LOWER LIMB AMPUTEE ACTIVITY UNEFFECTED BY SHOCK-ABSORBING PYLON OR C-LEG KNEE

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INTRODUCTION

Prosthetic prescription is widely believed to have a strong influence on lower limb amputee activity levels. Optimum prescription should equate to maximum performance. Field measurements of activity is one method to access performance on a functional level, yet few investigators have used this metric to explore how amputees actually use their prostheses in the community [1] and how prosthetic prescription might influence activity [2]. The purpose of this study is to discover if variation in prosthetic prescription can affect the activity levels of lower limb amputees. The secondary purpose was to discover the characteristics of their activity; specifically, how long are their bouts of activity, how frequently do they occur, and how many steps do they average during each bout.

METHODS

Ten *transtibial* and five *transfemoral* amputees gave informed consent to participate in this Institutional Review Board-approved protocol. Activity levels were measured using a pager-sized instrument (StepWatch2; Cyma) attached to the distal end of the prosthetic pylon. The number of steps taken was collected for 1 week using a 1 minute sample and record interval. The prosthetic components of all subjects were held constant throughout the study except for the intervention of interest. The *transtibial* amputees (5 traumatic, 4 dysvascular, 1 infection; age 52 ± 6 years; Ht. 178 ± 6 cm; Wt. 91 ± 18 kg), all long term prosthetic users, were provided with a SAP (Mercury™ Telescopic Torsion Pylon; Blatchford) and rigid pylon in random order. The activity of each subject was recorded following 3 weeks of acclimation. The *transfemoral* amputees (5 traumatic; age 48 ± 14 years; Ht. 171 ± 4 cm; Wt. 76 ± 10 kg), all previous long term Mauch SNS (Ossur) users, were provided with a C-Leg (Otto Bock) and a Mauch SNS in random order. The activity of each subject was recorded following 3 months of acclimation.

RESULTS AND DISCUSSION

The activity levels of neither *transtibial* nor *transfemoral* amputees were affected by their prosthetic prescription. Among *transtibial* amputees, no difference in activity level was observed across pylons (Rigid: 3191 ± 2230 steps/day, SAP: 3192 ± 2207 steps/day, $p > .99$). Among *transfemoral* amputees, no difference in activity level was observed across knees (Mauch SNS: 2675 ± 976 steps/day, C-Leg: 2657 ± 737 steps/day, $p > .96$). A study of *transtibial* amputees (n=13) did find a difference across liners: subjects were more active while wearing a closed-cell low-density polyethylene liner (4135 steps/day) than a silicone liner (2262 steps/day) [2]. Considering that activity levels can vary widely between individuals [3], a large sample population might be necessary to adequately determine a functional activity level ceiling for lower limb amputees. However, if appropriate controls are placed on age and amputation etiology [1], a small sample population might suffice to distinguish differences due to prosthetic prescription in within-subject experiments.

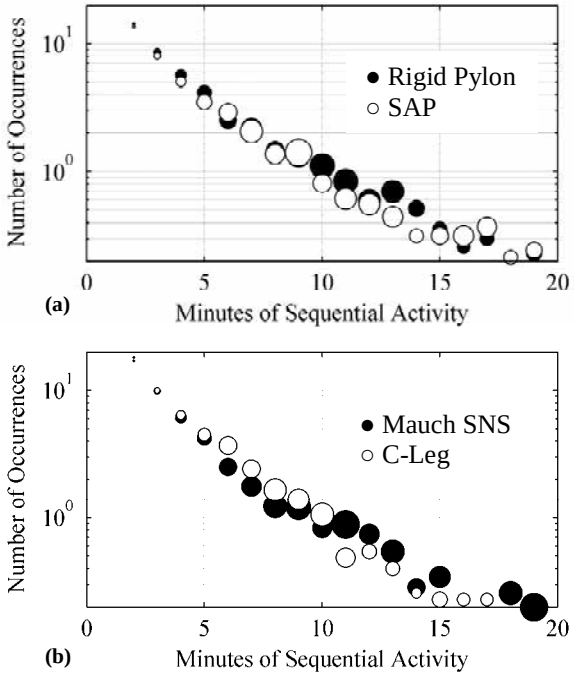

Figure 1: Bouts of daily activity (averaged over 1 week) for **(a)** *transtibial* amputees wearing rigid pylon or SAP and **(b)** *transfemoral* amputees wearing Mauch SNS or C-Leg. Circle diameter is proportional to number of steps per minute (1mm=20 steps/minute).

No differences were distinguishable in the characteristics of their daily activities averaged over a 1 week period (see Figure 1). When amputees walked for at least 5 minutes in a row, they averaged ~50 steps/minute. However, rarely were amputees active for more than 10 minutes at a time. Most of their activities (number of occurrences) consisted of short bouts of 3 minutes or less and during these short bouts they averaged ~14 steps/minute. Subjects in this study did not achieve the recommended minimum of 30 minutes moderate-intensity activity on most days of the week to promote health, psychological well-being, and a health body weight [4].

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