INTRODUCTION

Much like people have a preferred hand they also have a preferred foot. The dominant foot is the one used to manipulate an object (preferred foot), whereas the non-dominant foot provides postural support to the preferred foot. Aside from single limb stance, the preferred foot carries across most lower limb tasks in healthy people (Peters, 1988).

This study was designed to explore how amputation affects innate foot preference. We hypothesized that prosthesis users will use the intact leg for stability and the prosthetic leg for performance across different tasks with the same consistency as control subjects use their dominant leg. We also explored if prosthesis users change their strategy when provided with support. The results may improve understanding motor control strategies used by prosthesis users and have implications for therapy.

METHOD

Subjects: We recruited 19 able-bodied controls (9 men; mean age 42 yrs, 18 right-handed) and 31 prosthesis users (20 men; 49 yrs; 27 right-handed; 20 below knee amputees and 11 above knee amputees).

Set-up: We assessed performance of different tasks under 2 conditions, standing with hands on parallel bars (supported) and unsupported in an open area. Six tasks were identical in both conditions and the remaining 6 were selected from 6 pairs of tasks. Each task in a pair required similar action and difficulty. The subject stood with feet equally spaced from the midline, which served to place the cueing objects in consistent locations to avoid biasing leg choice.

Protocol: Prosthesis users performed both supported and unsupported conditions in random order. Eleven able-bodied subjects performed both conditions and 8 only the unsupported condition. Subjects were instructed to perform each task in the most comfortable way. No suggestion was given as to the choice of a leg. The demographic information was collected during a seated break between the two conditions. At the end, subjects completed the Waterloo Handedness Questionnaire-Revised.

Data Analysis: The single limb support task was found to be an outlier and excluded from analysis. The main outcomes were 1) the action leg (the leg used for object manipulation in each task), and 2) the preferred leg (the leg used as an action leg in 6 out of 11 tasks).

Outcomes were grouped in dominant vs. non-dominant hand side and prosthetic vs. intact side.

RESULTS

In controls, the action leg mostly matched the dominant hand side across all tasks (74-84% in free standing condition). In prosthetic users, the action leg varied, with the prosthetic leg used least often in the stomping (35%) and pumping (39%) tasks, most often in the door stopping (81%), lid lifting (81%), and pushing (74%) tasks, and about 50% in other tasks. The prosthesis users were more likely to switch their action leg between tasks within a condition (Figure 1).

As a group, controls performed similarly between the two conditions. The prosthesis users, however, used the prosthetic leg more often than the intact leg as either the action leg or the preferred leg in the unsupported compared to supported condition. The relationship between hand dominance and prosthetic leg could not explain these results.

DISCUSSION

Our results refute the hypothesis that the prosthesis users choose the strategy that favors the prosthetic leg for performance as often as control subjects use the dominant leg. This differs from the conventional assumption that the prosthetic leg is rarely used for stability. When provided with support, prosthesis users change their performance strategy in favor of intact leg while controls remain consistent. It should be evaluated if this variable strategy is related to falls.

CONCLUSION

Prosthetists should advise therapists to consider exercises that include training of the prosthetic leg in both stability and performance tasks.

REFERENCES