

A wearable robot that makes climbing mountains easier

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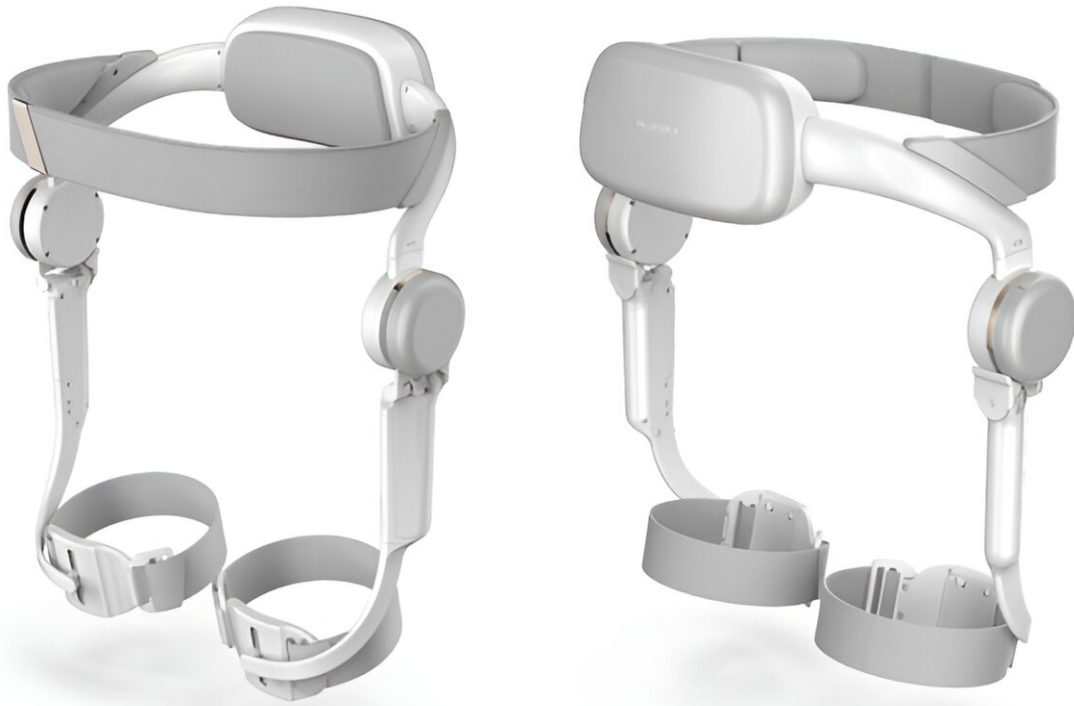
A 65-year-old man successfully climbs to the top of Mount Yongbong in Bukhansan Mountain using a wearable robot and muscle support. Credit: Korea Institute of Science and Technology

As people age, they gradually lose muscle strength in their arms and legs, making it difficult for them to participate in leisure activities such as hiking and traveling, and they often need to rely on assistive devices such as canes and wheelchairs for mobility. However, these devices do

not improve muscle strength, so wearable robots that can compensate for the lack of muscle strength are attracting attention as an innovative technology to improve the health and quality of life of the elderly.

Dr. Lee Jongwon of the Intelligent Robotics Research Center at the Korea Institute of Science and Technology (KIST) has developed a wearable robot, MOONWALK-Omni, which means "to actively support leg strength in any direction (omnidirection) to help walk like walking on the moon." A senior citizen successfully completed a wearable robot challenge to climb to the top of Mount Yeongbong (604 meters above sea level) in Korea.

The challenge raised the possibility of commercializing wearable robots in outdoor complex environments, successfully climbing with the help of the robot's muscle strength, without changing batteries or intervention from developers.



The wearable robot MOONWALK-Omni. Credit: Korea Institute of Science and Technology

Various types of wearable robots have been developed in the past, but due to their heavy weight and large volume, they have been limited to the rehabilitation process of patients in hospitals with simple indoor environments. However, MOONWALK-Omni is an ultra-lightweight wearable strength-assistance robot that predicts the user's movements and supports insufficient leg strength to help the elderly rehabilitate and assist with daily activities.

The 2-kilogram device can be easily donned by an older adult in less than 10 seconds without assistance, and its four ultra-lightweight, high-

powered actuators on either side of the pelvis help balance the user while walking and boost the wearer's leg strength by up to 30% to increase propulsion.

The robot's artificial intelligence (AI) analyzes the wearer's gait in real time and provides safe and effective muscle support in a variety of walking environments, including gentle slopes, rough rocky paths, steep wooden stairs, and uneven stone steps. Through the Bukhansan Mountain Wearable Robot Challenge, the research team succeeded in verifying the performance and reliability of [muscle](#) support using wearable robots in everyday environments that are more complex than hospitals.



An elderly man walks up a complex stone staircase environment while wearing a robot during a wearable challenge in Korea.(Bukhansan Challenge). Credit: Korea Institute of Science and Technology

An elderly participant in the challenge said, "I thought I would have to give up mountain climbing, which I have enjoyed since I was young, but I feel 10 to 20 years younger after climbing the mountain comfortably with the wearable robot."

Dr. Lee Jong-won of KIST said, "Through this challenge, we have obtained experimental data that shows that safe and effective strength support is possible in a variety of walking environments."

"Through the convergence of ultra-lightweight, high-power wearable robot drive technology and personalized artificial intelligence strength support technology, it is expected to be widely used in the fields of daily assistance, rehabilitation, and exercise for the elderly who lack [muscle strength](#) due to aging."

As a follow-up to MOONWALK-Omni, the research team is developing MOONWALK-Support, which not only strengthens leg muscles but also supports the complex joints of the lower extremities such as hip and knee.

In addition, the team has achieved achievements in various fields by transferring core technologies and components such as motors, reducers, and computing circuits for wearable robots to company in Korea.

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