THE EFFECT OF HEAD TILT ON LOW-LEVEL, DYNAMIC STERNOCLEIDOMASTOID ACTIVATION

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INTRODUCTION

Neck pain is a common complaint, often associated with workplace factors [1]. In a study involving 512 office workers, 45.5% reported occurrence of neck pain over 12 months [2]. The sternocleidomastoid (SCM) is a superficial muscle in the neck involved in flexion, lateral flexion and rotation of the head [3, 4]. The purpose of this study was to examine the effect of head tilt on SCM activation during a low force level, dynamic task.

METHODS

Data were collected from six adult subjects, with no reported neck pain. Surface EMG was recorded from the left and right SCM. The skin was cleaned with rubbing alcohol and skin impedance was lowered using conductive gel. Single use electrodes (Kendall Medi-Trace #135) were affixed to the skin surface in bipolar configuration. Electrodes were positioned at 1/3 of the muscle length, measured from the sternal notch, and oriented parallel to the muscle fibres. The ground electrode was placed over C7. EMG signals were amplified and pre-filtered using a Bortec® surface EMG recording system; signals were sampled at 1 kHz.

The subject was seated in a rigid chair with the head supported in a neutral posture. A horizontal LED display, comprising a central green LED and three red LED’s on either side, was mounted in front of the subject. The subject was positioned at a distance from the display such that turning to look at the LED’s resulted in head rotations of 15°, 30° or 45°. Four movement profiles were presented to the subject: jump right and left, in which s/he turned from 0° to 15°, 30° and 45° returning to 0° after each rotation; step right and left, in which s/he followed the pattern 0°-15°-30°-45°-30°-15°-0°. Each position was held for 5s. Three vertical locations of the LED display were tested in random start order: Neutral—at eye level; High—20° above eye level; and Low—20° below eye level. Subjects completed three trials of each movement profile for each vertical position. Prior to the dynamic data collection, EMG data for rest and maximum voluntary effort (MVE) contractions were recorded.

The average EMG amplitude over each 5s segment for each trial was obtained. The values were normalized by subtracting the rest EMG amplitude and dividing by EMG amplitude at MVE. Normalized EMG amplitudes for the segments where the head was turned (three positions for jump trials and five positions for step trials) were summed. Negative summed values were obtained for one subject and the subject’s data were discarded. A two-factor ANOVA with repetition was run on the remaining data. Subjects with missing trials were removed from the analysis. Data were analysed for 5 subjects x 3 trials for the jump left movement, and for 4 subjects x 3 trials for all other movements.

RESULTS

Both subject and head position were found to be significant factors (p<0.05) affecting summed EMG amplitude levels for all movements. Summed EMG amplitudes, averaged across subjects are shown in Fig. 1 for high (H), neutral (N) and low (L) head positions. There is little variation in EMG amplitude between the neutral and high positions, but it is apparent that EMG amplitude increases for the low position.

DISCUSSION & CONCLUSIONS

The results indicate that only a slight degree of neck flexion can result in an increase in SCM muscle activation during a low force dynamic task. It has been found that the SCM is susceptible to fatigue in endurance contractions [5]. The noticeable increase in SCM EMG amplitude with a slight neck flexion, may indicate an increased risk of developing neck pain during long term exposure.

REFERENCES