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Development of a Vibration Based-Heating Neckband for Cervical Spondylosis

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ABSTRACT

The post-pandemic working pattern has changed a lot due to the change in the mode of working and ease of flexibility as almost all the works are done online. This is affecting the lifestyle of the human due to continuing online working and due to this many health issues are being recorded. The main problem seen is in the postural change of the neck which results in minor or major neck pain problems. According to a study currently, the rate of neck pain is around 30% in adults, around 50% of individuals are facing a minor neck problem to some extent and 20% of humans experienced this neck pain in their daily activities.
Different types of neck diseases can be occurred due to this such as osteoarthritis, pinched nerves, postural pain, and also some problems related to cervical vertebrae, for the same the existing collar belt is modified and tried to make an affordable massager belt to have relief during this pain which helps the blood flow to maintain and can stimulate nerves.
Advanced treatment is embedded in this collar which has vibration motions and a heating pad that helps for the neck. According to their requirement, we can adjust the intensity of the motion. And also, this helps the improvement in the neck posture.

Keywords: [Cervical Spondylosis, Neck pain, Physiotherapy, Healthcare, Ultrasonic Heating Pad, Vibration effect]

INTRODUCTION

Due to increases in workload and more use of computers and other gadgets most user has to see through a screen which will bend their neck posture during working hours, also to manage their daily activities one has to complete their daily tasks in their required time. The neck pain caused due to this can remain either for days or months depending upon the tasks.

Neck pain can have causes that aren't due to underlying disease. Examples include long-term straining, sleeping in an uncomfortable position, stress, or wearing heavy necklaces. Our neck has a tough job. It holds up the same weight equal to a bowling ball all day long. The bones at the top of our spine, along with our muscles and ligaments, support our head, which weighs approximately 11 pounds. The most common cause of neck pain is muscle strain, in which a muscle is stretched too far and tears. Neck muscle strain is typically caused by poor posture or unbalanced support, such as sleeping with the neck in awkward positions. Most neck muscle injuries will feel better within a few days or weeks. Treatments could include medications called muscle relaxants, physical therapy, a padded neck collar, or traction.

LITERATURE REVIEW

Cervical spondylosis" is a situation that arises in most neck pain cases when a

person's neck bones are under continuous cyclic load. an acute neck pain resolves in a very small duration. There are many small duration exercises referred for acute pain but these may be repetitive and can become chronic throughout the year.

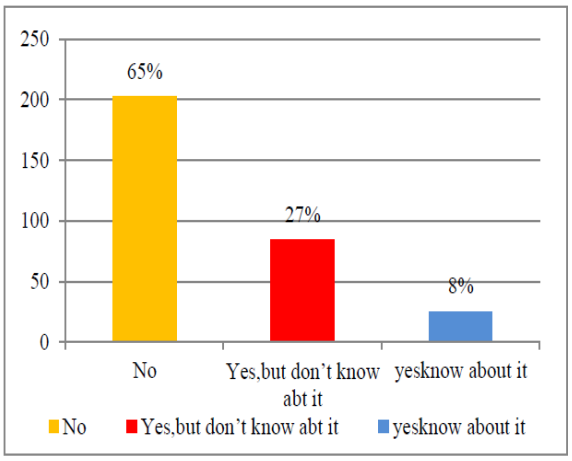

Figure 1: Showing the results for question, have you heard about text neck syndrome?

Figure 1 shows one of the studies shows how people are not aware of neck syndrome and consider this issue as a part of their daily lifestyle1. They were also not aware of the severity of this issue.

Cervical spondylosis can be complicated by myelopathy or radiculopathy, although cervical disc prolapses, plexopathy, motor neuron disease, or other diseases can cause similar symptoms; magnetic resonance imaging, electrodiagnostic tests, and other investigations may be needed to exclude other diagnoses. Neurological complications can occur in established cervical spondylosis or can be the presenting feature of the disease.

Recent studies regarding the effect of vibration on the body for medical treatment have been studied. With variations in input frequencies relaxation in patients has been observed but long-term exposure to these vibrations can lead to harmful effects

A neck collar, also known as a neck brace or cervical collar, is an instrument used to support the neck and spine and limit head movement after an injury. Its purpose is to prevent us from moving your head and neck until the injury is healed. Recently, better quality randomized controlled trials have suggested that exercise, mobilization physiotherapy, and manipulation are more effective than less active treatments, although their relative cost-effectiveness has not been studied.

Out of all 291 conditions studied in the Global Burden of Disease 2010 Study, neck pain ranked 4th highest in terms of disability as measured by YLDs, and 21st in terms of the overall burden. From 1990-to 2010 Disability-Adjusted Life Years (DALYs) as a result of neck pain increased from 23.9 million in 1990 to 33.6 million (47%). This has been attributed to population growth (30%) and population aging (17%). 3 improved child survival and aging populations throughout the world, especially in low-income and middle-income countries, the number of people experiencing neck pain is likely to increase substantially over the coming decades. Approximately half of all individuals will experience a clinically important neck pain episode throughout their lifetime. The most common types of mild to moderate neck pain usually respond well to self-care within two or three weeks. If neck pain persists, your doctor might recommend other treatments. Physical therapy, Transcutaneous electrical nerve stimulation (TENS), Traction, and Short-term immobilization are solutions followed for severe neck pain. This study aims to design a product that helps in reducing neck pain through vibrations.

3D CAD MODEL

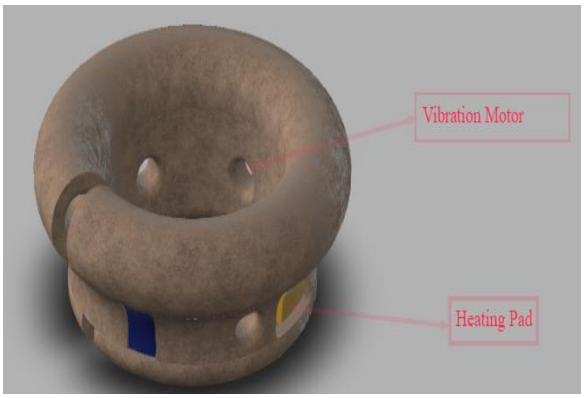

Figure 2: 3D Cad model of the belt showing the three sides where the vibration motor is going to install

Product Photograph

Figure 3: Actual Collar Belt

Components

- Fabric Cervical Collar Brace with foam Inside
- Button Size Vibration Motors 3V DC
- Battery Pack 9V
- Circular Heating Pad

Working

The idea behind the circuit design was to get the solution for the neck belt which has an inbuilt massager which helps the user to maintain the comfort of the neck and it is connected with the battery which helps the product to go wireless. The vibratory motor is connected in such a way that it will solve two issues, the first issue is to regain the same strength back again in the neck, and the second is to improve the sore throat and create a heat wave near the neck area. For the project, we have used three vibration motors of 3v Dc, each is connected in series. The arrangement is kept in the periphery of the neck prescribed by the acupressure expert. There are in total three points which we have marked in the belt and on that marked points we have fit our motors accordingly which will generate the vibration the motors are connected with the battery pack, simultaneously in the circuit we have attached a speed control regulator which can control the intensity of the vibration which changes from user to user. To solve the problem of blood circulation we have added the heating pad which will generate the heat in the neck portion which keeps the nerves and skin tissue softer to protect the sour throat problem and also blood flow to circulate towards the neck and spine area. The pad is connected to the battery pack as shown in the circuit diagram.

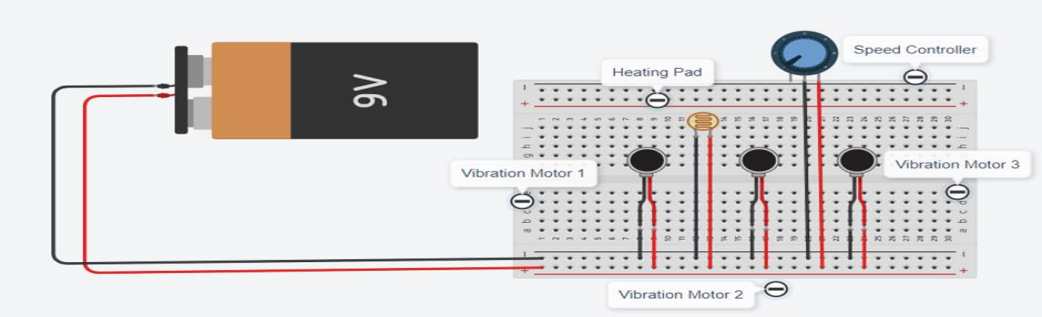

Figure 4: 3D Circuit diagram of the belt

RESULT

People using vibration collar belts found relaxation in their necks due to vibration effect and it was tested on the users of the different age gaps, those who were having pain they are getting relief. Also, we tested the problem related the sour throat with 5 users out of that 2 claiming that they are having a relaxation and the heating pad helped them to get the problem of neck frozen relieved. Using the neck collar belt for various neck-related activities could be practiced 2-3 times a week for Relaxing the neck.

CONCLUSION

Here we acknowledge that the approach for making the collar belt has been initiated and the tested feedback is positive with the idea to get relief from cervical spondylosis. In the next new version, we are going to study and implement the patent of the patient behavior and their pain impression with the pain points marked on the belt, we will add the radiation thermal

digital image processing so that the images thermal images can be captured and we can detect the crack as well as the tissue damage in the muscle.

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Conflict of Interest: None

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