PERFORMANCE AND SATISFACTION WITH INTUITIVE MULTIFUNCTIONAL HAND PROSTHESIS CONTROL

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BACKGROUND

Pattern recognition control (PR) functions in a different way than conventional control (CC). Instead of relying on two electrode sites to control a single degree of freedom (DoF), PR uses many electrodes and intuitive movement mapping to control several movements seamlessly.

AIM

The aim of this feasibility study is to test the performance and satisfaction of transradial amputees in prolonged home-use of PR prostheses, and to obtain feedback from certified prosthetists and trainers.

METHODS

Transradial amputees wearing prosthetic systems with CC, single opening/closing hand and active wrist rotation were enrolled in the study. Functional assessments were performed 4 times: 1) baseline with CC prosthesis-baseline, 2) 1st follow-up with the PR prostheses after fitting and training process, 3) 2nd follow-up after 1 month of PR home use, and 4) 3rd follow-up with re-fitted CC prosthesis, and consisted of performance-based (Modified Box and Blocks test (mB&B), Clothespin Relocation and Proportional Control Test) and self-reported tests (Disabilities of the Arm, Shoulder and Hand (DASH); project specific questions). The fitting and training process were rated by certified prosthetists and trainers.

RESULTS

Six patients have been enrolled in the study and fitted with the PR devices. Users were mainly male (71%), mean age 44 (± 13.4) years. Amputation etiology was trauma (100%).

All participants were satisfyingly fitted with PR prosthesis within the first visit. The fitting and training process ware rated as clear or slightly unclear with no or mild difficulty to follow the instructions.

The ability to control hand open/close and wrist rotation, measured with clothespin test, was improved with PR (transporting the clothespins from vertical to horizontal bar showed 34% improvement; from horizontal to vertical bar 18% improvement, *Figure 1*). The mB&B, was 27s (± 33.8s) prolonged at 1st follow-up and 9s (± 18.8s) at 2nd follow-up. Patients experienced mild difficulty and problems when controlling PR system. No difference was observed in DASH and the level of proportional control. 50% of participants would prefer PR over CC. Users who were already adept CC prostheses users gained disproportionally more from PR than to technically less savvy users.

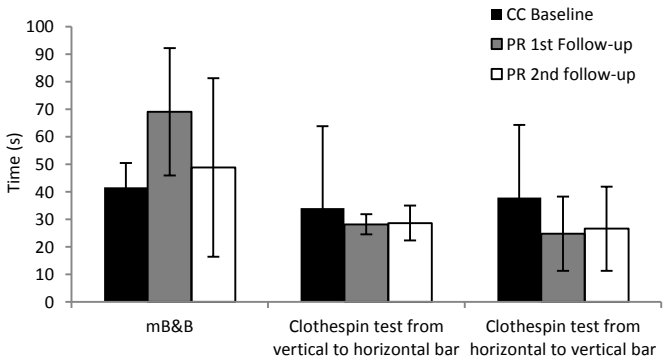

Figure1: Performance-based test conducted at baseline with CC, and at 1st and 2nd follow-up with PR.

DISCUSSION & CONCLUSION

PR improved the unilateral gross manual dexterity and ability to control two DoFs. The longer patient accommodation time and optimized product development might minimize mild problems in fine and gross motor movements observed during the first month of PR home-use.

DISCLOSURE

Sebastian Amsuess, Ivana Sreckovic and Birgit Bischof are affiliated with Otto Bock Healthcare Products.