip

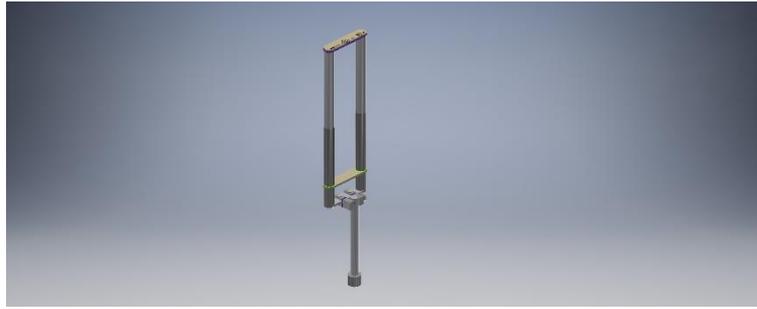


Figure 3.2.2:Crutch open

This product is made to help patients to use and store it. Then we created and innovated the usual crutch to be adjustable and minimize the space when stored while giving the patient easier ways to use the crutch.

3.2.4 IMPLEMENTATION

Implementation is the fabrication process and making about our adjustable crutch. It must be completed step by step. After the project is finished to make, this product must be tested to know the crutch can gain various weights. We also must test the adjustable part if it has any problem to change various heights. So we can identify any problem and modify the crutch to get the functional product.

3.2.5 SYSTEM

If the project system like adjustable height is functional and the crutch can open and close, this product will be used for the patient so it will help them to give more easier ways to use the crutch.

3.3 DATA COLLECTION METHOD

To implement this project, there are data collection methods that have been practiced to obtain data that are important for the analysis stage. Among the data collection methods is the questionnaire method. Data collection can be classified into two types, namely primary data and secondary data.

Primary data:

Primary data are important data in the project. Without key data, the objectives of the project will not be achieved. The data collection process is done through the distribution of questionnaires to respondents. Therefore, a total of 50 respondents were randomly selected.

Secondary data:

Secondary data consists of literature review and other sources such as theses, books related to the field of study, local newspapers, journals and other publications related to the study conducted. These materials are analyzed according to their suitability and form the basis of reference for this project.

3.4 STUDY INSTRUMENT

An instrument is a tool to collect the data required to answer a set of research questions. Thus, instrumentation is the process of providing a data collection tool. The fact that a person's true thoughts are secretive, and often hidden behind "masks", assumes that behavior is representative of thought. Sample behavior was measured through the administration of selected research tools. A research instrument also means any tool, or method or any method for obtaining and collecting study data. Research instruments are needed to deepen concepts related to attitudes, perceptions, background information and all primary or secondary resources.

In this project, the instrument used to obtain data is using questionnaires, interviews and reference methods. The selection of respondents consists of students of Sultan Azlan Shah Polytechnic. The questionnaire used consisted of a 5 scale Likert type format (1 = strongly disagree to 5 = strongly agree). The questionnaire form that provided is divided into three (3) main sections, namely:

- a) Part A: - Demographics of Respondents (Gender, Age)
- b) Part B: - General view of the study
- c) Part B: - Respondents' perspective on the Adjustable Crutch

(Based on the objectives of the study)

3.5 FABRICATION PROCESS AND MAKING



Figure 3.5.1:Project progress

1. Firstly, we made this adjustable crutch from the top which is crutch pad. in this section we use flat iron by cutting with a size of 16 cm in length into 2 parts.
2. Next, we cut 4 cm diameter iron with a height of 45 cm into 2 parts
3. After that, we joined the 4 cm diameter iron part with the flat iron earlier by using welding to make axillary support
4. Then, we drilled 3 holes on the left and right sides of the adjustable crutch to adjust the height of the crutch.



Figure 3.5.2:Project progress

5. For the bottom part of the stick, we cut a 4.3 cm diameter iron with a height of 40 cm into 2 parts.
6. And then, we cut 2 parts with a size of 16cm length.
7. After that, we joined the 4.3 cm diameter iron with a height of 40 cm and flat iron with a size 16 cm length at the bottom iron by using welding.
8. Next, we cut one more iron with a size 50 cm length with diameter 4 cm for the middle part of crutch.
9. Lastly, we put a lock system at bottom part of crutch so the middle part does not move when used.

3.7 CHAPTER SUMMARY

In the initial stage, the study design, data collection methods, research instruments, data sampling techniques and data analysis methods are made systematically in the methodological study to know the facts and information to support the research instrument and describe more clearly in this study.

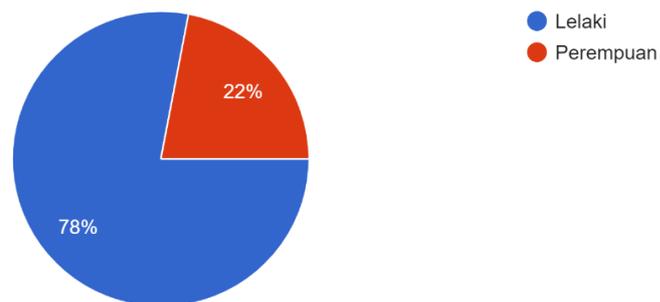
After the data analysis is done, it is important to make a conclusion or conclusion on the results and hypotheses that is whether the trap is effective or not.

FINDING & ANALYSIS

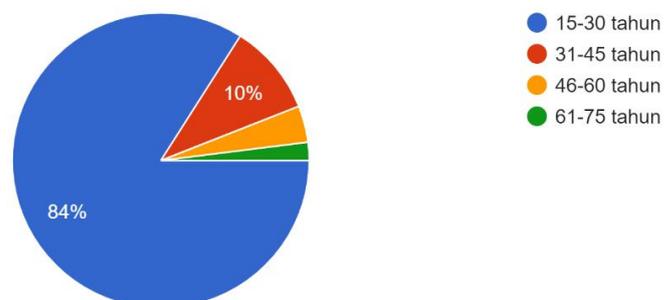
4.1 SURVEY

A survey has been done to identify the problems about the existed crutch and the things that need to be upgrade on the crutch so that it is easier for everyone to use it. From the survey, we can determine the important parts that need to be upgrade on the crutch with people demand. This can help us to produce a good product that can help others that having difficulty to walk.

Jantina
50 responses

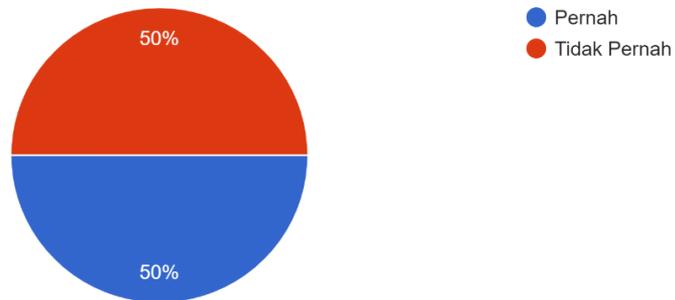


Umur
50 responses



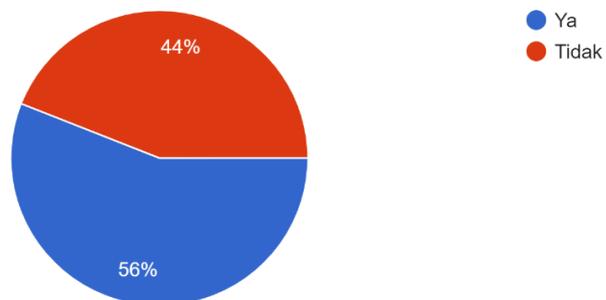
Pernakah anda mengalami kecederaan sehingga menyebabkan anda sukar untuk melakukan pergerakan?

50 responses



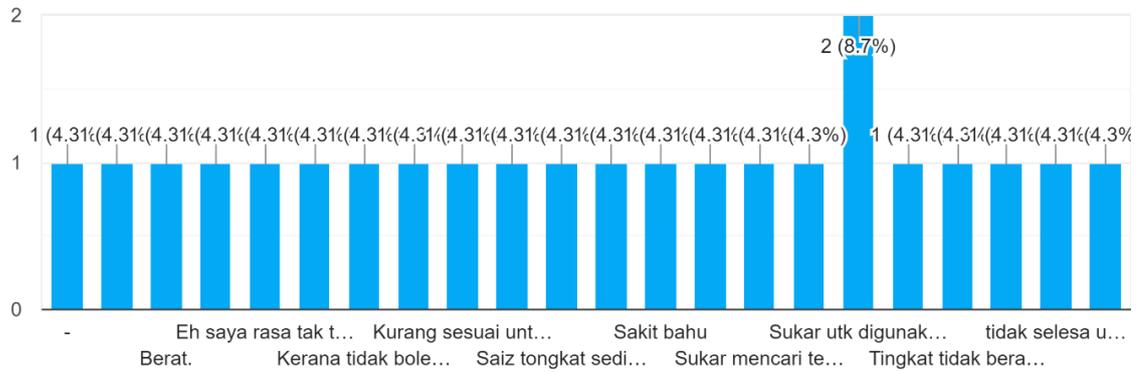
Adakah tongkat yang sedia ada dapat membantu anda bergerak dalam apa jua situasi? Cth: tempat yang sempit

50 responses



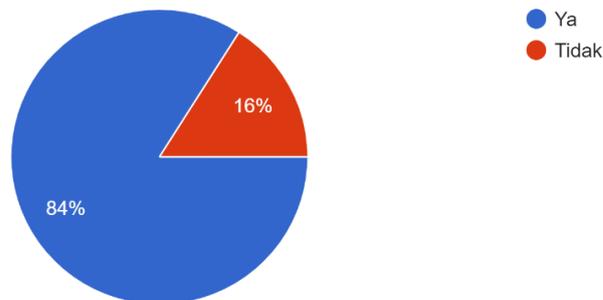
Jika tidak, apakah masalah yang menyebabkan anda sukar untuk menggunakannya dengan sebaik mungkin?

23 responses



Adakah dengan meminimakan saiz tongkat dapat memudahkan anda untuk membawa tongkat itu ke mana sahaja dengan mudah?

50 responses



Berikan cadangan anda bagi menambahbaik tongkat yang sedia ada. Cth: mengecilkan saiz tongkat, membuat pemegang tongkat yang boleh laras.

50 responses

ok la tu

Tongkat boleh lipat

Melakukan tongkat yg boleh laras..

Menambah kaki tongkat

Tukar nama jadi tongkat ali la senang

Lipat

Time guna sahaja ia dibuka . Time tidk diperlukan mahu simpan

Kecilkan saiz

Membuat pemegang tongkat yang boleh laras

Membuat tongkat yang boleh laras dah dapat dkecilkan saiznya

Meletakkan adjustable pada bahagian atas tongkat

Buat lagi tahan kuat .

tiada

Mengecilkan saiz tongkat supaya mudah digunakan dimana sahaja

My suggestion would be to remove the height adjustability function and cut it individually according to users' measurements. So, it will provide possibility to carry the crutch anywhere in a backpack.

buatkan lebih flexible

-

membuat tongkat mudah alih(bole liapt2 ke)

Boleh laras

Boleh laraskn dn mampu tahan beban yg berat badan

tongkat tu x payah manusia pegang biar tongkat tu sendiri pegang kita

membuat pemegang boleh laras

membuat tongkat lipat yang mudah dibawa ke mana sahaja

Membuat tongkat yang boleh dilaraskan bagi mengecilkan saiz tongkat

Tongkat boleh dekicilkan dan dibesarkan semula

Membuat pemegang tongkat Yang boleh laras mengikut ketinggian Dan keselesaan pengguna

Membuat tongkat yang yang lebih efficiency

menyediakan tempat duduk

Membuat tongkat boleh laras menjadi kecil dan membuat tali agar mudah untuk membawa tongkat ke mana sahaja

Menghadkan keluasan tongkat

tak tau tak leh nak fikir

Bahan yg digunakan hendaklah ringan serta kukuh

Saiz yg kecil Dan mudah dibawa ke semua tempat

Boleh lipat kan tongkat supaya lebih pendek dan senang dibawa

Pelbagaikan fungsi

Luas permukaan yg besar

Saiz tongkat yang boleh laras agar mudah dibawa ke mana sahaja

Tongkat mengikut saiz badan

Pemegang tongkat boleh di lipat

Xde idea la

kasi murah

Membuat tongkat dr benda yg ringan

Buat lah yang boleh simpan bukak tutup

4.2 MATERIAL COST

NO	MATERIAL	TOTAL	PRICE
1	Alumunium Tube	40 Ft	80
2	Hand Grip Crutch	1 Pcs	12
3	Bolt	4 Pcs	20
4	Nut	2 Pcs	10
5	Spray	2 Pcs	30
6	Sponge	1 Pcs	3
	Total		155

Table 4.2.1 Material cost

4.3 PRODUCT TESTING

During the testing phase, testing groups will employ a number of methods to ensure that the product operates as expected. Our methods for testing might vary depending on the type of product we are building but the concepts remain very similar.

We has done a weight testing on our product. We had classified the weight in three groups which is light, medium and heavy. Purpose of the test is to make sure that everybody can use the product no matter how much is their weight cause there are variety people with different weight in our country. So they can get assurance with this test and can use the product safely.

WEIGHT	CAPACITY TO ACCOMMODATE
Light (40kg to 60kg)	/
Medium (61kg to 80kg)	/
Heavy (81kg to 100kg)	/

Table 4.3.1:Weight test

Besides, height testing also has been done. We had classified the height in three groups which is short, average and tall. The focus of the test is to make sure that all of the groups of height can use the product without any problem. This test can guarantee the user that they can use it no matter how short or tall they are.

HEIGHT	CAPACITY TO ACCOMMODATE
Short (150cm to 165cm)	/
Average (166cm to 180cm)	/
Tall (181cm to 195cm)	/

Table 4.3.2:Heigh test

DISCUSSION AND CONCLUSION

5.1 DISCUSSION

For this adjustable crutch, stability and durability tests were conducted throughout in this process. The test for this adjustable crutch has been done according to different human height and weight, for the maximum height is 181 cm to 195 cm and the maximum weight is from 81 kg to 100 kg. This product has been tested by the general public and PSA students. Furthermore, the result of this study is the adjustable crutch stable and strong when it can be used in making daily activities. In addition, the level of effectiveness of this adjustable crutch can be evaluated when it is easy to fold and does not use much space to store. In addition, this adjustable crutch is light and easy to carry anywhere.

5.2 SUGGESTION OF IMPROVEMENT

Adjustable crutch is a tool to help patients to walk in daily activities. It is also one of the methods in helping to restore the patient's legs. Here are some things that are suggested to further enhance the study that will be done on adjustable crutch to know the level of effectiveness:

1. Propose to expand the base of the stick to make it more stable.
2. Suggest to place a sponge on the side of the stick so that it does not hurt when exposed to the iron.

CONCLUSION

As a conclusion Adjustable crutch has a lot of advantages. the methods implemented in this project are very crucial and important to complete the project. This crutch can be adjusted suitable with personal preference yet quite affordable. Plus, this project is very convenient and helpful for the patient that having difficulty to walk and the crutch is easy to bring anywhere without any problems especially tight places.

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