Manufacture of a Knee brace with support–strength properties

Poster Presentation

DOI: 10.22089/SSRC.2024.4777

Paper ID : 1912-SSRC

Authors

Benjamin Izadi[1] , Mahnaz Marvi Esfahani [2] , Alireza Ahmad Beigi[3] , Mahdi Nasiran Najafabadi[4] , Zinat Samadi Harandi[4]

[1]. undergraduate student, Sport Medicine Research Center, Najafabad Branch, Islamic Azad University, Najafabad, Iran (Corresponding Author)

[2]Assistant Professor, Sport Medicine Research Center, Najafabad Branch, Islamic Azad University, Najafabad, Iran.

[3]. Masters student, Sport Medicine Research Center, Najafabad Branch, Islamic Azad University, Najafabad, Iran.

[4]undergraduate student, Sport Medicine Research Center, Najafabad Branch, Islamic Azad University, Najafabad, Iran.

Abstract

Abstract

Background: The human knee is a complex mechanism that is highly vulnerable to disease and injury. Osteoarthritis (OA) of the knee is one of the most common musculoskeletal disorders affecting all age groups and is considered one of the main causes of disability. The use of mechanical rehabilitation equipment can facilitate and improve the quality of rehabilitation programs.

Purpose: The objective of the study was to manufacture a knee brace with support–strength properties for people with knee osteoarthritis.

Methodology: This brace was designed on the advantages and disadvantages of existing braces for knee rehabilitation. First, the initial design of the device was designed in Catia software and then it was made according to the designed sizes of the laboratory sample. The main body of the brace includes an upper support portion, a lower support portion, and one or more hinge assemblies pivotally interconnecting the upper and lower support portions. The upper support portion is secured to the wearer's upper leg, while the lower support portion is secured to the wearer's lower leg. The hinge assembly is located to a side of the wearer's knee and a condyle pad is typically located between each hinge assembly and the adjacent side of the knee. Also, a pair of tension and compression springs are installed on both sides next to the knee condyles to strengthen the knee's flexor and extensor muscles.

Results: This brace allows flexion and extension of the knee to be performed with strength. In this research, by using springs with three different stiffness coefficients, the amount of force can be increased up to about 50 newtons (5 kg). The amount of force can be increased according to the ability of the person. In the design of mechanical braces, weak resistance forces are used to prevent further inflammation of the knee.

Conclusion: One of the important features of this brace is knee support during movement. In case of knee pain, you should support the knee and perform flexion and extension movements. Knee support reduces inflammation. Doing strength exercises with a brace strengthens the knee flexors and extensors.

Keywords

"; Keywords: "; Manufacture "; Knee brace "; Support "; , "; Strength