Gait Training Interventions for Lower Extremity Amputees
A Systematic Literature Review

M. Jason Highsmith1,2, Casey Andrews1, Claire Milliman1, Ashley Fuller2, Jason Kahle4, Tyler Klenow3, Katherine Lewis2, Rachel Bradley3, John Orriola2

1VA/DOD Extremity Trauma & Amputation Center of Excellence (EACE) Tampa, FL
2University of South Florida, Tampa, FL, 3James Haley VA Hospital, Tampa, FL, 4OP Solutions, Tampa, FL

INTRODUCTION There are 1.6M Americans with limb amputation(s) and ~86% of these are lower limb amputations. Amputee gait impairments have been objectively documented in multiple domains including spatiotemporal, biomechanical and bioenergetic parameters. Gait parameters potentially altered in LE amputees include changes in magnitude and symmetry of forces and joint moments, event duration and others. These deviations may contribute to decreased balance and increased metabolic costs as well as more insidious, chronic issues including degenerative joint disease. Interventions to mitigate gait deviations and improve quality of life for Lower extremity amputees include prescribing the proper componentry and participating in physical therapy (PT) for gait training. This study’s purpose was to systematically review the literature to determine the evidence strength supporting gait training interventions and to formulate empirical evidence statements (EESs) to guide practice and research related to therapeutic gait training for LEAs.

METHOD A multi-disciplinary team systematically reviewed 1.) Pubmed, 2.) CINAHL and 3.) Web of Science on Dec15, 2014 using the following date limits: 2000(Jan1)-2014(Dec14). One month after the initial search, the search was repeated. References were exported to EndNote reference management software. Duplicate references were eliminated. Remaining articles were sorted by type. Exclusion criteria were selected to eliminate manuscripts that did not include gait training for adults with LEA who used prostheses. Articles were assigned 2 reviewers who independently screened for eligibility and classified them as either: 1) pertinent, 2) not pertinent or 3) uncertain pertinence.

Methodologic quality was assessed using the American Academy of Orthotists & Prosthetists (AAOP) State-of-the-Science Evidence Report Guidelines. Internal and external validity of each study was rated. Each study was then given an overall quality of evidence rating of “high”, “moderate”, “low”.

Key data were then extracted to describe studied subjects, interventions and their relative effect. Quality ratings were used to assign the confidence level for the developed EESs.

Based on publications’ results, EESs were developed to describe study findings related to gait training interventions for LEAs. Reviewers rated the confidence level of each EES based on the quantity and quality of publications contributing to the statement and whether the contributing findings were confirmatory or conflicting.

Following screening and eligibility determination procedures, full-text articles were sorted by reviewers into sub-topical areas.

RESULTS 11,118 total manuscripts were identified. 18 articles met eligibility criteria spanning 2001-2014 publication years and divided into 2 topical areas: 1) Overground Training (n=13) and 2) Treadmill Training (n=5). There were 11 experimental studies, 5 case study designs and 2 editorials. A total of 229 subjects were included. 145 LEAs served as experimental subjects (mean interquartile range[IQR]) age, height and mass were: 48.2(29.5)yr, 1.70(0.04)m and 80.6(10.3)kg. In terms of amputation level, 57% had TFA, 21% had TTA, 21% were mixed lower extremity samples. Outcomes included biomechanical, spatiotemporal measures and bioenergetics outcomes, and clinimetric assessment. Ten studies had low, six had moderate and two studies had high internal validity. Conversely, 16 studies had high and two had moderate external validity. Eight EESs were synthesized within the two topical areas: One was supported by a single study resulting in insufficient support. Four EESs had two to four studies supporting their synthesis (low confidence). One EES was supported by four studies (moderate confidence) and two were supported by sufficient evidence to provide high confidence. Four statements address overground gait training, one addressed treadmill gait training and three addressed both overground and treadmill gait training.

CONCLUSION Due to gait asymmetries, altered biomechanics and related secondary consequences associated with LEA, gait training is needed. Eight EESs were synthesized over two general areas of gait training therapy including overground and treadmill training. Overground training with verbal, other auditory, manual and psychological awareness are effective. Treadmill based training was also found to be effective as a supplement to overground training or independently and when augmented with visual feedback, body weight support or as part of a home exercise plan.

REFERENCES
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