Designing and Validating a Prosthetic Shock Absorbing Pylon Emulator

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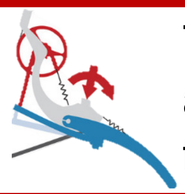
A prosthetic pylon emulator would expand the research capabilites for shock absorbing pylons.

The benefits of shock absorbing pylons are inconclusive[1-4].

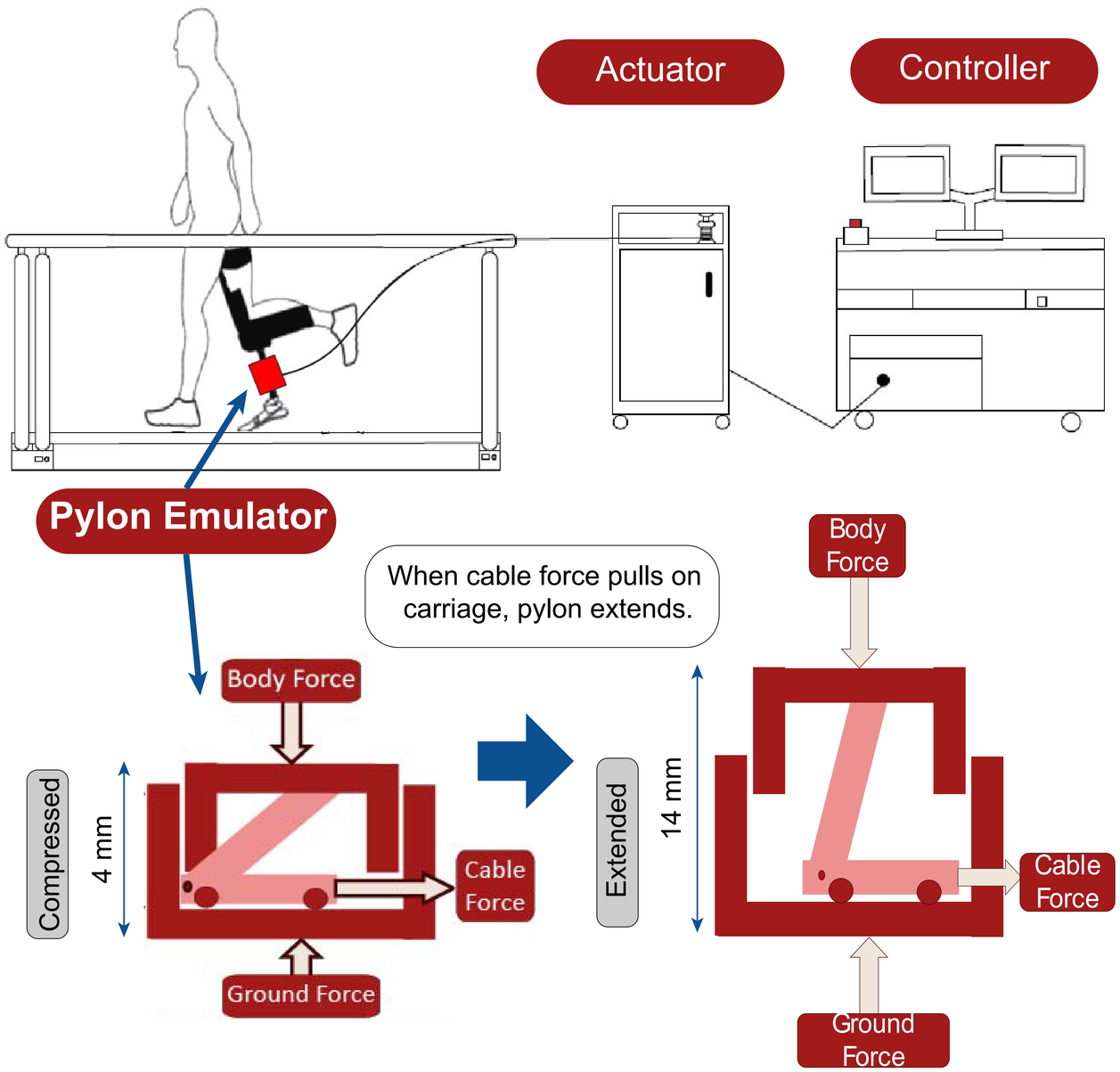


The benefits of prosthetic ankles are well known since emulation technology allows for a proliferation of ankle studies[5,6].

Purpose

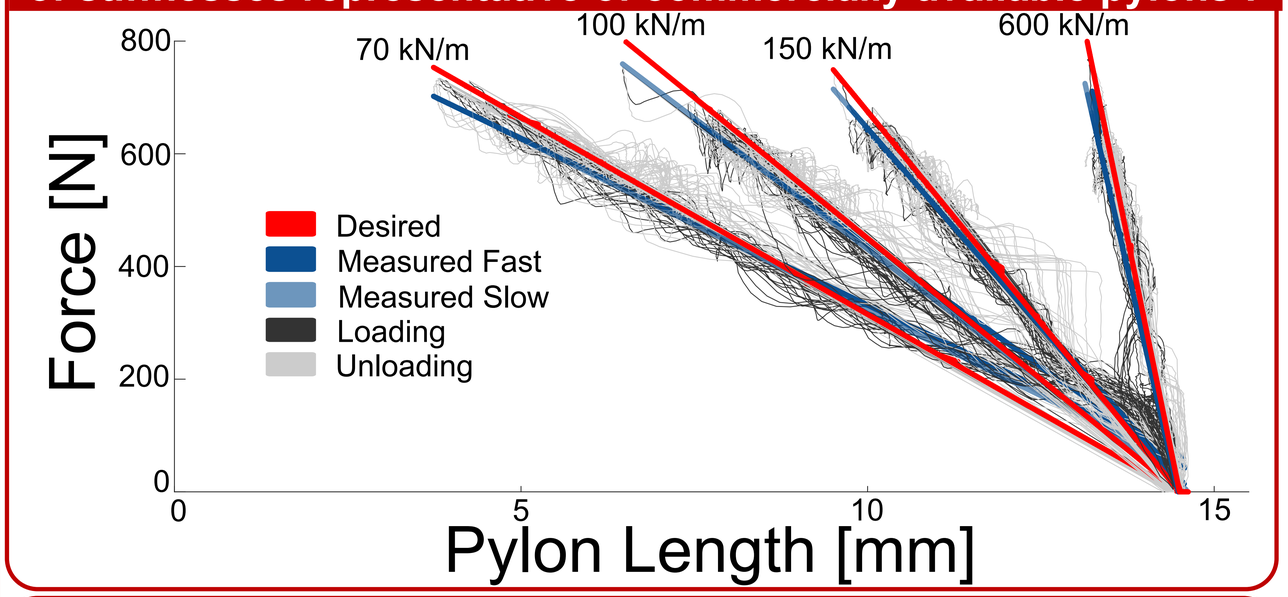
To develop and test a prosthetic pylon emulator for rapid, systematic evaluation.

The pylon was tested by applying load during gait while walking on an instrumented treadmill.

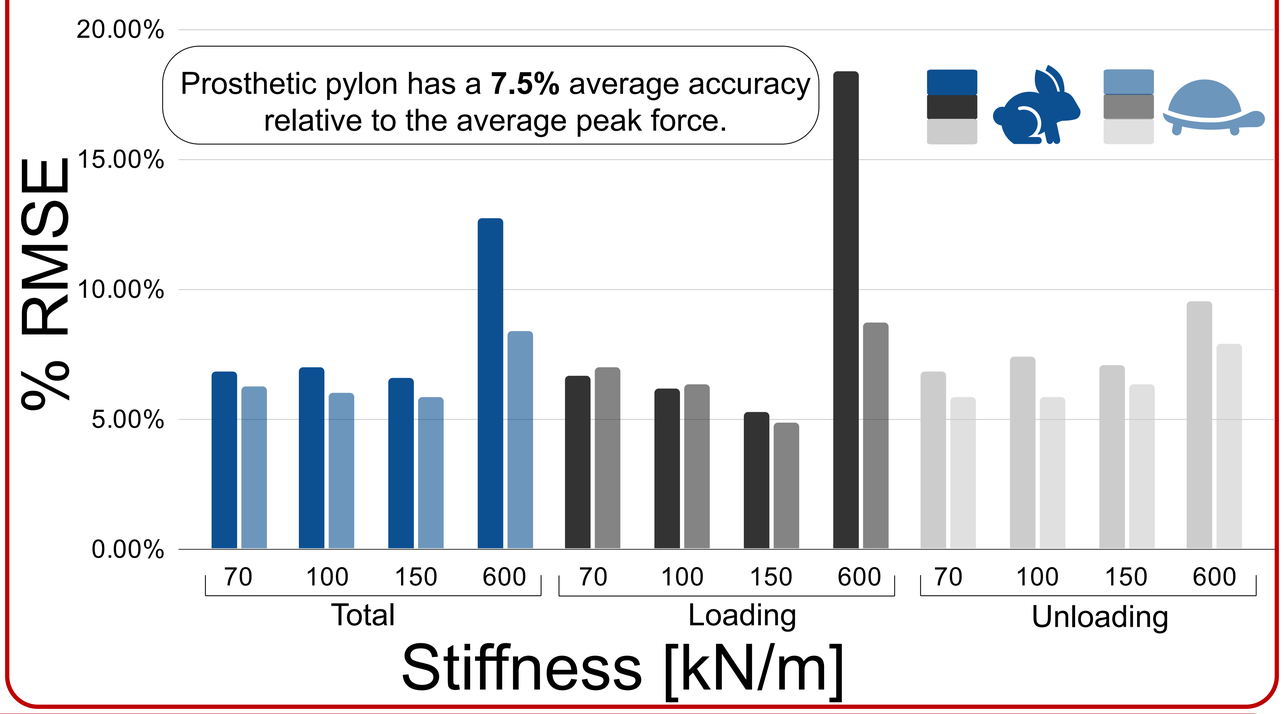


Speed	Stiffness [kN/m]			
Fast (1.2 m/s)	70	100	150	600
Slow (0.8 m/s)	70	100	150	600

The pylon can be instantaneously updated to emualte a range of stiffnesses representative of commercially available pylons[2].

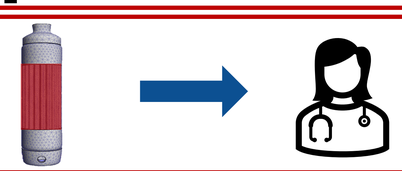


There is greater tracking error during unloading than during loading. Extremely stiff pylons produce the greatest error.



Relevance:

Effectively simulates the stiffness ranges (70-150 kN/m) of commercial pylons[2].
Can be combined with an ankle emulator to aid in the design and prescription of passive prosthetic components.



References:
[1] Gard & Konz, J of Rehab, 2003 [2] Maun et al, J NeuroEng Rehab, 2021
[3] Berge et al, J of Rehab, 2005 [4] Adderson et al, J Pros&Orth Int, 2007
[5] Caputo & Collins, J Biomech Eng, 2014 [6] Caputo et al, J Pros&Orth, 2022

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