INTRODUCTION
Cases with neck/shoulder pain compared to healthy controls have often been shown to generate less force during maximal isometric contractions (MVC) of the shoulder muscles. A possible explanation is a pain-related inhibition of the central drive. The aim of the present study was to investigate voluntary activation of the trapezius muscle during MVCs in neck/shoulder cases and healthy controls, using the twitch interpolation technique.

METHODS
Ten cases with neck shoulder pain classified as either trapezius myalgia and/or shoulder impingement syndrome and 11 healthy controls matched on age and gender were included in the study. Upper trapezius muscle thickness was measured using ultrasonography and pain intensity was measured on a 100mm visual analog scale (VAS) during rest. Subjects performed 3-5 isometric MVCs of the shoulder elevator muscles against fixed force transducers placed over each acromion. Electrical stimulation was delivered to the accessory nerve at peak force during the MVC and at 2% MVC. Voluntary activation was calculated using twitch interpolation based on the ratio between the force increase evoked during the MVC and during 2% MVC.

RESULTS AND DISCUSSION
Significant differences in MVC (cases: 546 ± 162N, controls: 692 ± 202N, P=0.04) and pain intensity (cases: 16.0 ± 14.4mm, controls: 2.1 ± 3.9mm, P=0.003) were found. There was no difference regarding muscle thickness (cases: 10.9 ± 1.9mm, controls: 10.5 ± 1.5mm, P=0.27) or voluntary activation (cases: 93.6 ± 14.2%, controls: 96.3 ± 6.0%, P=0.29). Also no difference was found regarding the maximal evoked 2% MVC twitch force. The similar muscle thickness for cases and controls could have been due to edema in the painful muscle and thus smaller amount of contractile tissue in spite of similar muscle thickness. However, the similar 2% twich force indicate that the muscle tissue quality is not the cause of the decreased MVC for the cases. Since voluntary activation was also similar for cases and controls an explanation may possibly be looked for in the timing and coordination of the activation of all parts of the trapezius muscle and muscle synergists around scapula and the gleno humeral joint.

CONCLUSION
Although cases had significantly higher pain intensity than the controls, lack of muscle mass or pain-related inhibition of the central drive could not account for the reduced ability of cases to generate force.

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