COLLISION WORK PERFORMED BY PATIENTS WITH PERIPHERAL ARTERY DISEASE

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INTRODUCTION

• Collision work is energy dissipated into the surrounding environment from impact, in this case, upon heel strike.
• Research in our laboratory has found that patients with PAD exhibit abnormal gait, including consistently reduced plantarflexor torque [1].
• When designing an exoskeleton for patients with peripheral artery disease (PAD), harvesting energy lost to collision work could be a valuable mechanism to improve walking performance.
• Devices designed to utilize the normally dissipated energy to assist propulsion for improved walking performance are under-explored [2, 3].

PURPOSE

• The purpose of this study was to assess the validity of healthy, older individuals as a model for patients with PAD for fundamental research comparisons when designing assistive exoskeleton devices.

METHODS

• Subjects were age-matched, 67.4 ± 9.5 years
  • Patients with PAD, n=15
  • Healthy controls, n = 5

RESULT (continued)

Constitution Collision Work [5] = \[ \sqrt{(V_x \times F_x)^2 + (V_y \times F_y)^2 + (V_z \times F_z)^2} \]
• F = Ground reaction force value corresponding to the first peak of its corresponding coordinal axis curve
• V = average heel velocity over 0.04s period before heel strike
• Statistics consisted of a student’s t-test

RESULTS

• Collision work performed by patients with PAD was not significantly different from control subjects (t = 0.73, p = 0.47).
• Average collision work and ankle power at push-off for patients with PAD was 2.54±0.83 and 1.99±0.50 watts/kg respectively.
• This allows for appropriately powered subject recruitment, and creates a wider impact for exoskeleton research dedicated to collision work.

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