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**PORTABLE INFRARED KNEE BRACE THERAPY
DEVICE**

MOHAMMAD SHAFIQ BIN ZAIDON

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With Honours

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ENDORSEMENT

“I hereby acknowledge that I have read this report and I find that its contents meet the requirements in terms of scope and quality for the award of the degree of Bachelor of Electronic Engineering Technology (Medical Electronics) With Honours”

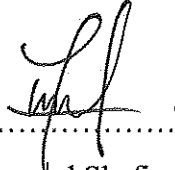
Signature :

Name of Supervisor : Pushpa A/P Jegannathan

Date : JUNE 2016

DECLARATION

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

Signature : 

Name : Mohammad Shafiq Bin Zaidon

Registration No. : 08UEU14F3007

Date : JUNE 2016

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ABSTRACT

Knee braces are used to support knee injuries and during knee rehabilitation. It can help to provide stability and support following knee injuries such as anterior crucial ligament (ACL) rupture, torn knee cartilage, sprained medial knee ligament, posterior crucial ligament (PCL) rupture, patella tendonitis, knee arthritis and runner knee. The existing knee brace is not portable as it needs a power source to operate and there is no self timer function. Sometimes patients forgot to turn off the device while doing the therapy as the heat therapy should be done only for about 15-20 minutes per session. Furthermore, many people are not aware that this therapy method can be used as a rehabilitation process. The portable infrared knee brace therapy device was designed to provide heat therapy thus improves the healing or recovering process. The purpose of this study is to develop a portable knee brace, analyse the device and do validate the efficiency. This study only focuses on knee of elder people and sport athlete. The reliability of the device was tested on 5 subjects who are elderly person and sport athlete. As a result, it shows that this device help most subjects with knee ligament injuries feel better and can even improve athletic performance in those with torn knee ligaments.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Knee injuries continue to plague the athletic population especially in the sport of football. Advances in the treatment and rehabilitation of sport-related knee injuries have hastened recovery time and subsequent return to sport. However, prevention of knee injuries remains elusive despite attempts to limit the frequency of these disabling conditions. Prophylactic knee braces are designed to prevent and help reduce the frequency and severity of knee injuries and are used primarily in football. Despite the inconsistencies regarding their purported effectiveness, many clinicians still advocate their use. Researchers have conducted several epidemiology studies to determine the effectiveness of prophylactic knee bracing on knee injury prevention.

Formerly, ACL injuries occurred most often in a sports contact injury, when other structures were frequently involved. A particularly severe form of the contact injury is called the "unhappy triad" or "O'Donoghue's triad", and involves the anterior cruciate ligament, the medial collateral ligament, and the medial meniscus.

Presently, ACL injury is more commonly a non-contact injury, such as a dismount from a layup in basketball. Both forms occur more frequently in athletes than in the general population and are prevalent in alpine skiing, association football, American football, Australian rules football, basketball, rugby, professional wrestling, martial arts, and artistic gymnastics[1]. It is also known to be about three times more common in women than men[2].

The consequences of the injury depend on how much the stability of the knee is affected, and the extent to which other structures have been involved, and this can vary on a case-by-case basis. If instability is evident, particularly rotatory instability, then the menisci will get injured, sooner or later, setting the scene for progressive, degenerative, arthritis of the knee. Knee braces have been used by the sports medicine community to treat instability of the knee due to an ACL disruption, to protect an ACL graft, and to prevent knee ligament injuries during sport. Both functional and prophylactic braces are designed with the objective of allowing normal joint kinematics while limiting unwanted displacements and rotations between the tibia and femur that might detrimentally strain a healing ligament or graft or produce intra-articular injury.

Studies have shown that braces help most subjects with knee ligament injuries feel better and can even improve athletic performance in those with torn knee ligaments; however, many athletes report that knee bracing hinders their performance and that braces migrate and slide out of position on the leg during activity. Hot pack with a transcutaneous electrical nerve stimulator or short-wave diathermy has the best outcome to help to treat knee injury[3]. Therapeutic heat can increase circulation, accelerate healing, control pain, and increase soft tissue extensibility. Therapeutic heat benefits patients with healing tissues, pain, and those with restrictions in joint or soft tissue mobility[4].

The problem of existing device is, the device is not portable as it needs power source to operate. Furthermore, not many people aware that this therapy method can be used as a rehabilitation process. The existing device do not have a self timer function as patient sometimes forgot to turn off the device while doing the therapy as the heat therapy should be done for about 15-20 minutes per session.

1.2 Problem Statement

The existing device is not portable as it needs power source to operate. Also, it do not have a self-timer function and patient sometimes forgot to turn off the device while doing the therapy as the heat therapy should be done for about 15-20 minutes per session. It will harm the patient's skin. Furthermore many people are not aware that this therapy method can be used as a rehabilitation process. The infrared knee brace therapy device that have been develop is portable and have a self-timer function which can address the existing problems with the current device.

1.3 Objective Of Project

The main objectives of this study are:-

1. To develop the knee brace with self timer and portable function
2. To analyse the functionality of the device
3. To validate the reliability of the device

1.4 Scope Of Project

This study is to develop the knee bracing device for the patients who have knee injury. This device provide the heat therapy which help patient provide stability and support following knee injuries such as anterior cruciate ligament (ACL) rupture, torn knee cartilage, sprained medial knee ligament, posterior cruciate ligament (PCL) rupture, patella tendonitis, knee arthritis and runners knee.

The knee brace of rehabilitation encompasses some scope as follows:

- i. This project only focuses on knee of elder people and sport athlete who suffer knee injury problem.
- ii. This project focus on rehabilitation process phases for knee injuries, which are ACL tear.
- iii. This project focus on the reliability and usability of this device on subject's knee.

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