

**HOME BASE MONITORING AND ASSESING FINGER
MOVEMENT FOR STROKE FINGER THERAPY USING
THERAPY GLOVE**

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Bachelor In Electronics Engineering (Medical)**

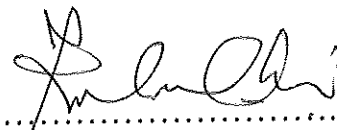
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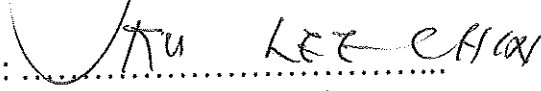
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ABSTRACT

Physiotherapy is a Rehabilitation profession that remediates impairments and promotes function, mobility, and quality of life through examination, diagnosis, physical intervention, and prognosis. Physiotherapists help people affected by physical injury, disability or illness through movement and exercise, manual therapy, education and advice. However, it is such a burden to the patient and the physiotherapists to meet with each other and run the physiotherapy session. A lot of time is wasted by both individual just to attend the therapy session. Furthermore, patients must also come to the hospital to deliver a medical health check such as blood pressure, temperature, pulse rate and oxygen level in blood before the physiotherapy treatment can take place. This project is focus on the physiotherapy treatment for patient by using fingers and thumbs. The objective of this project is to develop hardware glove as game controller call "Therapy Glove" and software Game Maker create a rhythm video game call "Finger Therapy Game". The Therapy Glove was developed by modify the keyboard to be a glove controller. The Finger Therapy Game was developed to monitor the patient stroke level by using game maker. Finally, the physician and physiotherapists can easily supervise the patient's stroke level in the real time by checking the email send by the patient.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Stroke is turning into a major public health problem in developing countries, particularly in the Asian region. This is attributed to urbanization, increase in life style diseases, adoption of modern life style and increasing life expectancy. Stroke is the third largest cause of mortality globally and the 4th in Malaysia. [3] Though the overall incidence and prevalence of stroke is not much different in the Asian region, differences in the clinical pattern and patho-physiological subtypes have been described (more strokes in the younger age group, stroke related to infection and greater number of lacunar strokes compared to large vessel disease). Major advances have taken place in the field of stroke management in the past decade, such as newer anti-platelet and antithrombotic agents, thrombolytic therapy, stroke units and improved interventional therapies. Based on this new evidence, updated Clinical Practice Guidelines have been published by various professional societies. The latest Malaysian Clinical Practice Guidelines for Stroke was released in 2011. [3]

Most stroke patients who have lost the ability to use their fingers do not recover the functions of the fingers in their activity of daily living (ADL). [2] The existing of a functional hand in one's body is very essential because humans use their legs to get closer to a place or a thing while the hand is used to take the things closer to them. There are a lot of diseases and incidents that can cause disabilities to a hand. Among them are Rheumatoid Arthritis (RA), Stroke, and accidents. Stroke is an event which can cause death to the victim or for most survivors; one side of the body gets paralysed.

A lot of work and energy have been put into the effort in helping paralysed patients in terms of rehabilitation and support devices. [2] However, based on the literature reviews carried out on current hand rehabilitation devices, there are no reported studies that solely focuses on acute paralysed fingers of a stroke victim. This project falls into the category of developing a rehabilitation device that mainly focuses on helping patients to perform passive range of motion to prevent muscle contractures.

Many daily living tasks are performed with the upper limbs. Upper limb motor deficit is one of the main symptoms of stroke patients, and up to 85% of stroke patients experience hemiparesis immediately after stroke. [4] Therefore, rehabilitation treatment of the upper limbs is very important for stroke patients. Upper extremity rehabilitation equipment (UERE) is usually used for training the proximal upper extremity movement functions. They are essential tools in the occupational therapy (OT) practice. Most existing clinical UERP provides no feedback to the patients in Taiwan. Patients may find that repeating the same activity can be boring and monotonous and thus develop a negative attitude toward the therapy process. In order to increase the mental satisfaction and physical vitality of rehabilitation therapy, some therapists have using off-the-shelf video game systems in rehabilitation. Digital games have been proven effective in upper extremity rehabilitation for stroke patients in addition to arousing higher motivation and feelings of pleasure. However, only a few OT departments in Taiwan's hospitals have tried to adopt digital games in their OT programs. The main reasons may be summarized as following: a) the devices are expensive; b) the gaming interfaces are not in simple language, hence easily causing operation errors and inconveniences; c) the gaming

interfaces are complicated for patients to independently operate the games without help from the therapists; d) the games contents are design for normal person to leisure, not for Stroke patient. [4] Their individual strengths and weaknesses may affect treatment effectiveness and safety for the patient. Therefore, digital games for stroke patient must be designed with users in mind. Such products that truly fit the users can increase user acceptance. It is desirable to domestically develop digital upper extremity rehabilitation games for the local hospitals as well as individual users. The purpose of this study was to develop a digital game system for rehabilitation and to assess their feasibility, usability and effectiveness. It is hoped that the results of this study could be used to improve existing UERE to meet the practical needs of practitioners providing treatment and quality care.

Therapy Glove is an innovative new finger rehabilitation device that to improve functional outcomes and patient satisfaction for finger therapy after stroke/cerebrovascular accident (CVA). It is a sensorized glove that promotes a high number of repetitions of functionally meaningful finger and thumb exercises through a rhythm game. The physician and physiotherapists can easily supervise the patient condition in the real time by logging into the database in their agency or through web cam. Based on the collected data, doctors can decide on the suitable medicine to be taken by the patient by notifying the patient through message. While, the physiotherapists can suggest a new task can be done by the patient from their previous improvement. In addition, if something happens to the patient, such as the temperature and BP of the patient rising extremely, the physician can take an action by sending an ambulance to the patient location or inform their guardian immediately.

1.2 Problem Statement

Physiotherapy is a Rehabilitation profession that remediates impairments and promotes mobility, function, and quality of life through examination, diagnosis, prognosis, and physical intervention. Physiotherapists help people affected by physical injury, illness or disability through movement and exercise, manual therapy, education and advice.

However, it is such a burden to the patient and the physiotherapists to meet with each other and run the physiotherapy session. A lot of time is wasted by both individual just to attend the therapy session. Furthermore, patients must also come to the hospital to deliver a medical health check such as blood pressure, pulse rate, temperature and oxygen level in blood before the physiotherapy treatment can take place.

Currently there are only few technological tools that can promote tele-treatment between the doctor and the patients, but in my opinion, these technologies still lack and have disadvantages in term of usability and portability.

In this project I would focus the physiotherapy treatment on patient with arm and hand stroke problem. In common practice, stroke patient rehabilitation starts from the constant training of hand exercise. Thus, I believe this area would probably be the best part to focus with.

1.3 Objective

The objective of this project is to develop hardware glove as game controller call "Therapy Glove" and software Game Maker create a rhythm video game call "Finger Therapy Game". The device will help them to easy doing the rehabilitation treatment and recovery from stroke. Apart from develop "Therapy Glove" and "Finger Therapy Game", it also help to reduce the time process for both patients and physiotherapist. Stroke patient to carry out their rehabilitation treatment at anytime and anywhere they want. Lastly, physiotherapists can monitor the patient's stroke level and the improvement of the finger movement from time to time according the result send by the stroke patient.

1.4 Scope of project

This project is focus on the stroke patient that facing finger disability in class I and II. There is already therapy game exist in market, but no one specifically made for

telemedicine like stroke patient to send the result to physician and physiotherapists. Stroke patient and physiotherapists are having same needs. So by developing a "Therapy Glove" and "Finger Therapy Game" which can solve both their difficulties together the market value can be expended. Thus it can decrease the price by increase the number of customers. The focus given specifically to the important problem face by them and a solution given with telemedicine.

1.5 Importance of Research

The project is mainly to help stroke patient and physiotherapists to carry out the rehabilitation treatment. By doing this stroke patient easier to recovery from stroke. The research also help to the patient's stroke level in the real time by checking the email send by the patient and developed the telemedicine technology to help them. Gaming in rehabilitation has gained a large amount of support for its differences in comparison to regular therapeutic methods. The biggest of these differences is the user engagement and enjoyment. It has been extensively shown that people feel more engaged in a gaming environment and less contained in a doctor office when interacting in a virtual reality, gaming environment. Therefore, in the future rehabilitation treatment will develop to video game. Wii, Microsoft and Sony now are starting to develop the video therapy game for the patient to do their rehabilitation.

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