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Compensatory Movement in Upper Limb Prosthesis Users during Activity Performance

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BACKGROUND
Low dexterity of conventional two-function (open, close) myoelectric hand prostheses with limited wrist movement often leads to compensatory shoulder and elbow movements, e.g. excess shoulder abduction and elbow flexion. Compensatory movements may lead to musculoskeletal pain [1] and it is thus important to identify prosthesis users with compensatory movements and to develop preventive treatments for musculoskeletal pain.

AIM
The study aim was to measure and compare compensatory movements during activity performance among upper limb prosthesis users with different levels of myoelectric control.

METHOD
Twenty-seven users of conventional myoelectric hand prosthesis performed the Assessment of Capacity for Myoelectric Control (ACMC) at the Örebro Limb Deficiency and Arm Prosthesis Centre. The performances were recorded and analyzed with Dartfish motion capture video analysis software. The software was used to track and measure the maximum angles for shoulder abduction and elbow flexion at the non-prosthetic and prosthetic sides during the activity performance. Two independent raters used Dartfish to analyze 10 videos and Intra-class Correlation Coefficient (ICC) was used to calculate inter-rater reliability. The ability to control a myoelectric prosthetic hand was assessed by the ACMC.

RESULTS
The within-individual differences for shoulder abduction ranged from 2° to 52° and for elbow flexion from 1° to 66°. When compared between prosthetic and non-prosthetic side, larger differences in shoulder abduction and elbow flexion were found among the users with ACMC ≤ 0 than users with ACMC > 0 (Fig.1a).

When comparing the within-individual side differences between prosthesis users with ACMC ≤0 and users with ACMC >0, a significant angle difference was found in the elbows (p=0.03) but not in the shoulders (p=0.34) (Fig.1b). Inter-rater reliability between the two independent raters was excellent (ICC 0.91).

DISCUSSION AND CONCLUSION
Compensatory elbow movements during activity performance are higher in upper limb prosthesis users with low level of myoelectric control. Prevention for musculoskeletal pain should consist of both training for improved prosthetic control and improved prosthetic use in activity performance. Measurement of compensatory movements can help to identify amputees with frequent compensatory movements. Future studies are needed to investigate the effect of ability to control myoelectric prosthesis on musculoskeletal pain.

REFERENCES

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