An Efficient Robotic-Assisted Rehabilitation Protocol for Post-Total Knee Arthroplasty

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Abstract:

Many studies have been carried out to examine the impact of prompt and effective rehabilitation treatments after surgery due to the recent rise in demand for total joint arthroplasty. The concept of utilizing robotic-assisted physiotherapy is interesting because of the development of exoskeletons and technologies for human-robot interfaces. This study aims to develop an exoskeletal robotic system for providing efficient rehabilitation program for patients in the initial phases following knee arthroplasty. The robotic system's mechanical structure was anthropometrically designed to ensure the exoskeleton functions solely as a torque source in an impedance control scheme. A systematic review of different interventions in the literature helped identify an effective physiotherapy protocol to strengthen quadriceps, hamstring, and calf muscles, increase knee flexibility, and enhance walking and stair-climbing abilities. A study was conducted on 20 participants (60% female, 40% male) to test out the suggested robot-assisted therapy, showing notable enhancements in pain levels, daily task capabilities, and knee function scores based on the WOMAC index.

Keywords:

rehabilitation, knee exoskeleton, total knee arthroplasty, physiotherapy, clinical investigation.