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**PROPOSAL ON PORTABLE LUMBAR SUPPORTER WITH ELECTRONIC MOTOR MASSAGER
FOR LOW-BACK PAIN (LBP) RELIEVER (PROPOSAL REVIEW)**

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ABSTRACT

The lumbar region of the spine is situated between the thoracic (chest) and sacral regions. Large muscles in the lower back region support the back and allow for trunk motion. Since covid-19 strikes Malaysia, workers and students are forced to work and study via online platform at home as new norm of life. However, limited movement and prolonged hours of sitting in a non-ergonomic space from doing work and studying triggered pain on the lumbar muscle. These muscles can spasm or get strained, causing lower back pain (LBP), which is a serious issue for most individuals. A recent study has proven that using a lumbar supporter, for example lumbar belt, does help in supporting the lumbar spine and increase the time-span of experienced discomfort in the lumbar area. Then, massaging the afflicted region can help to alleviate the discomfort. Therefore, this project aims to develop a product, a hybrid portable lumbar supporter with electronic motor that helps in massaging the affected area. The product is developed by integrating two gadgets into one machine, since it would support and massage users at the simultaneously depending on the user's desire by controlling the massaging device from user's smartphone. Hence, this paper serves to propose the idea of this product including basic electronic components that are used in developing this project, illustrated by using block diagram and circuit diagram. Then, the overview design of this product is shown as expected result. The desired goal of this project is that the device will treat LBP by correcting user postures and supporting the lumbar area when sitting in a nonergonomic position.

Keywords: - Low-Back Pain (LBP), non-ergonomic space, lumbar supporter, lumbar massager

INTRODUCTION

Lumbar discomfort, often known as low back pain, is a significant and persistent health concern in modern culture, especially for persons who work in situations with restricted physical flexibility. The condition is classed as an epidemic since it has a high prevalence and spreads swiftly over the world (Rilski & Рилски, n.d.). This happens when a person's lumbar spine is under a lot of strain when sitting. The prevalence of lumbar pain among employees who spend the most of their workday sitting is greater than in the general population. The most common causes of lumbar discomfort in the workplace include long-term computer usage, limited mobility, and non-ergonomic working circumstances (Keskin, 2019).

As a contrary, the goal of this study is to create and test the effectiveness of a revolutionary hybrid portable lumbar integrated electronic motor massager device in treating LBP. In the future, the device's efficiency will be assessed by data analysis.

A lumbar supporter or lumbar orthoses is a device that doctors (according to their recommendations) propose to decrease pressure on the spinal structures by unloading part of the weight ordinarily placed on the lower back. This gadget also aids in keeping the lower back in the optimum possible posture, minimizing strain when working in a sitting position, primarily at a non-ergonomic workplace (Sekiguchi & Medicine, n.d.) (Schott et al., 2018).

A non-invasive electronic back massager may do wonders for a hurting back. The most relief will be provided by a massager that matches the user's lifestyle and contains motions that target the pain locations. The gadget works by boosting blood flow to the skin and muscles with a massage action, produce by motor that is attached to massaging device (for example roller), which helps to relieve pain and stiffness in the low back region (Harorani et al., 2021) (Zheng et al., 2012)

METHODOLOGY

This chapter explained the overview idea in developing the product. Figure (3) depicts an overview design of a Lumbar Supporter with a built-in electronic motor massager that concentrates on the pain region to assist persons who suffer from LBP as a result of poor posture and extended sitting in a non-ergonomic setting. When used with the blynk app (to control speed and time usage of the massager), the gadget may serve two functions. The first is to act as a Lumbar Supporter by maintaining the spine straight to improve body posture and alleviate pressure on the lumbar, which causes lumbar discomfort. Simultaneously, it is utilized to massage the Lumbar Region in order to treat LBP via shiatsu motion from the attached roller on the massager.

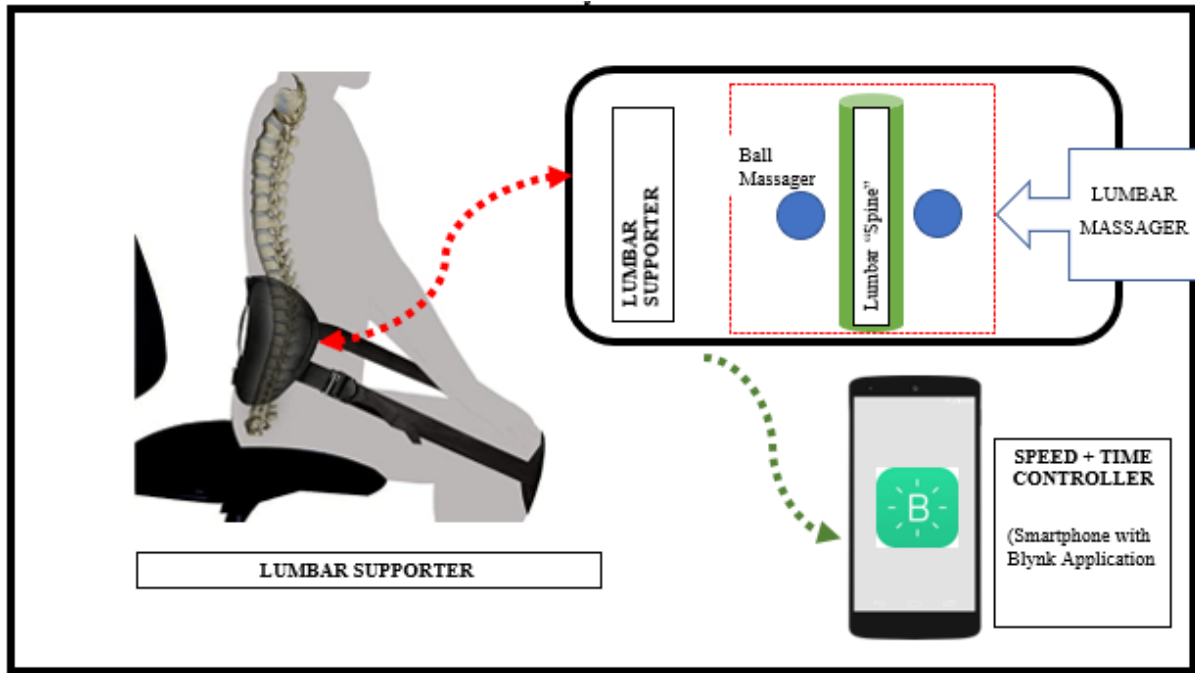


Figure 1 Overview design of portable lumbar supporter with built-in electronic massager

Block diagram (figure 6) shows the basic process of electronic components in developing Lumbar Massager. The components of the device are divided into three section, input, process and output. Starting from the input phase, power supply is the main power source of the device. ESP8266 is used to synchronous the device to blynk application that is installed in user's smartphone. As for the processing phase, Arduino Uno R3 is used as processing unit of the input, process the electrical signal as to control 'ON' and 'OFF' device based on the time intervals set on the device. Motor Driver L298N is used to control the speed of the motor by transforming a low-current control input into a higher-current signal capable of driving a motor and time control. The output phase, where DC motor electric operates based on the current that has been set on the motor driver and moves the roller to resemble the shiatsu motion.

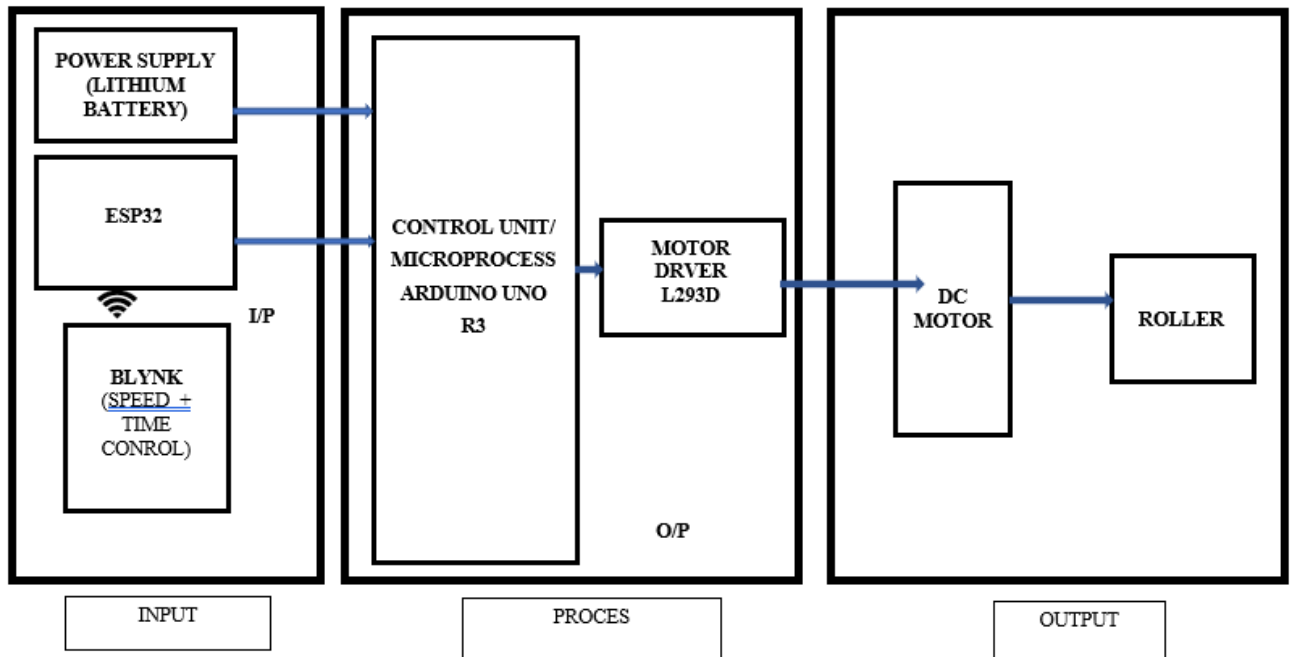


Figure 2 Block diagram of electronic components operation for lumbar massager

Circuit diagram shown in figure below (figure 3) is for the purpose of simulation to test the speed of DC motor by using proteus software. Pulse width modulation (PWM) program is used in determining the speed level of the motor. Future result of the simulation will be tabulated and analyzed in data analysis chapter.

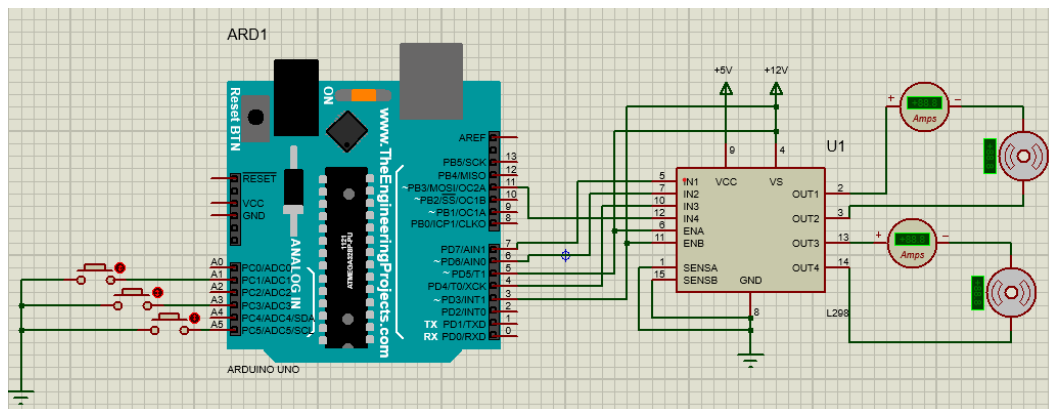


Figure 3 Circuit Diagram for simulation

EXPECTED RESULT

After confirming the idea and determining the electronic components that will be utilized in constructing the product, the following step would be to design the device using design software and identify the device's usage flow.