INTRODUCTION

Neck/shoulder pain is frequent in female office employees and muscle fatigue development and metabolic insufficiencies have been documented to be related to pain perception (2, 3). Previous studies have revealed pain relief following participation in physical activity programs. The aim of the present study was to quantify possible changes in muscle oxygenation and activation following different work site physical activity programs together with responses in perceived exertion and pain perception.

METHODS

48 employed female office employees, mean age 44 (30-60) years, clinically diagnosed with trapezius myalgia were randomly assigned to one of three groups: DRT (heavy dynamic resistance training for the shoulder and neck muscles with various dumbbell exercises with 8-12 RM loads), BIC (bicycle exercise ~70% VO2max, only using their legs while maintaining shoulders relaxed and not gripping onto the handle bars), and REF (receiving information on health promotion but without physical activity). Training in the two groups was performed for 20 min 3 times/wk for 10 wks. Before and after the intervention period the employees performed a standardized repetitive work task in terms of pegboard work, PEG, for 40 min. Muscle activity was measured by bipolar surface EMG recording from the upper trapezius muscle. The background noise level was quadratically subtracted individually for each participant; thereafter, RMS was analyzed and normalized to the maximal voluntary exertion, MVE. A straight line was fitted for each recording of which the initial value as well as the slope was calculated. Muscle oxygenation was measured non-invasively using the NIRS technique with the probe placed on the skin with the near-infrared light sources and detectors located cranially and caudally to the EMG electrodes, respectively, and sampled at 2 Hz (1). Immediately before start of PEG, the NIRS was set to zero, thus all muscle oxygenation measurements are presented as concentration changes in µM HbO from an initial value of 0. Rating of perceived exertion was assessed by the RPE scale (0 - 10= maximal) and pain perception by a VAS scale (0 -100%= worst possible pain).

RESULTS AND DISCUSSION

The training was completed by 18 employees in DRT, 16 in BIC and 8 REF. Muscle activity was 10 %MVE initially during PEG and increased during the 40 min with a slope of 0.02 %MVE/s. Muscle oxygenation decreased from resting value within the first 5 min to a delta nadir value of -1.3 µM and recovered only marginally to a mean value of -1.0 µM during the last 5 min of the PEG. Perceived exertion increased from a RPE score of 2.4 at rest to 5.6 at the end of PEG, and pain perception from a VAS score from 27% to 54%. There were no differences between the three intervention groups for any of these measures. Following the intervention no changes had occurred in the REF. Only in the DRT the EMG activity initially during PEG decreased to 6.3 %MVE while the slope remained unchanged during the PEG. Muscle oxygenation showed the largest changes in the BIC with a nadir value of -0.7 µM only, and a full recovery at the end of the PEG with a value of 0.02 µM above resting value. In the DRT the corresponding values were -1.0 µM and -0.61 µM. At rest RPE had decreased in the DRT to 1.4 and pain perception to 12.6%, and during the PEG increased to only 4.1 and 31%, respectively. The corresponding values for BIC were 2.5 and 27% at rest and 4.6 and 43% at the end of PEG.

The main finding of the present study was the decrease in EMG level, perceived exertion, and pain perception following 10 weeks of DRT with only minor changes in muscle oxygenation. In contrast, following BIC the muscle oxygenation was dramatically improved but relative muscle load, perceived exertion, and pain perception were only marginally changed. DRT improved muscle strength by approx 30% and may thereby account for the decrease in relative load and fatigue development during PEG. Interestingly, measures of oxygenation of the trapezius muscle during bicycle training with the legs only- have shown an increase even though the subjects were instructed in keeping the arms relaxed and hanging along the side. This may indicate that the activity of large muscle groups may have a systemic effect also on the passive muscle mass. Such an effect may be mediated by an increased synthesis and release of cytokines such as IL6 from the contracting muscles.

CONCLUSION

Trapezius muscle activity is lowered in females with trapezius myalgia following a period of dynamic resistance training concomitant with a decrease in pain perception. Surprisingly, the largest improvement in muscle oxygenation was seen following a period of bicycle training with the legs only, but with only minor effect on pain perception. The data do not support a direct effect of muscle oxygenation on pain perception in trapezius myalgia.

REFERENCES
