

**DEVELOPMENT OF HAND GRIPPER
FOR REHABILITATION PROCESS**

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**This Report Is Submitted In Partial Fulfillment Of The
Requirements For Bachelor Of Electronic Engineering Technology
(Medical Electronics) With Honours**

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JUN 2016

ENDORSEMENT

"I hereby acknowledge that I have read this report and I find that its contents meet the requirements in term of scope and quality for the award of the Degree in Technology Engineering Electronic (Medical) with honours"

Signature

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Name of Supervisor

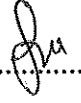
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DECLARATION

"I hereby declare that the work in this report is my own except for quotation and summaries which have been duly acknowledged"

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DEDICATION

TO MY HUSBAND:

MR. MOHD SYAMIL BIN SAHAK

For Patience and Affection

TO MY PARENT:

EN. JASNI BIN ARIFIN

PN. ZAITON BINTI HUSIN

For Support And Love

SUPERVISOR

MADAM WEE SOO LEE

For Guidance And Idea

LOVELY FRIENDS:

For Their Help And Moral Support

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BISMILLAH HIRRAHMAN NIRRAHIM

Gratitude to Allah for His permission, I could prepare a final report as qualify for the award Polytechnic Requirements For Bachelor of Electronic Engineering Technology (Medical Electronics) With Honours.

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ABSTRACT

The development of technology is very rapid at present , especially in the field of medical engineering. This paper focuses on the development of the measurement hand gripper to help disable patients due to accident or decease. The system of artificial hand gripper requires sensor to measure smooth and accurate movement. Basically , in rehabilitation process there are a few stage that starting from the light exercise to heavy exercise orderly. When the patient need to perform exercise , they must wait until they managed to get an appointment with a doctor. This delay will slow down the healing process of patients. Therefore ,the objective of this research is to determine the stage and need of patient needed for rehabilitation. Since this product can be used without help, patient can do rehabilitation activities at home without the need to see the doctor so often.

Keyword : artificial hand gripper , measurement , rehabilitation , flex sensor

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Chapter 1

Introduction

1.1 Introduction

Hand has a very fragile and complex structure. This allows muscles and joints in the hand a great range of mobility and precision. The different forces are also distributed in the hand in the best possible way. But the hand is also quite susceptible like tendons, nerve fibers, blood vessels and very thin bones, they are all positioned right under the skin and are only protected by a thin layer of muscle and fat. Only the palm is insulated by a strong pad of tendons for a powerful grip. Our hands are put through quite a lot day in and day out, and are often within range of dangerous tools. This makes hand problems and injuries due to wear and tear very common. In science, the definition of "gripper" is subsystems of handling mechanisms which provide temporary contact with the object to be grasped.[1] They ensure the spot and orientation when conveying and linking the object to the handling equipment. The

term "gripper" is also used in cases where no actual grasping, but rather holding the object as in vacuum suction where the retention force can act on a point, line or surface. [2]The opposite hemisphere of the brain is controlled by each right and left hand. Usually one hand is preferred for fine and complex motion, leading us to know of someone as being either right- or left-handed. Hand grips are compact and portable lever-type devices that you squeeze in order to build up arm strength and muscle. Athletes mainly use them to increase their ability to excel at their chosen sport. Most sports involve the concept of moving weights or transferring the power of your body through the hands. Hand grips allow you to build up your lower arms, and this works to make you a better athlete, whether your sport is football, martial arts, weightlifting, baseball or even golf. Many of these sports depend on high lower arm strength, and working out with hand grips helps you develop this strength. Grip strength is the force caused by the hand to pull on or hang from objects and is a specific part of hand strength. Optimum-sized objects permit the hand to wrap around a cylindrical shape with a diameter from one to three inches. Stair rails are an example of where shape and diameter are critical for proper grip in case of a fall. Other grip strengths that have been studied are the screwdriver and other hand tools. In implementation of grip strength, the wrist must be in a neutral position to avoid developing cumulative trauma disorders.

1.2 Problem Statement

To begin the solution to a design problem with a clear, unambiguous definition of the problem. Unlike an analysis problem, a design problem often begins as a vague, abstract idea in the mind of the designer. Creating a clear definition of a design problem is more difficult than, defining an analysis problem. The definition of a design problem may evolve through a series of steps or processes as you develop a more complete understanding of the problem.

In this project the problem that required is a :

- I. Patient always tired during therapy session.
- II. Lack of measurement indicator for testing the finger muscle strength of the patient.
- III. Delay of rehab process due to inadequate number of available therapists.

1.3 Objective

1. To create a rehabilitation device where the patient can have rehabilitation exercise unaided.
2. To fabricate user friendly and low cost device that can help to measure.
3. To facilitate the patient to measure their finger muscle strengthen level in infirmaries at home.

1.4 Scope of project

⊙ For adult and children

⚡ TRAUMATIC CONDITIONS

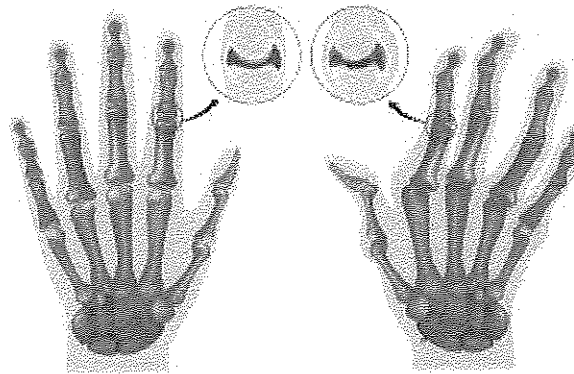


Figure 1.1 : Fractures Injuries to bone

Good condition

Bad condition

These include cracks, chips and complete breaks. Treatment includes splinting, mobilizing and strengthening

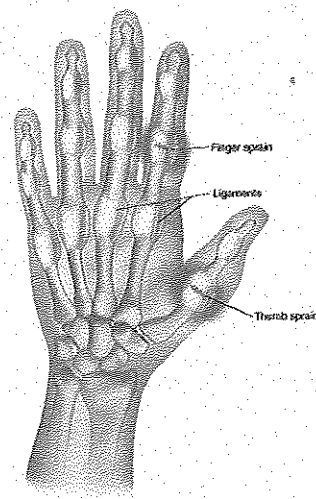


Figure 1.2 : Sprains and Strain

Injuries to ligaments and muscles/tendons can be a result of a fall, twist, pull, etc. Treatment may include rest to allow for healing, then reactivation through exercises, ultrasound, massage, etc.

POST SURGICAL CONDITIONS

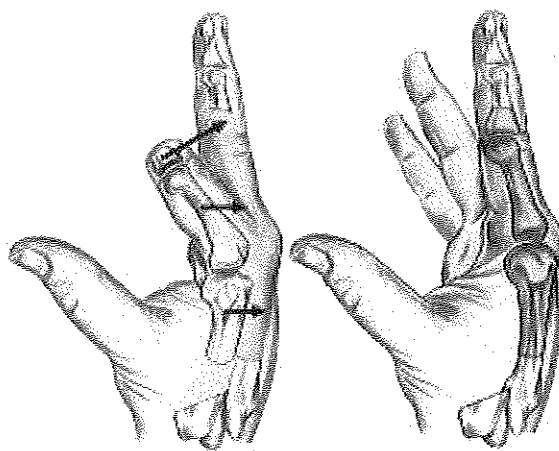


Figure 1.3: Amputations

Amputations are usually a result of a laceration, crush injury, or disease. Treatment will focus on reshaping the tip of the finger, restoring function and desensitization.

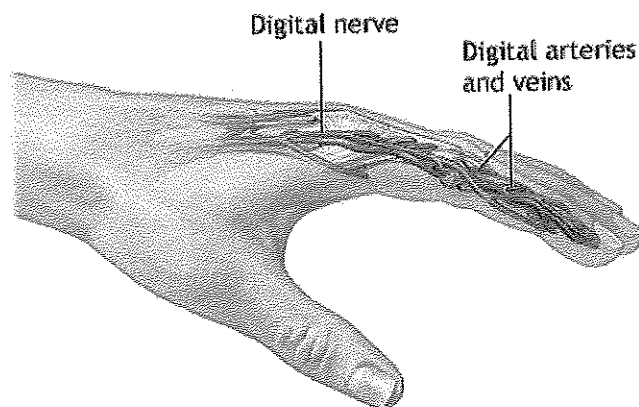


Figure 1.4: Nerve Repairs

If a laceration has damaged a nerve, the surgeon may repair it by reconnecting the severed ends. Hand therapy may include splinting for protection while the nerve is healing, restoration of function, and activities to help normalize the sensation and restore strength once the nerve has regrown.

REPETITIVE STRAIN INJURIES

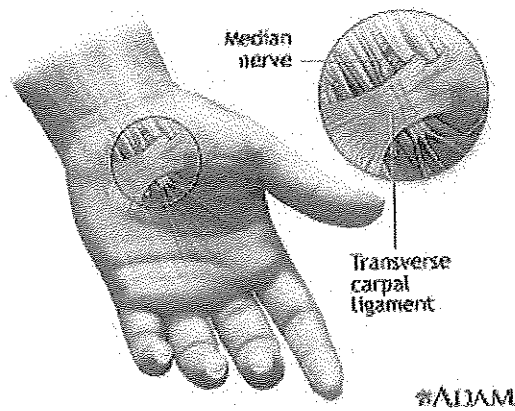


Figure 1.5: Carpal Tunnel Syndrome

Compression of the median nerve through the carpal tunnel, at the base of the hand, causes numbness and tingling of the fingers, weakness, and in some cases, pain. Night splinting and hand therapy can be effective in reducing symptoms and increasing function.

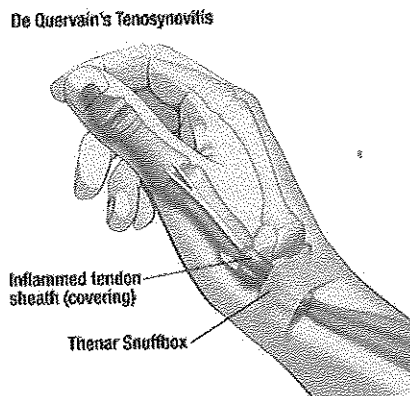


Figure 1.6 :DeQuervain's Tenosynovitis

This is a form of repetitive strain injury that is localized to the tendons of the thumb at the level of the wrist. The most common cause is sideways movement of the wrist with the thumb stabilized in a gripping position. Changing the causative activities combined with hand therapy are key to resolution.

4 OTHER UPPER EXTREMITY CONDITIONS

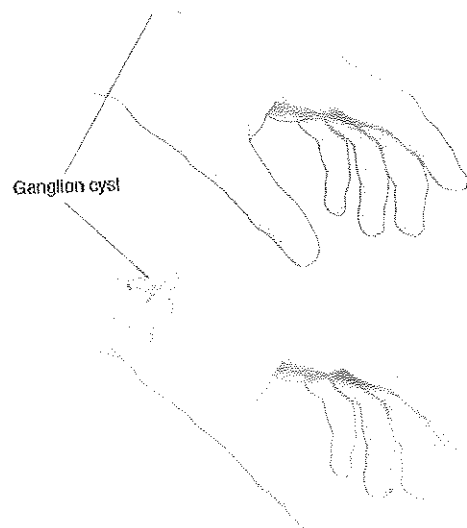


Figure 1.7 : Ganglion

A benign cyst that forms on the back or front of the wrist or on the insides of the fingers. Conservative treatment is aimed to decrease discomfort.

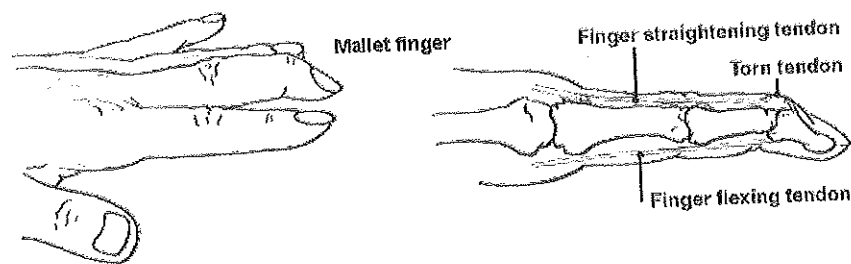


Figure 1.8 : Sports Injuries

This covers a wide range of injuries associated with sports activities, including fractures, dislocations, sprains, and strains. Therapy helps to return the client to regular activities as quickly as possible in a safe fashion.

1.5 Importance of Research

Engineering design activity always occurs in response to a human need. Before you can develop a problem definition statement for a design problem, you need to recognize the need for a new product, system, or machine. Thomas Newcomen saw the need for a machine to pump the water from the bottom of coal mines in England. Recognizing this human need provided him the stimulus for designing the first steam engine in 1712. Before engineers can clearly define a design problem, they must see and understand this need.

Although engineers are generally involved in defining the problem, they may not be the ones who initially recognize the need. In private industry, market forces generally establish the need for a new design. A company's survival depends on producing a product that people will buy and can be manufactured and sold at a profit. Ultimately, consumers establish a need, because they will purchase and use a product that they perceive as meeting a need for comfort, health, recreation, transportation, shelter, and so on. Likewise, the citizens of a government decide whether they need safe drinking water, roads and highways, libraries, schools, fire protection, and so on.

The perceived need, however, may not be the real need. Before you delve into the details of producing a solution, you need to make sure you have enough information to generate a clear, unambiguous problem definition that addresses the real need. The following example illustrates the importance of understanding the need before attempting a solution.

In this research , we focus on how to measure the gripping strengtness of a patient. The reaction from the joint make a finger move and from the sensor that attach on the finger (inside the glove) , it will give a resistor reading that out by led meter.

This research is use for a patient that have a finger gripping problem. Other from accident or illness.

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