

## SUMMARY

# NECK PAIN IN AIR FORCE PILOTS On Risk Factors, Neck Motor Function and an Exercise Intervention

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- Subject** : NECK PAIN IN  
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On Risk Factors,  
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### **Description :**

Neck pain is a medical problem in modern military aviation. While neck exercises are recommended, clinical trials of neck motor function have been less investigated. The aims of the work presented in this thesis were to estimate potential flight-related and individual factors involved in helicopter pilots' neck pain, to explore neck motor function in fighter pilots and helicopter pilots with different progression of neck pain and to evaluate the effect of an early neck/shoulder exercise intervention for neck pain in helicopter pilots.

The subjects were volunteers recruited consecutively as the pilots reported to the Swedish Armed Forces Aeromedical Center for regular medical examinations (papers I and II) and from two operational air force helicopter bases in Sweden (papers III and IV). A survey estimated the prevalence of, and potential flight-related and individual risk indicators for, neck pain in helicopter pilots (paper I, N = 127). Experimental measures of neck motor function included neck extensor and flexor muscle strength, and electromyography (EMG) frequency parameters in extensors and sternocleidomastoid (SCM) muscles with the subject seated during sustained contraction against stipulated loads representing 50% of maximal strength (paper II, N = 60). EMG frequency parameters were also obtained for SCM in supine position against the weight of the head. Further, EMG activity in SCM during staged active craniocervical flexion when supine, as well as neck range of motion when seated, were assessed. Fear-avoidance beliefs about physical activity were rated (paper III, N = 72). A controlled trial evaluated a six-week, supervised, neck/shoulder exercise intervention. Intervention members and untreated controls were followed regarding the number of neck pain cases (defined as reported neck pain during the previous three months), SCM activity and rated fear-avoidance beliefs (paper IV, N = 68).

The results showed the three-month prevalence of neck pain to be 57%. Previous neck pain and shoulder pain were associated risk factors, while use of helmet-mounted night-vision goggles indicated a risk. About half the neck pain cases reported that their pain occasionally interfered with flying duty and leisure, while only 25% had ever been on sick-leave related to neck pain.

Experimental findings showed that fighter pilots with frequent pain had lower neck extensor strength than their pain-free controls, while no such differences were found for helicopter pilots. In seated position, EMG frequency shifts were less in SCM for helicopter pilots with frequent pain, while no significant effect emerged for helicopter pilots in supine. Helicopter pilots with acute ongoing pain as well as subacute pain had higher SCM activity during active craniocervical flexion than pain-free controls did, while the acute group, solely, had less range of motion and rated higher fear-avoidance beliefs than controls. A logistic regression entering EMG variables, range of motion and fear-avoidance suggested that SCM activity was the strongest predictor of neck pain. In the clinical trial, SCM activity at the highest contraction level of active craniocervical flexion was reduced in intervention members post-intervention while no between-group effect emerged for fear-avoidance beliefs. At a 12-month follow-up, the results indicated a reduction in number of neck pain cases among subjects allocated to the intervention. In conclusion, neck pain is common in air force helicopter pilots, and preventive action aiming to reduce the risk of a first neck pain episode seems important. In air force pilots, screenings of neck extensor strength and surface neck flexor activity appeared to be relevant measures of neck motor function for clinical understanding of pilots' neck pain, but should be understood in the context of pilots' specific exposure. A supervised neck/shoulder exercise intervention improved neck motor function to some extent and had a positive early preventive effect over a 12-month period in reducing the occurrence of neck pain in air force pilots.

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