



Clinical specialties in orthotics and prosthetics

Orthotic exoskeletons: powered orthoses for rehabilitation and mobility

- Orthotic exoskeletons are a type of powered orthosis
- Powered orthoses may be used to enable walking in people who cannot walk or can be used as a rehabilitation aid in people who have only some ability to walk
- Powered orthoses are an emerging technology in the field of orthotics and are undergoing substantial research and development

What are orthotic exoskeletons?

Exoskeleton is the term used to describe an externally powered orthosis for the upper or lower limbs. An orthosis (often called a splint, brace or calliper) is a supportive device fitted to the body to protect and support a body part, compensate for changes in muscle length or function, re-align skeletal joints, redistribute pressure or optimise walking pattern. An orthotic exoskeleton is different from a conventional orthosis because it uses an external power source to supplement and produce movement.

Various exoskeleton designs have been developed, several of which are commercially available. As with the use of any orthosis or form of gait rehabilitation, walking with a powered exoskeleton requires specialised training and practice.

Who might use an orthotic exoskeleton?

Powered orthoses may benefit people who have lost all ability to walk due to trauma or illness. For example, a spinal cord injury (or 'SCI') can result in a partial or total inability to walk. This can lead to physical complications including skin breakdown, muscle atrophy, reduced cardiorespiratory capacity, and pain. Being unable to walk can also affect psychological well-being and can increase the risk of depression and reduce quality of life. While there are a variety of conventional orthoses available to assist with walking (for example, Reciprocal Gait Orthoses), people with SCI must expend high levels of energy to achieve only modest walking speeds, dependent on their level of injury. Therefore, many people with SCI do not regain the ability to walk and require a wheelchair for their mobility.

What are the benefits of powered orthoses?

Powered orthoses are an emerging technology that can enable people who cannot walk (are 'non-ambulatory') due to paralysis, to walk, or can be used as a rehabilitation tool to improve walking ability in ambulatory individuals with partial paralysis. Powered



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orthoses may offer potential in providing an alternative form of gait training compared to supported gait training on a treadmill. Walking can be facilitated both in the clinical setting and in the home via an external power supply using electric motors, pneumatic and/or hydraulic actuators.

One of main reasons for the development of powered orthoses was to potentially reduce energy consumption when walking with a conventional (mechanical) orthosis. While recent systemic reviews conclude that there is currently insufficient evidence to prove the efficacy of powered orthoses when used for walking by SCI patients, there is some evidence to suggest that when compared to conventional orthoses, powered orthoses may require less energy of the user and may improve walking speed and distance walked. The development of powered orthoses is still in its infancy and progress needs to be made to improve their functionality and performance.

Who provides orthotic exoskeletons?

Orthoses, including orthotic exoskeletons, are provided by orthotists. Orthotists are the only specialist tertiary qualified allied health practitioners in Australia who prescribe the full range of orthoses. Orthotists are trained at either a Bachelor or Master's level and may work autonomously or within the multidisciplinary team.



An example of an orthotic exoskeleton

If you need to use the services of an orthotist they will:

- Perform a thorough clinical assessment
- Discuss the most suitable orthotic options to meet your goals and requirements and support you in decision making
- Complete the digitisation/measurement/casting process and oversee the manufacturing or procurement of the orthosis
- Provide clinical services associated with fitting, education of use, regular reviews for functional effectiveness and adjustment for fit, as well as liaising with other relevant members of the healthcare team

How do I access orthotic treatment?

The Australian Orthotic Prosthetic Association (AOPA) is the peak body regulating orthotists/prosthetists in Australia. Certification is conditional upon tertiary training at University level and meeting minimum professional competencies. Certified orthotist/prosthetists are required to abide by standards including a code of ethics and continuing professional development.

Certified Orthotist/Prosthetists (c-OP AOPA) can be located using the 'Find a practitioner' search function on the AOPA website (www.aopa.org.au). Orthotists working in both the public and private settings are listed.

If you require the services of an orthotist you may be referred by your specialist clinic, physiotherapist or other health professional to one of our members or you may contact them directly yourself.



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Disclaimer – This fact sheet does not replace clinical advice. If you require prosthetic services AOPA recommend speaking to your practitioner. This fact sheet was developed based on interpretation of current evidence as of August 2017. References available on request.