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# Content

## **Archives of Physical Medicine and Rehabilitation** (October 2020, Vol 101, Issue 10)

Published by Elsevier

- Investigation of the Effects of Dual-Task Balance Training on Gait and Balance in Transfemoral Amputees: A Randomized Controlled Trial
- Factors Associated With Health-Related Quality of Life in People Living With Partial Foot or Transtibial Amputation
- Health Services Utilization, Health Care Costs, and Diagnoses by Mild Traumatic Brain Injury Exposure: A Chronic Effects of Neurotrauma Consortium Study
- Analysis of the Microbiota of the Physiotherapist's Environment

## **Clinical Rehabilitation** (October 2020, Vol 34, Issue 10)

Published by SAGE journals

- The effectiveness of extracorporeal shock wave therapy for improving upper limb spasticity and functionality in stroke patients: a systematic review and meta-analysis
- Prehabilitation in patients awaiting elective coronary artery bypass graft surgery - effects on functional capacity and quality of life: a randomized controlled trial
- Effects of two different types of ankle-foot orthoses on gait outcomes in patients with subacute stroke: a randomized crossover trial
- What attributes should a specialist in rehabilitation have? Seven suggested specialist Capabilities in Practice

## **Prosthetics and Orthotics International** (October, Vol 44, Issue 5)

Published by SAGE journals

- Financial difficulty in community-dwelling persons with lower limb loss is associated with reduced self-perceived health and wellbeing
- Effectiveness of a crossover prosthetic foot in active children with a congenital lower limb deficiency: an explorative study
- Three-dimensional printing in prosthetics: Method for managing rapid limb volume change
- Strength deficits in lower limb prosthesis users: A scoping review

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# Archives of Physical Medicine and Rehabilitation

October 2020, Vol 101, Issue 10

## Investigation of the Effects of Dual-Task Balance Training on Gait and Balance in Transfemoral Amputees: A Randomized Controlled Trial

Senem Demirdel, Fatih Erbahçeci

October 2020; 101(10): 1675-1682

[https://www.archives-pmr.org/article/S0003-9993\(20\)30422-6/fulltext](https://www.archives-pmr.org/article/S0003-9993(20)30422-6/fulltext)

### Objectives

To investigate the effects of dual-task balance training on static and dynamic balance, functional mobility, cognitive level, and sleep quality in individuals with transfemoral amputation.

### Design

Randomized controlled clinical trial.

### Participants

Transfemoral amputees (N=20).

### Interventions

Participants were randomly assigned to the single-task gait and balance training group (n=10) or the dual-task gait and balance training group (n=10). Training was given in sessions of 60 min/d, 3 d/wk for 4 weeks. The single-task training group performed traditional gait and balance exercises, and the dual-task training group practiced cognitive and motor tasks while performing gait and balance exercises.

### Main Outcome Measures

The 1-leg stance test and the Four Square Step Test were used for balance assessment. The timed Up and Go test and 10-m walk test were used for gait assessment. Three test conditions to evaluate the training effects were single walking, walking while performing a cognitive task (serial subtraction), and walking while performing a motor task (tray carrying). The Montreal Cognitive Assessment scale was used for cognitive assessment and the Pittsburgh Sleep Quality Index for sleep quality assessment.

### Results

Balance and mobility improved in both groups. Dual-task balance performance, functional mobility, and gait speed improved more in the dual-task training group after training ( $P<.05$ ). Cognitive status and sleep quality improved significantly in the dual-task group ( $P<.05$ ).

## Conclusions

Dual-task training was more effective than single-task training in the improvement of dual-task performance and cognitive status. The inclusion of dual-task exercises in the rehabilitation program of transfemoral amputees will provide a different perspective because of increased task automation.

## **BACK**

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### Factors Associated With Health-Related Quality of Life in People Living With Partial Foot or Transtibial Amputation

Michael P. Dillon, Matthew Quigley, Phil Stevens, Yuri Balasanov, Sarah P. Anderson

October 2020; 101(10): 1711-1719

[https://www.archives-pmr.org/article/S0003-9993\(20\)30308-7/fulltext](https://www.archives-pmr.org/article/S0003-9993(20)30308-7/fulltext)

#### Objectives

To determine which demographic, amputation, and health-related factors were associated with health-related quality of life (HR-QoL) in people living with partial foot amputation (PFA) or transtibial amputation (TTA).

#### Design

Cross-sectional survey.

#### Setting

Community.

#### Participants

Adults (N=123) with unilateral PFA (n=42) or TTA (n=81).

#### Intervention

Not applicable.

#### Main Outcome Measure

Medical Outcome Short Form (SF-36) version 2.

#### Results

Variation in the SF-36 Physical or Mental Component Summary scores were associated with complex interactions between factors, including: time since amputation, fatigue, anxiety, depression, pain interference, and physical function. Level of amputation (ie, PFA or TTA) did

not explain a significant part of the variation in either the SF-36 Physical or Mental Component Summary scores.

## Conclusions

Given the complex interactions between factors associated with the physical and mental health components of HR-QoL, there are opportunities to consider the long-term holistic care required by people living in the community with PFA or TTA.

## **BACK**

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### Health Services Utilization, Health Care Costs, and Diagnoses by Mild Traumatic Brain Injury Exposure: A Chronic Effects of Neurotrauma Consortium Study

Clara Dismuke-Greer, Shawn Hirsch, Kathleen Carlson, Terri Pogoda, Risa Nakase-Richardson, Saurabha Bhatnagar, Blessen Eapen, Maya Troyanskaya, Shannon Miles, Tracy Nolen, William C. Walker

October 2020; 101(10): 1720-1730

[https://www.archives-pmr.org/article/S0003-9993\(20\)30421-4/fulltext](https://www.archives-pmr.org/article/S0003-9993(20)30421-4/fulltext)

#### Objective

To compare Veterans Health Administration (VHA) diagnoses, health services utilization, and costs by mild traumatic brain injury (mTBI) group (blast-related [BR] mTBI vs non–blast-related [NBR] mTBI vs no mTBI) among Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF)/Operation New Dawn (OND) veterans in the Chronic Effects of Neurotrauma Consortium multicenter observational study.

#### Design

Prospective cohort study.

#### Setting

Four Veterans Affairs Medical Centers.

#### Participants

OEF/OIF/OND veterans (N=472) who used Veterans Affairs Medical Centers services between 2002-2017.

#### Interventions

Not applicable. Lifetime mTBI history was assessed via semistructured interviews.

#### Main Outcome Measures

VHA diagnoses, health services utilization, and costs.

#### Results

Relative to NBR mTBI and no mTBI, veterans with BR mTBI were more likely to be male, have greater combat, and have controlled and uncontrolled detonations exposures (median BR, 15.0 vs NBR, 3.0 vs no mTBI, 3.0). They also had higher prevalence of headache, posttraumatic stress disorder, and anxiety diagnoses. Veterans with BR had the highest site-adjusted mean annual VHA utilization (26.31 visits; 95% confidence interval [CI], 26.01-26.61) relative to NBR (20.43 visits; 95% CI, 20.15-20.71) and no mTBI (16.62 visits; 95% CI, 16.21-17.04) and highest site adjusted mean annual VHA outpatient costs (\$6480; 95% CI, \$5842-\$7187) relative to NBR (\$4901; 95% CI, \$4392-\$5468) and no mTBI (\$4069; 95% CI, \$3404-\$4864).

## Conclusions

Veterans with BR mTBI had higher exposure to combat and detonation. BR was associated with greater prevalence of select diagnoses and higher health services utilization and costs relative to NBR and no mTBI. The role of health care needs from mTBI polytrauma, other deployment-related exposures, and VHA access warrants future research.

## **BACK**

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### Analysis of the Microbiota of the Physiotherapist's Environment

C Tomás Pérez-Fernández, Francisco Llinares-Pinel, Mayte Troya-Franco, Luis Fernández-Rosa

October 2020; 101(10): 1789-1795

[https://www.archives-pmr.org/article/S0003-9993\(20\)30390-7/fulltext](https://www.archives-pmr.org/article/S0003-9993(20)30390-7/fulltext)

#### Objectives

To analyze the microbiota of the physiotherapist's work environment to understand the existing potential risks and to adopt appropriate preventive measures.

#### Design

Cross-sectional descriptive observational study.

#### Setting

Physiotherapist's working environment.

#### Participants

Physiotherapy and rehabilitation centers (N=19).

#### Interventions

A microbiological sampling was carried out in the physiotherapy centers. The samples were studied using the usual culture and analysis methodology for characterization and isolation of a range of bacteria.

#### Main Outcome Measures

Absolute and relative frequency of microorganism isolation.

#### Results

In the analysis, pathogens normally responsible for nosocomial infections were detected, especially on instruments and equipment used by the physiotherapist such as sponge electrodes, and were significantly more contaminated than the rest of the places studied ( $P < .01$ ).

#### Conclusion

This situation confirms the absence of measures and protocols for the prevention and control of such infections in the physiotherapist's environment, which is why they must be considered to protect both physiotherapy professionals and patients.

**BACK**

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# Clinical Rehabilitation

October 2020, Vol 34, Issue 10

## The effectiveness of extracorporeal shock wave therapy for improving upper limb spasticity and functionality in stroke patients: a systematic review and meta-analysis

Rosa Cabanas-Valdés, Pol Serra-Llobet, Pere Ramón Rodríguez-Rubio, Carlos López-de-Celis, Mercé Llauró-Fores, Jordi Calvo-Sanz

September 2020; 34(9): 1141-1156

<https://journals.sagepub.com/doi/full/10.1177/0269215520932196>

### Objective

To assess the effectiveness of Extracorporeal Shock Wave Therapy for reducing spasticity and improving functionality of the upper limb in stroke survivors.

### Data sources

A systematic review of MEDLINE, Cochrane Central Register of Controlled Trials, CINAHL, PEDro, REHABDATA, Scielo, Scopus, Web of Science, Tripdatabase and Epistemonikos from 1980 to April 2020 was carried out.

### Review methods

The bibliography was screened to identify randomized controlled clinical trials that applied extracorporeal shock waves to upper limb spastic muscles in post-stroke individuals. Two reviewers independently screened references, selected relevant studies, extracted data and assessed risk of bias using the PEDro scale. The primary outcome was spasticity and functionality of the upper limb.

### Results

A total of 1,103 studies were identified and 16 randomized controlled trials were finally included (764 individuals) were analyzed. A meta-analysis was performed and a beneficial effect on spasticity was found. The mean difference (MD) on the Modified Ashworth Scale for comparison extracorporeal shock wave versus sham was -0.28; with a 95% confidence interval (CI) from -0.54 to -0.03. The MD of the comparison of extracorporeal shock wave plus conventional physiotherapy versus conventional physiotherapy was -1.78; 95% CI from -2.02 to -1.53. The MD for upper limb motor-function using the Fugl Meyer Assessment was 0.94; 95% CI from 0.42 to 1.47 in the short term and 0.97; 95% CI from 0.19 to 1.74 in the medium term.

### Conclusion

The extracorporeal shock wave therapy is effective for reducing upper limb spasticity. Adding it to conventional therapy provides an additional benefit.

## **BACK**

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### Prehabilitation in patients awaiting elective coronary artery bypass graft surgery - effects on functional capacity and quality of life: a randomized controlled trial

Carolin Steinmetz, Birna Bjarnason-Wehrens, Heike Baumgarten, Thomas Walther, Thomas Mengden, Claudia Walther

October 2020; 34(10): 1256-1267

<https://journals.sagepub.com/doi/full/10.1177/0269215520933950>

#### Objective

To determine the impact of an exercise-based prehabilitation (EBPrehab) program on pre- and postoperative exercise capacity, functional capacity (FC) and quality of life (QoL) in patients awaiting elective coronary artery bypass graft surgery (CABG).

#### Design

A two-group randomized controlled trial.

#### Setting:

Ambulatory prehabilitation.

#### Subjects

Overall 230 preoperative elective CABG-surgery patients were randomly assigned to an intervention (IG, n = 88; n = 27 withdrew after randomization) or control group (CG, n = 115).

#### Intervention

IG: two-week EBPrehab including supervised aerobic exercise. CG: usual care.

#### Main measures

At baseline (T1), one day before surgery (T2), at the beginning (T3) and at the end of cardiac rehabilitation (T4) the following measurements were performed: cardiopulmonary exercise test, six-minute walk test (6MWT), Timed-Up-and-Go Test (TUG) and QoL (MacNew questionnaire).

#### Results

A total of 171 patients (IG, n = 81; CG, n = 90) completed the study. During EBPrehab no complications occurred. Preoperatively FC (6MWT IG :  $443.0 \pm 80.1$  m to  $493.5 \pm 75.5$  m,  $P = 0.003$ ; TUG IG :  $6.9 \pm 2.0$  s to  $6.1 \pm 1.8$  s,  $P = 0.018$ ) and QoL (IG:  $5.1 \pm 0.9$  to  $5.4 \pm 0.9$ ,  $P \leq 0.001$ ) improved significantly more in IG compared to CG. Similar effects were observed

postoperatively in FC (6MWD IG :  $\Delta$ -64.7 m, p T1-T3 = 0.013;  $\Delta$ +47.2 m, p T1-T4 &lt; 0.001; TUG IG :  $\Delta$ +1.4 s, p T1-T3 = 0.003).

## Conclusions

A short-term EBPrehab is effective to improve perioperative FC and preoperative QoL in patients with stable coronary artery disease awaiting CABG-surgery.ID: NCT04111744 (www.ClinicalTrials.gov; Preoperative Exercise Training for Patients Undergoing Coronary Artery Bypass Graft Surgery- A Prospective Randomized Trial).

## **BACK**

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### Effects of two different types of ankle-foot orthoses on gait outcomes in patients with subacute stroke: a randomized crossover trial

Priya Sibi Karakkattil, Elaine Trudelle-Jackson, Ann Medley, Chad Swank

August 2020; 34(8): 1094-1102

<https://journals.sagepub.com/doi/full/10.1177/0269215520927738>

#### Objective

To identify whether patients in the subacute stage of stroke, with foot drop, would have better gait outcomes when using a double-adjustable AFO (DA AFO) or a posterior leaf spring AFO (PLS AFO) at baseline without practice and to determine whether one week of practice would significantly change gait outcomes with either of the AFOs.

#### Design

Within-subject 2 × 2 repeated measures design.

#### Setting

Postacute and outpatient rehabilitation center.

#### Participants

Twenty individuals with mean age of 57 years (SD: 12.0 years) with subacute stroke.

#### Interventions

Participants were measured using DA AFO and PLS AFO at baseline. Follow-up measurements were taken after one week of practice with each type of AFO in randomly assigned order.

#### Outcome measures

Gait endurance (6-Minute Walk Test (6MWT)), gait symmetry, and gait velocity at self-selected and fast-paced velocity measured using GAITRite gait analysis system and patient report of AFO preference.

## Results

At baseline, no significant differences were found between the 2 AFOs ( $P > 0.05$ ). There was no significant interaction ( $P > 0.05$ ) of AFO and practice for gait endurance, symmetry, and velocity. Main effect of practice was significant for gait endurance ( $P < 0.001$ ), self-selected velocity ( $P = 0.001$ ), and fast-paced velocity ( $P < 0.001$ ). In all, 16 participants preferred using DA AFO for walking.

## Conclusions

No difference between DA AFO and PLS AFO was found on measures of gait endurance, symmetry, and velocity at baseline or after practice. With practice over time, participants improved in gait endurance and velocity regardless of AFO type.

## **BACK**

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### What attributes should a specialist in rehabilitation have? Seven suggested specialist Capabilities in Practice

Derick T Wade

August 2020; 34(8): 995-1003

<https://journals.sagepub.com/doi/full/10.1177/0269215520925869>

#### Problem

Many services and professionals refer to themselves as providing rehabilitation. There is no agreed method for determining whether someone has specific expertise in rehabilitation. This makes it difficult for patients and payers to know whether professionals who claim to provide rehabilitation are specifically expert in rehabilitation.

#### Context

Doctors have a medical speciality of rehabilitation. The medical training curriculum gives attributes that differentiate a rehabilitation specialist from other doctors. Until recently, these attributes were competencies to undertake activities associated with specialization. Apart from nurses, who have at least one, unofficial, curriculum identifying specific competencies, other professions involved in rehabilitation do not have any way to show specialization in rehabilitation.

#### Capabilities in practice

The U.K. General Medical Council accredits specialist medical training. It has moved from specifying multiple practical clinical competencies to specifying fewer high-level

‘Capabilities in Practice’. Six are generic to all doctors, eight identify the trained doctor as having specialist rehabilitation skills. This article adopts this approach to put forward seven generic and seven specialist capabilities to identify any professional as having special expertise in rehabilitation. The seven specialist capabilities centre on the biopsychosocial model of illness and multidisciplinary teamwork. Four of them could be used to define a specialist rehabilitation team.

### Conclusion

Seven capabilities identifying specialization in rehabilitation are put forward for discussion. They could form the basis of a formal recognition that any professional has additional expertise in rehabilitation. A validating authority would be needed to provide oversight and governance.

**BACK**

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# Prosthetics and Orthotics International

October 2020, Vol 44, Issue 5

## Financial difficulty in community-dwelling persons with lower limb loss is associated with reduced self-perceived health and wellbeing

Szu-Ping Lee, Lung-Chang Chien, Tyler Chin, Heather Fox, Juan Gutierrez

October 2020; 44(5): 290-297

<https://doi.org/10.1177/0309364620921756>

### Background

Socioeconomic status has been shown to be an important factor in the disparate prevalence and selected treatment of limb loss, but how personal financial difficulty affects patients' health outcomes is currently unclear.

### Objective

Examining how presence and experience of personal financial difficulty affects perceived health and wellbeing in individuals with lower limb loss.

### Study Design

Cross-sectional study.

### Methods

A total of 90 participants (68 males, mean age  $58.7 \pm 16.7$  years) were recruited from local physical therapy and prosthetic and orthotic clinics, rehabilitation hospitals, and a regional amputee patient support group. All participants were community-dwelling, non-military adults with amputation involving at least one major lower limb joint. Participants were interviewed, and each completed a survey that included basic demographic/medical information, self-reported health and wellbeing (Short-Form Health Survey, SF-36v2), and a question to determine their financial situation after limb loss. Multiple regression analyses were used to examine the effect of financial difficulty on the eight subscales of SF-36v2 while accounting for age, gender, and amputation level.

### Results

Experiencing financial difficulty significantly and negatively affected Role-Physical and Role-Emotional subscale scores ( $p < 0.01$  and  $p = 0.02$ , respectively). Individuals with financial difficulty scored approximately 60% lower in these two specific subscales.

### Conclusion

Experiencing financial difficulty is a significant predictor for diminished work or daily activity

participation due to physical and emotional stresses. Clinicians and health policy makers need to understand how socioeconomic factors may prevent individuals with lower limb loss from achieving higher levels of functional recovery and community re-integration after amputation.

#### Clinical relevance

Our findings showed that presence or experience of financial difficulty was significantly associated with diminished community re-integration in community-dwelling, non-military adults with lower limb loss. It affects both physical and emotional aspects of wellbeing. Clinicians should be aware how socioeconomic factors may affect social re-integration after amputation.

## **BACK**

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### Effectiveness of a crossover prosthetic foot in active children with a congenital lower limb deficiency: an explorative study

Floor Jacoba Marie-Georgette Verheul, Olaf Verschuren, Marenka Zwinkels, Mariska Herwegh, Anka Michielsen, Marieke de Haan, Iris van Wijk

October 2020; 44(5): 305-313

<https://doi.org/10.1177/0309364620912063>

#### Background

Children with lower limb prostheses cannot always keep up with their peers during active play. A pediatric crossover foot may be a promising prosthetic alternative for children engaging in high-intensity movements necessary for active play.

#### Objectives

To compare children's walking performance, running performance, experienced competence, and cosmesis using their prescribed prosthesis compared with the crossover foot.

#### Study Design

Pretest-posttest study.

#### Methods

Children with lower limb amputation or deficiency were recruited. Measurements were taken at baseline with the prescribed prosthesis and 6 weeks later with the crossover foot. Walking speed, energy cost of walking, anaerobic muscle power, stair climbing speed, ankle power, and cosmesis were evaluated.

#### Results

Four children participated in the study. Two children had increased walking speed with the same energy cost, one child had decreased speed with increased energy cost, and one child had the same speed with decreased energy cost. Muscle power increased for three of the four children and ankle power increased for all children while using the crossover foot compared to the prescribed prosthesis. Two children reported knee pain or feeling excessive knee flexion when running with the crossover foot. One child reported negative feelings toward cosmesis of the crossover foot.

## Conclusions

This study suggests crossover foot may benefit active children by improving walking and running performance, and decreasing energy cost. However, knee pain reports or negative feelings toward the atypical design suggest the crossover foot may not be ideal for every child. Further research is needed to determine which pediatric users would benefit from this type of prosthetic foot.

## Clinical relevance

Children with lower limb deficiencies are active prosthetic users who often switch between low- and high-intensity movements in their daily activities. Therefore, they might benefit from a crossover prosthetic design. The preliminary findings of this study suggest the crossover foot (XF) may be a promising foot for active children.

## **BACK**

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### Three-dimensional printing in prosthetics: Method for managing rapid limb volume change

Eric Nickel, Kyle Barrons, Barry Hand, Alana Cataldo, Andrew Hansen

October 2020; 44(5): 355-358

<https://doi.org/10.1177/0309364620934340>

## Background and Aim

During post-amputation recovery or rapid body mass change, residual limb volume can change quickly, requiring frequent adjustments or replacement of the socket to maintain fit. The aim of this pilot test was to evaluate the feasibility of using a three-dimensional-printed insert to extend the service life of a prosthetic socket after substantial residual limb volume loss.

## Technique

One research subject with a well-fitting transtibial prosthetic socket had an oversized socket fabricated to simulate substantial limb volume loss. The digital shapes of the oversized and well-fitting sockets were used to create a three-dimensional-printed insert to restore fit.

## Discussion

Two-minute walk test distance decreased when using the oversized socket without the insert, but not when using the socket with the insert. Socket comfort score was 8+ under all conditions. These results suggest that three-dimensional-printed inserts may be an effective method of extending the service life of prosthetic sockets when rapid limb volume loss occurs.

Clinical relevance

Three-dimensional (3D) printing gives prosthetists a new tool to manage large volume changes without refabricating entire sockets. Sockets can be fabricated in anticipation of volume gain/loss, using replaceable 3D-printed inserts to maintain fit and comfort.

## **BACK**

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### Strength deficits in lower limb prosthesis users: A scoping review

Alex Hewson, Shaquitta Dent, Andrew Sawers

October 2020; 44(5): 323-340

<https://doi.org/10.1177/0309364620930176>

Background

Strength deficits may play a central role in the severity of balance, mobility, and endurance impairments in lower limb prosthesis users. A body of literature detailing the scope and specifics of muscle weakness in lower limb prosthesis users is emerging, but has yet to be summarized. A synopsis of strength deficits, and their impact on functional abilities in lower limb prosthesis users, may inform rehabilitation and research needs.

Objectives

Synthesize reported strength deficits in lower limb prosthesis users, and discuss possible causes, consequences, and solutions.

Study Design

Scoping review.

Methods

A search of biomedical databases was performed, and inclusion/exclusion criteria were applied to identify publications relevant to the purpose of the review.

Results

In all, 377 publications were identified, of which 12 met the inclusion/exclusion criteria. When compared with the controls and the intact limb, the primary strength outcome, peak torque, was lower in transtibial residual limb knee flexors and extensors, as well as transfemoral residual limb hip muscles.

## Conclusions

The reviewed studies provide evidence of strength deficits in lower limb prosthesis users. These deficits appear to be consequential, as they may contribute to balance, mobility, and endurance impairments. Additional research exploring alternative strength metrics, clinical tests, and causal links to functional impairments is required.

## Clinical relevance

Evidence of muscle weakness among lower limb prosthesis users, and its influence on balance, mobility, and endurance, suggests that greater clinical attention and scientific inquiry into physical conditioning of lower limb prosthesis users is merited and required.  
Peter J Marshall, Andrew N Meltzoff

**BACK**

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