

Author:

Bjerkefors, Anna (Swedish School of Sport and Health Sciences, GIH, Department of Sport and Health Sciences, Laboratory for Biomechanics and Motor Control)

Title:

Performance and trainability in paraplegics: motor function, shoulder muscle strength and sitting balance before and after kayak ergometer training

Department:

Swedish School of Sport and Health Sciences, GIH, Department of Sport and Health Sciences, Laboratory for Biomechanics and Motor Control

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Abstract(en) :

Background

Spinal cord injury (SCI) results in a complete or partial loss of motor and/or sensory function below the injury level. An SCI causes extensive functional impairment compelling many persons to wheelchair usage. Maintaining an adequate strength and control of trunk and shoulder muscles becomes essential, as the majority of every day tasks will be performed in a sitting position. Moreover, physical exercise is crucial to avoid risks connected with a sedentary life-style. Therefore, it becomes important to find suitable, effective, and attractive physical activities to retain and even improve motor functions achieved during rehabilitation. Ideally, such a training activity should be versatile and have the potential to improve several capacities beneficial to everyday life and thereby increase the independence of persons with SCI. Kayak paddling appears to fulfil several of the criteria for such an activity.

Objectives

The overall aims were to see if, and to what extent, a period of training on a modified kayak ergometer could influence functional performance as well as specific qualities, such as, shoulder muscle strength and sitting balance control in a group of postrehabilitated persons with thoracic SCI. An additional aim was to understand more about the availability of the trunk muscles in a person with a clinically complete thoracic SCI and how the trunk muscles are used to maintain upright sitting in response to balance perturbations.

Methods

Ten adult post-rehabilitated persons with thoracic SCI performed 30 sessions of kayak ergometer training for a 10-week period, with progressively increased intensity and balance demand in the medio-lateral direction. Pre- and posttraining measurements included performance in functional wheelchair tests, maximal voluntary shoulder muscle strength, and trunk stability in response to support-surface translations. Electromyographic (EMG) recordings from deep and superficial trunk muscles were obtained in a sub-sample of two subjects, one with a high thoracic SCI and one able-bodied person.

Results

There were significant improvements with training in functional performance, shoulder muscle strength, and the ability to maintain an upright sitting posture in response to balance perturbations in the group of persons with SCI. The EMG results revealed that the person with a high thoracic SCI, clinically classified as complete, was still able to activate trunk muscles below the injury, both in maximal voluntary efforts and in response to balance perturbations, but the response pattern differed from that of the able-bodied.

Conclusions

The improvements in test-performance observed with the kayak ergometer training in the persons with SCI should enhance their capacity to master similar challenges in everyday life, which, in turn, might lead to a greater independence. The pilot data on muscle activation highlight the importance of including examination of trunk muscle function in persons with thoracic SCI in relation to injury classification, prognosis, and training prescription.

Note: För att beställa tryckta exemplar av avhandlingen kontakta Anna Bjerkefors, anna.bjerkefors@gih.se

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Supervisor: Thorstensson, Alf (Swedish School of Sport and Health Sciences, GIH, Department of Sport and Health Sciences, Laboratory for Biomechanics and Motor Control)

Opponent: Fridén, Jan, Professor

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