Assistive Device for Walking Support and Physical Therapy in Foot Drop Patients

Ubaidillah Waaryita[1], Bulkis Satirak[1], Sirachuch Juntongpoon[1]*

Princess Chulabhorn Science High School Satun, Chalung, Mueang Satun, Satun 91140, Thailand

**E-mail: Sirachuch.j@pccst.ac.th*

Abstract

This project aims to apply the principles of mechanics to the design and development of the proposed assistive device for walking support and physical therapy for patients with foot drop. The device employs a linear actuator to transmit force and generate torque about the ankle joint, enabling dorsiflexion and plantarflexion movements that closely resemble natural ankle motion. The system is controlled through a web application. The device was designed with consideration of force transmission and actuator positioning to achieve appropriate torque generation and improve the stability of ankle movement. Its performance was evaluated through load-bearing tests, ankle range of motion (ROM) measurements, and gait motion analysis using the Tracker software. The experimental results showed that the device could support loads of up to 4 kg, with optimal performance in the range of 0.5–3.5 kg. The device achieved an ankle range of motion of approximately 20°, and gait analysis demonstrated that ankle movement while wearing the device was closer to natural walking than without the device. These findings indicate that the application of mechanical principles can effectively contribute to the design of assistive devices for walking support and rehabilitation. The developed device has the potential for use in hospitals, rehabilitation centers, and home-based rehabilitation to promote functional recovery, reduce the risk of tripping, and improve the quality of life of patients with foot drop.

Keywords: Foot Drop, Mechanics, Torque, Linear Actuator